Net-Zero America - Maryland data

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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)		83.9	0.057	0.056	0.052	0.036	0.003
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		28	20.9	13.9	12.6	7.41	3.09
Premature deaths from air pollution - Mobile - On-Road (deaths)		246	229	173	100	44.8	16.5
Premature deaths from air pollution - Gas Stations (deaths)		17.5	16.1	12	6.99	3.22	1.34
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		32.2	26.2	17.3	9.45	4.49	1.96
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		16	13	8.78	5	2.15	0.668
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		4.19	3.77	2.93	2	1.18	0.679
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		1.88	1.8	1.72	1.63	1.54	1.44
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		35	30	21.2	12.8	7.49	4.58
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		9.17	7.3	5.23	3.42	2.23	1.44
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		2.59	2.21	1.83	1.44	1.06	0.704
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.17	0.672	0.669	0.661	0.671	0.664
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		54.1	49.3	42.7	33.1	23.3	13.8
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		744	0.505	0.5	0.458	0.318	0.027
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		248	185	123	112	65.6	27.4
Monetary damages from air pollution - Mobile - On-Road (million $2019)		2,187	2,036	1,542	889	398	147
Monetary damages from air pollution - Gas Stations (million $2019)		155	142	106	61.9	28.6	11.8
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		286	232	154	83.8	39.8	17.4
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		142	115	77.8	44.3	19.1	5.92
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		37.1	33.4	25.9	17.7	10.5	6.02
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		16.6	15.9	15.2	14.4	13.6	12.7
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		310	265	188	113	66.3	40.5

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)		81.2	64.6	46.3	30.2	19.8	12.8
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		23	19.6	16.2	12.7	9.42	6.24
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		10.4	5.93	5.91	5.84	5.92	5.86
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		480	438	379	294	207	123

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		49.8	101	38.7	30	22	337
By economic sector - Construction (jobs)		8,186	7,158	8,759	8,839	10,024	16,606
By economic sector - Manufacturing (jobs)		1,995	2,739	2,865	2,620	3,059	4,315
By economic sector - Mining (jobs)		1,387	923	589	350	190	100
By economic sector - Other (jobs)		1,189	1,070	1,356	1,467	1,712	2,649
By economic sector - Pipeline (jobs)		304	256	280	153	102	100
By economic sector - Professional (jobs)		3,402	3,072	3,620	3,926	4,519	7,613
By economic sector - Trade (jobs)		2,518	2,146	2,441	2,575	2,950	4,772
By economic sector - Utilities (jobs)		5,913	5,732	7,685	8,514	10,230	18,603
By resource sector - Biomass (jobs)		214	279	110	90.3	80.4	1,438
By resource sector - CO2 (jobs)		0	0	655	56	72.2	326
By resource sector - Coal (jobs)		803	212	0	0	0	0
By resource sector - Grid (jobs)		7,214	7,858	11,725	13,620	17,971	35,860
By resource sector - Natural Gas (jobs)		3,257	2,606	2,312	2,623	1,856	1,628
By resource sector - Nuclear (jobs)		923	908	894	880	866	677
By resource sector - Oil (jobs)		3,071	2,410	1,678	1,089	673	385
By resource sector - Solar (jobs)		9,148	8,282	9,383	8,809	9,300	12,424
By resource sector - Wind (jobs)		315	642	876	1,307	1,990	2,356
By education level - All sectors - High school diploma or less (jobs)		10,609	9,880	11,786	12,069	13,919	23,547
By education level - All sectors - Associates degree or some college (jobs)		7,901	7,370	8,922	9,245	10,690	17,942
By education level - All sectors - Bachelors degree (jobs)		5,016	4,644	5,404	5,570	6,375	10,568
By education level - All sectors - Masters or professional degree (jobs)		1,235	1,138	1,334	1,394	1,602	2,678
By education level - All sectors - Doctoral degree (jobs)		184	165	188	197	222	362
Related work experience - All sectors - None (jobs)		3,619	3,369	4,041	4,174	4,816	8,141
Related work experience - All sectors - Up to 1 year (jobs)		5,019	4,679	5,550	5,687	6,556	11,027
Related work experience - All sectors - 1 to 4 years (jobs)		8,970	8,327	9,906	10,221	11,775	19,775
Related work experience - All sectors - 4 to 10 years (jobs)		5,830	5,405	6,458	6,666	7,671	12,840
Related work experience - All sectors - Over 10 years (jobs)		1,506	1,416	1,679	1,726	1,989	3,313
On-the-Job Training - All sectors - None (jobs)		1,388	1,274	1,494	1,532	1,752	2,897
On-the-Job Training - All sectors - Up to 1 year (jobs)		16,172	15,111	17,873	18,392	21,199	35,625

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)		5,342	4,953	5,992	6,195	7,149	12,014
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,797	1,628	2,007	2,087	2,404	4,073
On-the-Job Training - All sectors - Over 10 years (jobs)		247	229	267	268	303	486
On-Site or In-Plant Training - All sectors - None (jobs)		4,050	3,765	4,447	4,571	5,243	8,711
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		14,732	13,749	16,297	16,778	19,349	32,542
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		4,134	3,837	4,630	4,781	5,519	9,282
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,813	1,644	2,010	2,084	2,395	4,048
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		216	202	249	259	301	513
Wage income - All (million $2019)		1,443	1,356	1,635	1,712	1,999	3,410

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

Item	2020	2025	2030	2035	2040	2045	2050
Oil consumption - Annual (million bbls)		69.1	59.1	44.6	31.1	20.6	12.5
Oil consumption - Cumulative (million bbls)							1,382
Oil production - Annual (million bbls)		0	0	0	0	0	0
Natural gas consumption - Annual (tcf)		233	196	157	118	74.6	51.7
Natural gas consumption - Cumulative (tcf)							4,741
Natural gas production - Annual (tcf)		0.029	0.028	0.024	0.02	0.016	0.013

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	448	417	367	305	249	213	197
Final energy use - Residential (PJ)	241	228	209	183	162	149	144
Final energy use - Commercial (PJ)	189	188	180	167	157	154	156
Final energy use - Industry (PJ)	130	132	132	141	151	159	167

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)		2.99	3.04	6	6.39	5.4	5.63

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	65.5	406	746	1,938	3,129	4,082	5,034
Vehicle stocks - LDV – All others (1000 units)	4,197	3,997	3,796	2,766	1,737	983	228
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		800	2,073	3,321	5,046	5,475	5,229
Public EV charging plugs - DC Fast (1000 units)	0.402		1.31		5.5		8.84
Public EV charging plugs - L2 (1000 units)	1.67		31.5		132		212

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 (%)	17.4	35.6	79.7	89.7	90.1	90.1	90.1
Sales of space heating units - Electric Resistance (%)	13.2	13.8	5.81	3.98	3.89	3.95	3.95
Sales of space heating units - Gas (%)	55.1	31.6	8.99	3.84	3.61	3.62	3.62
Sales of space heating units - Fossil (%)	14.3	18.9	5.51	2.51	2.38	2.35	2.35
Sales of water heating units - Electric Heat Pump (%)	0	9.19	48.7	57.6	58	58	58
Sales of water heating units - Electric Resistance (%)	35.7	51	42.2	40.3	40.2	40.2	40.2
Sales of water heating units - Gas Furnace (%)	59.5	36.5	7.04	0.317	0.002	0	0
Sales of water heating units - Other (%)	4.77	3.29	2.07	1.81	1.81	1.83	1.84
Sales of cooking units - Electric Resistance (%)	59.2	67.9	94.5	99.7	100	100	100
Sales of cooking units - Gas (%)	40.8	32.1	5.5	0.277	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		4.8	4.71				

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 (%)	2.22	28.1	70.4	83.7	85	85.1	85.1
Sales of space heating units - Electric Resistance (%)	2.54	8.39	10.6	12.7	13.1	13.1	13.1
Sales of space heating units - Gas (%)	84.3	59.3	18.3	3.58	1.9	1.86	1.85
Sales of space heating units - Fossil (%)	11	4.19	0.8	0.034	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.097	10.5	54.4	64.3	64.7	64.8	64.7
Sales of water heating units - Electric Resistance (%)	2.5	10.8	28.3	32.3	32.5	32.5	32.5
Sales of water heating units - Gas (%)	93	74.5	14.3	0.646	0.003	0	0
Sales of water heating units - Other (%)	4.44	4.22	3.02	2.72	2.72	2.72	2.71
Sales of cooking units - Electric Resistance (%)	32	46	79.9	86.5	86.9	86.9	86.9
Sales of cooking units - Gas (%)	68	54	20.1	13.5	13.1	13.1	13.1
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		21,776	24,347				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	2,851	1,599	0	0	0	0	0
Installed thermal - Natural gas (MW)	4,401	6,790	7,271	7,956	10,343	10,506	10,333
Installed thermal - Nuclear (MW)	1,829	1,829	1,829	1,829	1,829	1,829	911
Installed renewables - Rooftop PV (MW)	851	1,276	1,695	2,240	2,899	3,650	4,510
Installed renewables - Solar - Base land use assumptions (MW)	809	4,104	5,824	7,813	8,889	10,195	10,378
Installed renewables - Wind - Base land use assumptions (MW)	191	191	191	191	191	191	191
Installed renewables - Offshore Wind - Base land use assumptions (MW)	0	0	0	0	0	4,288	15,370
Installed renewables - Solar - Constrained land use assumptions (MW)	532	3,826	4,335	5,450	6,017	7,371	7,986
Installed renewables - Wind - Constrained land use assumptions (MW)	191	191	191	263	2,069	2,069	2,069
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	989	15,372

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Solar PV - Base (billion $2018)		4.41	2.06	2.19	1.12	1.28	0.169
Capital invested - Offshore Wind - Base (billion $2018)		0	0	0	0	6.33	14.7
Capital invested - Solar PV - Constrained (billion $2018)		2.9	0.138	0.35	0	1.23	1.46
Capital invested - Wind - Constrained (billion $2018)		0	0	0.457	3.71	0	0
Capital invested - Offshore Wind - Constrained (billion $2018)		0	0	0	0	1.46	19.1
Capital invested - Biomass power plant (billion $2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion $2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	1,524	7,647	10,854	14,593	16,586	18,938	19,283
Wind - Base land use assumptions (GWh)	786	786	786	786	786	786	786
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	19,084	72,114
Solar - Constrained land use assumptions (GWh)	845	6,984	7,931	9,956	10,973	13,309	14,379
Wind - Constrained land use assumptions (GWh)	786	786	786	1,049	7,048	7,048	7,048
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	19,084	72,114
Biomass power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	0	0	4
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0
Conversion capital investment - Cumulative 5-yr (million $2018)		0	0	0	0	0	4,833
Biomass purchases (million $2018/y)		0	0	0	0	0	222

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	0	3.32	3.42	9.75
Annual - BECCS (MMT)		0	0	0	0	0	6.21

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - NGCC (MMT)		0	0	0	0	0	0
Annual - Cement and lime (MMT)		0	0	0	3.32	3.42	3.53
Cumulative - All (MMT)		0	0	0	3.32	6.74	16.5
Cumulative - BECCS (MMT)		0	0	0	0	0	6.21
Cumulative - NGCC (MMT)		0	0	0	0	0	0
Cumulative - Cement and lime (MMT)		0	0	0	3.32	6.74	10.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	0	112	112	112	112
Spur (km)		0	0	0	85.1	85.1	317
All (km)		0	0	112	197	197	429
Cumulative investment - Trunk (million $2018)		0	0	667	667	667	667
Cumulative investment - Spur (million $2018)		0	0	0	81.3	82.7	294
Cumulative investment - All (million $2018)		0	0	667	748	749	961

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)							-18.8
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-183
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-511
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-71.1
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-288
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-125
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-31.1
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-67.1
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-184
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-1,480
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-28.2
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-642
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-922

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-104
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-576
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-240
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-46.6
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-477
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-365
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-3,401
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-37.6
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,101
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-1,332
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-140
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-864
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-356
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-62.1
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-886
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-5,324
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-546
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							3.08
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							140
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							260
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							25.8
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)							17.8
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							2.05
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							4.36
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							110

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							563
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							4.61
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							144
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							470
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							38.8
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)							25.8
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							3.08
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							31.5
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							221
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							938
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							6.15
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							149
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							679
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							51.5
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)							33.8
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							4.11
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							25.2
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							181
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,130

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-313
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-14.5
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-327
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-595
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-29
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-624
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)							276
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							26.4
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							302
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)							525
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							52.7
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							578

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)		83.9	0.057	0.056	0.052	0.036	0.003
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		28	18.3	8.27	3.91	1.32	0.863
Premature deaths from air pollution - Mobile - On-Road (deaths)		251	254	247	222	176	120
Premature deaths from air pollution - Gas Stations (deaths)		18	18.2	17.5	15.7	12.4	8.42

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		32.5	29.9	26.4	21.5	15.7	10.2
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		16.3	15.7	15.2	13.3	9.81	6.08
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		4.25	4.29	4.26	3.91	3.16	2.31
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		1.88	1.8	1.72	1.63	1.54	1.44
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		35.3	34.5	32.7	28.5	22.4	16.2
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		9.21	7.97	6.74	5.46	4.39	3.48
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		2.59	2.37	2.14	1.9	1.67	1.43
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.14	0.673	0.674	0.669	0.672	0.649
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		53.9	46.5	37.2	30.2	25.2	18.2
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		744	0.505	0.5	0.458	0.318	0.027
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		248	162	73.2	34.7	11.7	7.64
Monetary damages from air pollution - Mobile - On-Road (million $2019)		2,231	2,262	2,199	1,975	1,567	1,069
Monetary damages from air pollution - Gas Stations (million $2019)		159	161	155	139	109	74.6
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		288	265	234	191	139	90
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		144	140	134	117	86.9	53.8
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		37.6	38	37.7	34.7	28	20.5
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		16.6	15.9	15.2	14.4	13.6	12.7
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		312	306	289	252	198	143
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		81.5	70.5	59.6	48.3	38.8	30.8
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		23	21	19	16.8	14.7	12.7
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		10.1	5.94	5.95	5.91	5.93	5.73

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		478	413	330	268	224	162

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		60.7	77.8	29.7	19.1	17.3	337
By economic sector - Construction (jobs)		8,322	7,156	7,966	7,517	10,357	19,094
By economic sector - Manufacturing (jobs)		2,032	2,814	2,456	2,284	3,642	5,191
By economic sector - Mining (jobs)		1,399	963	704	501	338	187
By economic sector - Other (jobs)		1,225	1,089	1,231	1,323	1,735	2,800
By economic sector - Pipeline (jobs)		305	253	345	186	157	168
By economic sector - Professional (jobs)		3,448	3,039	3,237	3,374	4,642	8,567
By economic sector - Trade (jobs)		2,557	2,183	2,302	2,361	3,112	5,363
By economic sector - Utilities (jobs)		5,821	5,472	6,537	6,256	10,245	22,280
By resource sector - Biomass (jobs)		230	209	98.5	80.3	73.6	1,389
By resource sector - CO2 (jobs)		0	0	1,123	96	124	559
By resource sector - Coal (jobs)		803	212	0	0	0	0
By resource sector - Grid (jobs)		6,992	7,484	9,159	9,614	18,360	43,192
By resource sector - Natural Gas (jobs)		3,270	2,400	1,980	1,889	1,517	1,619
By resource sector - Nuclear (jobs)		923	908	894	880	866	853
By resource sector - Oil (jobs)		3,110	2,602	2,182	1,740	1,309	787
By resource sector - Solar (jobs)		9,517	8,563	8,527	8,251	9,558	12,439
By resource sector - Wind (jobs)		324	668	845	1,271	2,437	3,148
By education level - All sectors - High school diploma or less (jobs)		10,716	9,823	10,581	10,099	14,561	27,365
By education level - All sectors - Associates degree or some college (jobs)		7,966	7,309	7,969	7,652	11,108	20,844
By education level - All sectors - Bachelors degree (jobs)		5,056	4,621	4,885	4,721	6,680	12,270
By education level - All sectors - Masters or professional degree (jobs)		1,245	1,129	1,202	1,178	1,666	3,097
By education level - All sectors - Doctoral degree (jobs)		186	164	172	172	230	411
Related work experience - All sectors - None (jobs)		3,651	3,343	3,626	3,477	5,017	9,451
Related work experience - All sectors - Up to 1 year (jobs)		5,076	4,660	4,982	4,791	6,861	12,760
Related work experience - All sectors - 1 to 4 years (jobs)		9,046	8,270	8,899	8,554	12,292	22,982
Related work experience - All sectors - 4 to 10 years (jobs)		5,877	5,365	5,798	5,558	7,992	14,932
Related work experience - All sectors - Over 10 years (jobs)		1,518	1,408	1,504	1,442	2,084	3,862
On-the-Job Training - All sectors - None (jobs)		1,403	1,272	1,354	1,307	1,833	3,341
On-the-Job Training - All sectors - Up to 1 year (jobs)		16,319	15,026	16,052	15,445	22,197	41,370
On-the-Job Training - All sectors - 1 to 4 years (jobs)		5,385	4,910	5,362	5,126	7,424	13,983
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,812	1,609	1,798	1,715	2,473	4,730
On-the-Job Training - All sectors - Over 10 years (jobs)		250	230	243	229	319	562
On-Site or In-Plant Training - All sectors - None (jobs)		4,092	3,745	4,002	3,852	5,475	10,075
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		14,864	13,669	14,634	14,073	20,249	37,807

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

Item	2020	2025	2030	2035	2040	2045	2050
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		4,168	3,806	4,145	3,965	5,740	10,802
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,828	1,626	1,806	1,720	2,470	4,705
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		218	199	221	212	311	597
Wage income - All (million $2019)		1,454	1,345	1,467	1,428	2,083	3,969

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	449	421	386	356	331	302	268
Final energy use - Residential (PJ)	241	229	222	214	200	183	167
Final energy use - Commercial (PJ)	189	189	186	183	177	171	167
Final energy use - Industry (PJ)	130	132	133	143	154	162	170

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)		2.54	2.53	3.68	3.81	5.55	5.88

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	50.7	151	250	713	1,176	2,200	3,224
Vehicle stocks - LDV – All others (1000 units)	4,214	4,214	4,214	3,998	3,781	2,914	2,046
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		0	133	271	925	2,883	4,210
Public EV charging plugs - DC Fast (1000 units)	0.402		0.44		2.06		5.66
Public EV charging plugs - L2 (1000 units)	1.67		10.6		49.6		136

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 (%)	17.4	27.2	32.2	46.7	68.8	83.3	88.3
Sales of space heating units - Electric Resistance (%)	13.2	15.3	14.3	11.6	7.67	5.11	4.2
Sales of space heating units - Gas (%)	55.1	36	33.4	26	14.6	7.13	4.52
Sales of space heating units - Fossil (%)	14.3	21.5	20.1	15.7	8.92	4.46	2.92
Sales of water heating units - Electric Heat Pump (%)	0	1.58	6.08	19	38.9	51.9	56.4
Sales of water heating units - Electric Resistance (%)	35.7	52.7	51.6	48.7	44.3	41.5	40.5
Sales of water heating units - Gas Furnace (%)	59.5	42.2	38.9	29.2	14.4	4.62	1.21
Sales of water heating units - Other (%)	4.77	3.53	3.4	3	2.4	2.02	1.89
Sales of cooking units - Electric Resistance (%)	59	60.1	63.8	73.7	87.5	96	98.9
Sales of cooking units - Gas (%)	41	39.9	36.2	26.3	12.5	4.04	1.09
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		4.8	4.72				

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 (%)	2.22	20.1	24.9	38.9	61	76.7	82.8
Sales of space heating units - Electric Resistance (%)	2.54	8.05	8.31	9.13	10.6	12	12.8
Sales of space heating units - Gas (%)	84.3	67	62.3	48.5	26.7	10.8	4.34
Sales of space heating units - Fossil (%)	11	4.85	4.51	3.43	1.69	0.531	0.139
Sales of water heating units - Electric Heat Pump (%)	0.097	2.03	7.02	21.4	43.5	57.9	63
Sales of water heating units - Electric Resistance (%)	2.5	7.39	9.34	15.1	24	29.8	31.8
Sales of water heating units - Gas (%)	93	86.1	79.2	59.6	29.2	9.38	2.45
Sales of water heating units - Other (%)	4.44	4.46	4.4	3.91	3.31	2.91	2.76
Sales of cooking units - Electric Resistance (%)	32	36.2	40.9	53.4	71	81.7	85.5
Sales of cooking units - Gas (%)	68	63.8	59.1	46.6	29	18.3	14.5
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		21,752	24,163				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	2,851	1,599	0	0	0	0	0
Installed thermal - Natural gas (MW)	4,401	6,858	6,858	6,858	6,070	6,167	7,743
Installed thermal - Nuclear (MW)	1,829	1,829	1,829	1,829	1,829	1,829	1,829

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)							-18.8
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-183
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-511
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-71.1
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-288
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-125
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-31.1
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-67.1
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-184
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-1,480
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-28.2
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-642
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-922
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-104
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-576
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-240

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-46.6
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-477
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-365
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-3,401
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-37.6
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,101
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-1,332
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-140
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-864
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-356
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-62.1
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-886
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-5,324
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-546
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							3.08
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							140
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							260
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							25.8
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)							17.8
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							2.05
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							4.36
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							110
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							563
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							4.61

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							144
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							470
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							38.8
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)							25.8
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							3.08
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							31.5
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							221
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							938
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							6.15
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							149
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							679
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							51.5
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)							33.8
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							4.11
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							25.2
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							181
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,130

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-313
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-14.5
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-327
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-595
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-29
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-624
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)							276
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							26.4
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							302
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)							525
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							52.7
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							578

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)		83.9	0.057	0.056	0.052	0.036	0.003
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		25.7	18	11.2	7.87	2.76	0.525
Premature deaths from air pollution - Mobile - On-Road (deaths)		246	229	173	100	44.8	16.5
Premature deaths from air pollution - Gas Stations (deaths)		17.5	16.1	12	6.99	3.22	1.34
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		32.2	26.2	17.3	9.45	4.49	1.96
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		16	13	8.78	5	2.15	0.668

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		4.19	3.77	2.93	2	1.18	0.679
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		1.88	1.8	1.72	1.63	1.54	1.44
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		35	30	21.2	12.8	7.49	4.58
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		9.17	7.3	5.23	3.42	2.23	1.44
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		2.59	2.21	1.83	1.44	1.06	0.704
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.26	0.672	0.669	0.661	0.67	0.63
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		52.7	48.2	38.9	27.5	15.3	1.37
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		744	0.505	0.5	0.458	0.318	0.027
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		228	159	99	69.7	24.4	4.65
Monetary damages from air pollution - Mobile - On-Road (million $2019)		2,187	2,036	1,542	889	398	147
Monetary damages from air pollution - Gas Stations (million $2019)		155	142	106	61.9	28.6	11.8
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		286	232	154	83.8	39.8	17.4
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		142	115	77.8	44.3	19.1	5.92
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		37.1	33.4	25.9	17.7	10.5	6.02
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		16.6	15.9	15.2	14.4	13.6	12.7
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		310	265	188	113	66.3	40.5
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		81.2	64.6	46.3	30.2	19.8	12.8
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		23	19.6	16.2	12.7	9.42	6.24
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		11.1	5.93	5.9	5.83	5.91	5.56
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		468	428	345	244	136	12.1

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		50.1	104	38.4	24.5	19.8	336
By economic sector - Construction (jobs)		8,263	6,039	8,057	9,465	16,290	21,122
By economic sector - Manufacturing (jobs)		2,300	2,742	3,850	3,274	4,510	5,869
By economic sector - Mining (jobs)		1,375	901	541	282	116	16.5
By economic sector - Other (jobs)		1,207	839	1,303	1,675	2,548	5,020
By economic sector - Pipeline (jobs)		296	246	172	108	57.7	23.4
By economic sector - Professional (jobs)		3,428	2,688	3,488	4,253	7,088	10,610
By economic sector - Trade (jobs)		2,533	1,874	2,346	2,794	4,506	7,188
By economic sector - Utilities (jobs)		5,919	5,325	6,702	7,945	17,232	15,240
By resource sector - Biomass (jobs)		195	293	103	80	73.4	1,479
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Coal (jobs)		803	212	0	0	0	0
By resource sector - Grid (jobs)		7,287	7,172	10,833	13,823	34,407	29,633
By resource sector - Natural Gas (jobs)		3,168	2,460	1,996	2,118	1,518	1,511
By resource sector - Nuclear (jobs)		923	908	710	258	0	0
By resource sector - Oil (jobs)		3,072	2,376	1,606	924	407	0.019
By resource sector - Solar (jobs)		9,582	6,596	9,854	10,336	12,355	29,084
By resource sector - Wind (jobs)		339	741	1,394	2,280	3,607	3,717
By education level - All sectors - High school diploma or less (jobs)		10,801	8,809	11,312	12,691	22,363	27,811
By education level - All sectors - Associates degree or some college (jobs)		8,037	6,576	8,523	9,701	17,186	21,253
By education level - All sectors - Bachelors degree (jobs)		5,096	4,202	5,208	5,780	9,974	12,641
By education level - All sectors - Masters or professional degree (jobs)		1,251	1,024	1,272	1,442	2,510	3,233
By education level - All sectors - Doctoral degree (jobs)		186	146	180	206	336	486
Related work experience - All sectors - None (jobs)		3,678	3,009	3,853	4,368	7,723	9,631
Related work experience - All sectors - Up to 1 year (jobs)		5,116	4,166	5,372	6,017	10,445	13,410
Related work experience - All sectors - 1 to 4 years (jobs)		9,117	7,465	9,481	10,674	18,788	23,381
Related work experience - All sectors - 4 to 10 years (jobs)		5,924	4,841	6,164	6,958	12,250	15,127
Related work experience - All sectors - Over 10 years (jobs)		1,536	1,278	1,625	1,802	3,161	3,874
On-the-Job Training - All sectors - None (jobs)		1,410	1,135	1,437	1,608	2,742	3,610
On-the-Job Training - All sectors - Up to 1 year (jobs)		16,468	13,572	17,261	19,289	33,736	42,414
On-the-Job Training - All sectors - 1 to 4 years (jobs)		5,426	4,417	5,683	6,467	11,508	14,029
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,814	1,431	1,852	2,171	3,911	4,756
On-the-Job Training - All sectors - Over 10 years (jobs)		252	204	262	285	470	615
On-Site or In-Plant Training - All sectors - None (jobs)		4,123	3,364	4,289	4,808	8,275	10,652
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		14,997	12,341	15,708	17,580	30,840	38,608
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		4,201	3,423	4,403	4,997	8,882	10,861
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,831	1,451	1,861	2,164	3,880	4,712
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		220	180	235	272	492	591
Wage income - All (million $2019)		1,465	1,218	1,559	1,777	3,187	3,968

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	448	417	367	305	249	213	197
Final energy use - Residential (PJ)	241	228	209	183	162	149	144
Final energy use - Commercial (PJ)	189	188	180	167	157	154	156
Final energy use - Industry (PJ)	130	132	132	141	151	159	167

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)		2.99	3.04	6	6.39	5.4	5.63

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	65.5	406	746	1,938	3,129	4,082	5,034
Vehicle stocks - LDV – All others (1000 units)	4,197	3,997	3,796	2,766	1,737	983	228
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		800	2,073	3,321	5,046	5,475	5,229
Public EV charging plugs - DC Fast (1000 units)	0.402		1.31		5.5		8.84
Public EV charging plugs - L2 (1000 units)	1.67		31.5		132		212

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 (%)	17.4	35.6	79.7	89.7	90.1	90.1	90.1
Sales of space heating units - Electric Resistance (%)	13.2	13.8	5.81	3.98	3.89	3.95	3.95
Sales of space heating units - Gas (%)	55.1	31.6	8.99	3.84	3.61	3.62	3.62
Sales of space heating units - Fossil (%)	14.3	18.9	5.51	2.51	2.38	2.35	2.35
Sales of water heating units - Electric Heat Pump (%)	0	9.19	48.7	57.6	58	58	58
Sales of water heating units - Electric Resistance (%)	35.7	51	42.2	40.3	40.2	40.2	40.2
Sales of water heating units - Gas Furnace (%)	59.5	36.5	7.04	0.317	0.002	0	0
Sales of water heating units - Other (%)	4.77	3.29	2.07	1.81	1.81	1.83	1.84
Sales of cooking units - Electric Resistance (%)	59.2	67.9	94.5	99.7	100	100	100
Sales of cooking units - Gas (%)	40.8	32.1	5.5	0.277	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		4.8	4.71				

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 (%)	2.22	28.1	70.4	83.7	85	85.1	85.1
Sales of space heating units - Electric Resistance (%)	2.54	8.39	10.6	12.7	13.1	13.1	13.1
Sales of space heating units - Gas (%)	84.3	59.3	18.3	3.58	1.9	1.86	1.85
Sales of space heating units - Fossil (%)	11	4.19	0.8	0.034	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.097	10.5	54.4	64.3	64.7	64.8	64.7
Sales of water heating units - Electric Resistance (%)	2.5	10.8	28.3	32.3	32.5	32.5	32.5
Sales of water heating units - Gas (%)	93	74.5	14.3	0.646	0.003	0	0
Sales of water heating units - Other (%)	4.44	4.22	3.02	2.72	2.72	2.72	2.71

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of cooking units - Electric Resistance (%)	32	46	79.9	86.5	86.9	86.9	86.9
Sales of cooking units - Gas (%)	68	54	20.1	13.5	13.1	13.1	13.1
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		21,776	24,347				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	2,851	1,599	0	0	0	0	0
Installed thermal - Natural gas (MW)	4,401	6,754	6,982	7,583	9,493	9,207	10,165
Installed thermal - Nuclear (MW)	1,829	1,829	1,829	911	0	0	0
Installed renewables - Rooftop PV (MW)	851	1,276	1,695	2,240	2,899	3,650	4,510
Installed renewables - Solar - Base land use assumptions (MW)	972	4,354	4,700	6,660	9,052	12,770	28,882
Installed renewables - Wind - Base land use assumptions (MW)	191	191	191	191	191	1,394	4,802
Installed renewables - Offshore Wind - Base land use assumptions (MW)	0	0	0	0	987	12,663	15,370
Installed renewables - Solar - Constrained land use assumptions (MW)	1,309	3,030	4,675	7,213	8,857	9,127	28,742
Installed renewables - Wind - Constrained land use assumptions (MW)	219	219	219	1,831	3,540	3,540	3,540
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	989	989	15,372
Capital invested - Solar PV - Base (billion $2018)		4.53	0.414	2.16	2.49	3.65	14.9
Capital invested - Wind - Base (billion $2018)		0	0	0	0	2.43	6.5
Capital invested - Offshore Wind - Base (billion $2018)		0	0	0	1.71	17.2	3.59

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	1,833	8,064	8,720	12,261	16,434	22,811	52,725
Wind - Base land use assumptions (GWh)	786	786	786	786	786	4,950	14,593
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	4,268	58,926	72,114
Solar - Constrained land use assumptions (GWh)	4,898	11,221	17,264	26,520	32,278	33,228	105,973
Wind - Constrained land use assumptions (GWh)	1,572	1,572	1,572	12,555	21,470	21,470	21,470
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	8,552	8,552	144,242

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)							-18.8
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-183
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-511
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-71.1
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-288

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-125
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-31.1
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-67.1
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-184
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-1,480
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-28.2
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-642
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-922
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-104
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-576
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-240
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-46.6
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-477
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-365
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-3,401
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-37.6
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,101
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-1,332
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-140
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-864
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-356
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-62.1
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-886
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-5,324
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-546
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							3.08
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							140
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							260

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							25.8
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)							17.8
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							2.05
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							4.36
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							110
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							563
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							4.61
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							144
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							470
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							38.8
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)							25.8
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							3.08
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							31.5
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							221
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							938
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							6.15
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							149
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							679
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							51.5
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							33.8
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							4.11
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							25.2
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							181
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,130

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)							-313
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-14.5
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-327
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-595
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-29
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-624
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)							276
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							26.4
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							302
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)							525
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							52.7

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							578

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)		83.9	0.057	0.056	0.052	0.036	0.003
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		22.9	18	23.2	17.7	6.19	1.89
Premature deaths from air pollution - Mobile - On-Road (deaths)		246	229	173	100	44.8	16.5
Premature deaths from air pollution - Gas Stations (deaths)		17.5	16.1	12	6.99	3.22	1.34
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		32.2	26.2	17.3	9.45	4.49	1.96
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		16	13	8.78	5	2.15	0.668
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		4.19	3.77	2.93	2	1.18	0.679
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		1.88	1.8	1.72	1.63	1.54	1.44
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		35	30	21.2	12.8	7.49	4.58
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		9.17	7.3	5.23	3.42	2.23	1.44
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		2.59	2.21	1.83	1.44	1.06	0.704
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.09	0.671	0.669	0.661	0.671	0.63
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		55	52.4	51	44.8	37.6	28.3
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		744	0.505	0.5	0.458	0.318	0.027
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		202	159	206	157	54.8	16.7
Monetary damages from air pollution - Mobile - On-Road (million $2019)		2,187	2,036	1,542	889	398	147
Monetary damages from air pollution - Gas Stations (million $2019)		155	142	106	61.9	28.6	11.8
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		286	232	154	83.8	39.8	17.4
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		142	115	77.8	44.3	19.1	5.92
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		37.1	33.4	25.9	17.7	10.5	6.02

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		16.6	15.9	15.2	14.4	13.6	12.7
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		310	265	188	113	66.3	40.5
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		81.2	64.6	46.3	30.2	19.8	12.8
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		23	19.6	16.2	12.7	9.42	6.24
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		9.65	5.92	5.91	5.83	5.92	5.56
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		489	466	453	398	334	251

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		57	81.6	27.3	22.5	20.7	337
By economic sector - Construction (jobs)		5,240	4,938	6,370	5,967	6,631	8,456
By economic sector - Manufacturing (jobs)		1,623	1,545	1,554	1,344	1,651	1,514
By economic sector - Mining (jobs)		1,399	943	634	402	248	159
By economic sector - Other (jobs)		661	685	857	958	1,073	1,796
By economic sector - Pipeline (jobs)		311	270	392	212	172	199
By economic sector - Professional (jobs)		2,303	2,124	2,559	2,573	3,726	4,827
By economic sector - Trade (jobs)		1,842	1,593	1,753	1,748	2,164	2,953
By economic sector - Utilities (jobs)		4,462	4,136	6,726	5,868	12,117	10,636
By resource sector - Biomass (jobs)		199	209	93.5	84.1	81.2	1,401
By resource sector - CO2 (jobs)		0	0	1,268	109	140	632
By resource sector - Coal (jobs)		803	212	0	0	0	0
By resource sector - Grid (jobs)		4,794	4,829	7,847	8,252	10,016	10,288
By resource sector - Natural Gas (jobs)		2,817	2,428	2,303	2,376	2,385	2,458
By resource sector - Nuclear (jobs)		923	908	1,846	1,072	8,122	5,483
By resource sector - Oil (jobs)		3,071	2,410	1,678	1,089	708	484
By resource sector - Solar (jobs)		4,979	4,910	5,424	5,588	5,721	9,486
By resource sector - Wind (jobs)		314	408	412	524	629	644
By education level - All sectors - High school diploma or less (jobs)		7,546	6,907	8,806	8,068	11,173	12,705
By education level - All sectors - Associates degree or some college (jobs)		5,600	5,132	6,689	6,161	8,669	9,708
By education level - All sectors - Bachelors degree (jobs)		3,715	3,337	4,193	3,782	6,146	6,510
By education level - All sectors - Masters or professional degree (jobs)		906	819	1,039	949	1,584	1,694
By education level - All sectors - Doctoral degree (jobs)		132	119	146	135	232	259
Related work experience - All sectors - None (jobs)		2,585	2,368	3,045	2,797	3,942	4,468
Related work experience - All sectors - Up to 1 year (jobs)		3,550	3,253	4,117	3,789	5,407	6,174
Related work experience - All sectors - 1 to 4 years (jobs)		6,477	5,884	7,517	6,870	10,094	11,134
Related work experience - All sectors - 4 to 10 years (jobs)		4,192	3,813	4,913	4,481	6,577	7,208

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

Item	2020	2025	2030	2035	2040	2045	2050
Related work experience - All sectors - Over 10 years (jobs)		1,096	996	1,280	1,158	1,783	1,891
On-the-Job Training - All sectors - None (jobs)		995	904	1,136	1,037	1,589	1,760
On-the-Job Training - All sectors - Up to 1 year (jobs)		11,692	10,633	13,471	12,315	18,172	20,148
On-the-Job Training - All sectors - 1 to 4 years (jobs)		3,795	3,473	4,540	4,155	5,906	6,526
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,244	1,145	1,524	1,408	1,871	2,152
On-the-Job Training - All sectors - Over 10 years (jobs)		174	160	201	180	266	290
On-Site or In-Plant Training - All sectors - None (jobs)		2,897	2,644	3,355	3,066	4,578	5,090
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		10,641	9,677	12,297	11,241	16,545	18,318
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		2,941	2,690	3,498	3,204	4,540	5,033
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,269	1,164	1,536	1,411	1,916	2,175
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		152	140	185	172	225	260
Wage income - All (million $2019)		1,046	962	1,254	1,156	1,785	1,959

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	448	417	367	305	249	213	197
Final energy use - Residential (PJ)	241	228	209	183	162	149	144
Final energy use - Commercial (PJ)	189	188	180	167	157	154	156
Final energy use - Industry (PJ)	130	132	132	141	151	159	167

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)		2.99	3.04	6	6.39	5.4	5.63

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	65.5	406	746	1,938	3,129	4,082	5,034
Vehicle stocks - LDV – All others (1000 units)	4,197	3,997	3,796	2,766	1,737	983	228
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		800	2,073	3,321	5,046	5,475	5,229
Public EV charging plugs - DC Fast (1000 units)	0.402		1.31		5.5		8.84
Public EV charging plugs - L2 (1000 units)	1.67		31.5		132		212

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 (%)	17.4	35.6	79.7	89.7	90.1	90.1	90.1
Sales of space heating units - Electric Resistance (%)	13.2	13.8	5.81	3.98	3.89	3.95	3.95
Sales of space heating units - Gas (%)	55.1	31.6	8.99	3.84	3.61	3.62	3.62
Sales of space heating units - Fossil (%)	14.3	18.9	5.51	2.51	2.38	2.35	2.35

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Electric Heat Pump (%)	0	9.19	48.7	57.6	58	58	58
Sales of water heating units - Electric Resistance (%)	35.7	51	42.2	40.3	40.2	40.2	40.2
Sales of water heating units - Gas Furnace (%)	59.5	36.5	7.04	0.317	0.002	0	0
Sales of water heating units - Other (%)	4.77	3.29	2.07	1.81	1.81	1.83	1.84
Sales of cooking units - Electric Resistance (%)	59.2	67.9	94.5	99.7	100	100	100
Sales of cooking units - Gas (%)	40.8	32.1	5.5	0.277	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		4.8	4.71				

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 (%)	2.22	28.1	70.4	83.7	85	85.1	85.1
Sales of space heating units - Electric Resistance (%)	2.54	8.39	10.6	12.7	13.1	13.1	13.1
Sales of space heating units - Gas (%)	84.3	59.3	18.3	3.58	1.9	1.86	1.85
Sales of space heating units - Fossil (%)	11	4.19	0.8	0.034	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.097	10.5	54.4	64.3	64.7	64.8	64.7
Sales of water heating units - Electric Resistance (%)	2.5	10.8	28.3	32.3	32.5	32.5	32.5
Sales of water heating units - Gas (%)	93	74.5	14.3	0.646	0.003	0	0
Sales of water heating units - Other (%)	4.44	4.22	3.02	2.72	2.72	2.72	2.71
Sales of cooking units - Electric Resistance (%)	32	46	79.9	86.5	86.9	86.9	86.9
Sales of cooking units - Gas (%)	68	54	20.1	13.5	13.1	13.1	13.1
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		21,776	24,347				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	2,851	1,599	0	0	0	0	0
Installed thermal - Natural gas (MW)	4,401	4,024	4,495	4,735	4,787	7,975	5,063
Installed thermal - Nuclear (MW)	1,829	1,829	1,829	2,228	2,228	5,292	6,619
Installed renewables - Rooftop PV (MW)	851	1,276	1,695	2,240	2,899	3,650	4,510
Installed renewables - Solar - Base land use assumptions (MW)	569	1,405	2,106	2,586	2,865	2,865	2,865
Installed renewables - Wind - Base land use assumptions (MW)	191	191	191	191	191	191	191
Installed renewables - Solar - Constrained land use assumptions (MW)	713	1,607	2,761	2,915	3,761	3,963	3,963
Installed renewables - Wind - Constrained land use assumptions (MW)	191	191	191	191	191	191	191
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	260	582
Capital invested - Solar PV - Base (billion $2018)		1.12	0.84	0.53	0.29	0	0
Capital invested - Wind - Base (billion $2018)		0	0	0	0	0	0
Capital invested - Solar PV - Constrained (billion $2018)		1.2	1.38	0.17	0.879	0.198	0
Capital invested - Wind - Constrained (billion $2018)		0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Offshore Wind - Constrained (billion $2018)		0	0	0	0	0.383	0.427

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	1,078	2,619	3,931	4,822	5,347	5,347	5,347
Wind - Base land use assumptions (GWh)	786	786	786	786	786	786	786
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	1,345	3,008	5,115	5,408	6,969	7,338	7,338
Wind - Constrained land use assumptions (GWh)	786	786	786	786	786	786	786
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	1,098	2,486

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)							-18.8
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-183
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-511
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-71.1
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-288
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-125
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-31.1
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-67.1
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-184
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-1,480
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-28.2
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-642
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-922
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-104
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-576
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-240
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-46.6
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-477
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-365
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-3,401

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-37.6
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,101
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-1,332
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-140
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-864
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-356
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-62.1
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-886
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-5,324
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-546
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							3.08
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							140
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							260
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							25.8
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)							17.8
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							2.05
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							4.36
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							110
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							563
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							4.61
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							144
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							470
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							38.8

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 - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							25.8
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							3.08
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							31.5
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							221
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							938
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							6.15
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							149
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							679
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							51.5
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)							33.8
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							4.11
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							25.2
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							181
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,130

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)							-313
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-14.5
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-327

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-595
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-29
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-624
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)							276
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							26.4
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							302
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)							525
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							52.7
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							578

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)		83.9	0.057	0.056	0.052	0.036	0.003
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		27.2	16.8	9.67	7.59	4.48	1.32
Premature deaths from air pollution - Mobile - On-Road (deaths)		251	254	247	222	176	120
Premature deaths from air pollution - Gas Stations (deaths)		18	18.2	17.5	15.7	12.4	8.42
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		32.5	29.9	26.4	21.5	15.7	10.2
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		16.3	15.7	15.2	13.3	9.81	6.08
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		4.25	4.29	4.26	3.91	3.16	2.31
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		1.88	1.8	1.72	1.63	1.54	1.44
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		35.3	34.5	32.7	28.5	22.4	16.2

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		9.21	7.97	6.74	5.46	4.39	3.48
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		2.59	2.37	2.14	1.9	1.67	1.43
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.17	0.673	0.674	0.67	0.679	0.669
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		53.9	46.5	37.2	30.2	25.2	18.2
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		744	0.505	0.5	0.458	0.318	0.027
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		241	149	85.6	67.2	39.7	11.7
Monetary damages from air pollution - Mobile - On-Road (million $2019)		2,231	2,262	2,199	1,975	1,567	1,069
Monetary damages from air pollution - Gas Stations (million $2019)		159	161	155	139	109	74.6
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		288	265	234	191	139	90
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		144	140	134	117	86.9	53.8
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		37.6	38	37.7	34.7	28	20.5
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		16.6	15.9	15.2	14.4	13.6	12.7
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		312	306	289	252	198	143
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		81.5	70.5	59.6	48.3	38.8	30.8
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		23	21	19	16.8	14.7	12.7
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		10.3	5.94	5.95	5.91	5.99	5.9
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		478	413	330	268	224	162

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		55.5	77.8	29.1	21.5	17.8	388
By economic sector - Construction (jobs)		8,248	7,111	7,691	7,257	8,995	16,520
By economic sector - Manufacturing (jobs)		2,013	2,792	2,240	1,932	2,707	4,481
By economic sector - Mining (jobs)		1,395	962	708	524	337	175
By economic sector - Other (jobs)		1,213	1,081	1,171	1,229	1,503	2,554
By economic sector - Pipeline (jobs)		303	252	351	193	155	163
By economic sector - Professional (jobs)		3,421	3,025	3,115	3,242	4,016	7,638

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Trade (jobs)		2,541	2,173	2,223	2,276	2,718	4,760
By economic sector - Utilities (jobs)		5,772	5,433	6,401	6,461	9,070	18,743
By resource sector - Biomass (jobs)		221	209	98.4	90.2	82.6	1,830
By resource sector - CO2 (jobs)		0	0	1,152	98.6	127	574
By resource sector - Coal (jobs)		803	212	0	0	0	0
By resource sector - Grid (jobs)		6,934	7,418	8,848	9,674	15,607	35,778
By resource sector - Natural Gas (jobs)		3,220	2,382	1,996	2,268	1,809	1,563
By resource sector - Nuclear (jobs)		923	908	894	880	866	853
By resource sector - Oil (jobs)		3,110	2,602	2,182	1,830	1,319	734
By resource sector - Solar (jobs)		9,419	8,488	7,952	7,331	8,056	11,921
By resource sector - Wind (jobs)		331	687	807	966	1,652	2,171
By education level - All sectors - High school diploma or less (jobs)		10,624	9,763	10,200	9,792	12,530	23,699
By education level - All sectors - Associates degree or some college (jobs)		7,899	7,263	7,686	7,439	9,573	17,989
By education level - All sectors - Bachelors degree (jobs)		5,018	4,596	4,717	4,591	5,771	10,671
By education level - All sectors - Masters or professional degree (jobs)		1,235	1,122	1,162	1,148	1,445	2,699
By education level - All sectors - Doctoral degree (jobs)		185	163	166	166	200	365
Related work experience - All sectors - None (jobs)		3,620	3,323	3,499	3,385	4,331	8,187
Related work experience - All sectors - Up to 1 year (jobs)		5,033	4,632	4,795	4,621	5,889	11,102
Related work experience - All sectors - 1 to 4 years (jobs)		8,972	8,221	8,589	8,320	10,608	19,891
Related work experience - All sectors - 4 to 10 years (jobs)		5,829	5,332	5,597	5,411	6,900	12,907
Related work experience - All sectors - Over 10 years (jobs)		1,506	1,399	1,450	1,399	1,790	3,336
On-the-Job Training - All sectors - None (jobs)		1,392	1,265	1,305	1,263	1,582	2,917
On-the-Job Training - All sectors - Up to 1 year (jobs)		16,185	14,936	15,473	14,974	19,098	35,896
On-the-Job Training - All sectors - 1 to 4 years (jobs)		5,340	4,879	5,178	4,996	6,413	12,049
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,796	1,599	1,741	1,683	2,153	4,072
On-the-Job Training - All sectors - Over 10 years (jobs)		248	228	233	220	273	489
On-Site or In-Plant Training - All sectors - None (jobs)		4,058	3,723	3,857	3,726	4,714	8,760
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		14,742	13,587	14,109	13,653	17,430	32,781
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		4,133	3,782	4,002	3,861	4,955	9,314
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,812	1,616	1,749	1,688	2,151	4,055
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		216	198	214	207	269	514
Wage income - All (million $2019)		1,442	1,337	1,417	1,392	1,801	3,433

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	449	421	386	356	331	302	268
Final energy use - Residential (PJ)	241	229	222	214	200	183	167
Final energy use - Commercial (PJ)	189	189	186	183	177	171	167
Final energy use - Industry (PJ)	130	132	133	143	154	162	170

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)		2.54	2.53	3.68	3.81	5.55	5.88

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	50.7	151	250	713	1,176	2,200	3,224
Vehicle stocks - LDV – All others (1000 units)	4,214	4,214	4,214	3,998	3,781	2,914	2,046
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		0	133	271	925	2,883	4,210
Public EV charging plugs - DC Fast (1000 units)	0.402		0.44		2.06		5.66
Public EV charging plugs - L2 (1000 units)	1.67		10.6		49.6		136

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 (%)	17.4	27.2	32.2	46.7	68.8	83.3	88.3
Sales of space heating units - Electric Resistance (%)	13.2	15.3	14.3	11.6	7.67	5.11	4.2
Sales of space heating units - Gas (%)	55.1	36	33.4	26	14.6	7.13	4.52
Sales of space heating units - Fossil (%)	14.3	21.5	20.1	15.7	8.92	4.46	2.92
Sales of water heating units - Electric Heat Pump (%)	0	1.58	6.08	19	38.9	51.9	56.4
Sales of water heating units - Electric Resistance (%)	35.7	52.7	51.6	48.7	44.3	41.5	40.5
Sales of water heating units - Gas Furnace (%)	59.5	42.2	38.9	29.2	14.4	4.62	1.21
Sales of water heating units - Other (%)	4.77	3.53	3.4	3	2.4	2.02	1.89
Sales of cooking units - Electric Resistance (%)	59	60.1	63.8	73.7	87.5	96	98.9
Sales of cooking units - Gas (%)	41	39.9	36.2	26.3	12.5	4.04	1.09
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		4.8	4.72				

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 (%)	2.22	20.1	24.9	38.9	61	76.7	82.8
Sales of space heating units - Electric Resistance (%)	2.54	8.05	8.31	9.13	10.6	12	12.8
Sales of space heating units - Gas (%)	84.3	67	62.3	48.5	26.7	10.8	4.34
Sales of space heating units - Fossil (%)	11	4.85	4.51	3.43	1.69	0.531	0.139
Sales of water heating units - Electric Heat Pump (%)	0.097	2.03	7.02	21.4	43.5	57.9	63
Sales of water heating units - Electric Resistance (%)	2.5	7.39	9.34	15.1	24	29.8	31.8
Sales of water heating units - Gas (%)	93	86.1	79.2	59.6	29.2	9.38	2.45
Sales of water heating units - Other (%)	4.44	4.46	4.4	3.91	3.31	2.91	2.76
Sales of cooking units - Electric Resistance (%)	32	36.2	40.9	53.4	71	81.7	85.5
Sales of cooking units - Gas (%)	68	63.8	59.1	46.6	29	18.3	14.5
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		21,752	24,163				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	2,851	1,599	0	0	0	0	0
Installed thermal - Natural gas (MW)	4,401	6,754	6,754	6,754	8,019	8,691	8,525
Installed thermal - Nuclear (MW)	1,829	1,829	1,829	1,829	1,829	1,829	1,829
Capital invested - Biomass power plant (billion $2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion $2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	6
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0
Conversion capital investment - Cumulative 5-yr (million $2018)		0	0	0	0	0	5,252
Biomass purchases (million $2018/y)		0	0	0	0	0	476

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	0	3.32	3.42	3.53
Annual - BECCS (MMT)		0	0	0	0	0	0
Annual - NGCC (MMT)		0	0	0	0	0	0
Annual - Cement and lime (MMT)		0	0	0	3.32	3.42	3.53
Cumulative - All (MMT)		0	0	0	3.32	6.74	10.3
Cumulative - BECCS (MMT)		0	0	0	0	0	0
Cumulative - NGCC (MMT)		0	0	0	0	0	0
Cumulative - Cement and lime (MMT)		0	0	0	3.32	6.74	10.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	0	112	112	112	112
Spur (km)		0	0	0	85.1	85.1	145
All (km)		0	0	112	197	197	257
Cumulative investment - Trunk (million $2018)		0	0	667	667	667	667
Cumulative investment - Spur (million $2018)		0	0	0	81.3	82.7	153

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

Item	2020	2025	2030	2035	2040	2045	2050
Cumulative investment - All (million $2018)		0	0	667	748	749	820

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)							-18.8
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-183
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-511
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-71.1
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-288
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-125
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-31.1
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-67.1
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-184
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-1,480
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-28.2
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-642
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-922
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-104
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-576
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-240
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-46.6
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-477
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-365
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-3,401
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-37.6
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,101

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-1,332
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-140
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-864
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-356
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-62.1
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-886
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-5,324
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-546
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							3.08
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							140
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							260
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							25.8
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)							17.8
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							2.05
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							4.36
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							110
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							563
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							4.61
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							144
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							470
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							38.8
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)							25.8

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							3.08
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							31.5
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							221
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							938
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							6.15
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							149
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							679
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							51.5
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)							33.8
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							4.11
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							25.2
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							181
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,130

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)							-140
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-276
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-12.6
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)							-429

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-140
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-526
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-25.2
Carbon sink potential - Aggressive deployment - Cropland to woody energy crops (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Pasture to energy crops (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-691
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							66.5
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							243
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							22.9
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)							24.8
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)							15.5
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							372
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							66.5
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							1,142
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							45.8
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)							24.8
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)							15.5
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							1,295

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)		219	138	129	125	123	113

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		22.4	24.9	29.7	31.3	28.6	27.7
Premature deaths from air pollution - Mobile - On-Road (deaths)		250	257	263	270	277	283
Premature deaths from air pollution - Gas Stations (deaths)		17.9	18.3	18.6	19.1	19.5	19.8
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		32	29.9	28.6	28.2	28.4	28.5
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		15.5	13	9.13	5.83	3.47	2.18
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		4.07	4.04	4.06	4.15	4.24	4.32
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		1.96	1.97	1.97	1.97	1.96	1.94
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		35.6	35.1	32.9	30.3	29.4	30.4
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		9.39	8.57	7.62	6.65	6.11	5.85
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		2.71	2.81	2.91	3	3.08	3.16
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		2.1	1.57	1.34	1.29	1.27	1.21
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		54.3	58.7	61	58.3	58.6	56.5
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		1,940	1,219	1,141	1,109	1,088	998
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		199	221	263	277	254	246
Monetary damages from air pollution - Mobile - On-Road (million $2019)		2,223	2,284	2,337	2,400	2,459	2,517
Monetary damages from air pollution - Gas Stations (million $2019)		158	162	165	169	173	176
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		284	265	253	249	252	253
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		137	115	80.9	51.7	30.7	19.3
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		36	35.8	36	36.7	37.6	38.3
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		17.4	17.4	17.5	17.4	17.4	17.2
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		315	311	291	269	260	269
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		83.1	75.9	67.5	58.8	54.1	51.8

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		24	24.9	25.8	26.5	27.3	28
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		18.6	13.8	11.8	11.4	11.2	10.6
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		482	521	542	518	521	502

Table 65: *REF scenario - IMPACTS - Jobs*

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		52.7	47.2	46.7	38	37.9	41.1
By economic sector - Construction (jobs)		2,968	4,758	5,552	6,175	6,438	8,253
By economic sector - Manufacturing (jobs)		1,220	1,240	1,342	1,479	1,488	1,874
By economic sector - Mining (jobs)		1,413	1,143	932	761	646	512
By economic sector - Other (jobs)		144	562	718	866	970	1,690
By economic sector - Pipeline (jobs)		311	320	323	306	310	309
By economic sector - Professional (jobs)		1,620	2,112	2,394	2,685	2,805	3,706
By economic sector - Trade (jobs)		1,360	1,652	1,788	1,964	2,060	2,776
By economic sector - Utilities (jobs)		5,009	4,901	5,661	6,336	6,547	6,736
By resource sector - Biomass (jobs)		203	190	177	158	162	164
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Coal (jobs)		803	598	567	539	514	197
By resource sector - Grid (jobs)		5,499	5,656	7,418	8,683	9,315	10,024
By resource sector - Natural Gas (jobs)		3,363	3,132	3,254	3,696	3,527	3,338
By resource sector - Nuclear (jobs)		923	908	710	438	431	425
By resource sector - Oil (jobs)		3,128	2,658	2,331	2,159	2,061	1,993
By resource sector - Solar (jobs)			3,365	4,054	4,605	4,941	9,091
By resource sector - Wind (jobs)		179	229	246	331	351	664
By education level - All sectors - High school diploma or less (jobs)		5,784	7,030	7,924	8,716	9,023	10,987
By education level - All sectors - Associates degree or some college (jobs)		4,403	5,280	5,990	6,647	6,885	8,381
By education level - All sectors - Bachelors degree (jobs)		3,066	3,457	3,779	4,092	4,204	5,071
By education level - All sectors - Masters or professional degree (jobs)		746	849	933	1,014	1,045	1,273
By education level - All sectors - Doctoral degree (jobs)		99	120	130	141	145	185
Related work experience - All sectors - None (jobs)		2,041	2,433	2,745	3,033	3,141	3,824
Related work experience - All sectors - Up to 1 year (jobs)		2,648	3,269	3,674	4,034	4,178	5,171
Related work experience - All sectors - 1 to 4 years (jobs)		5,175	6,072	6,786	7,448	7,695	9,318
Related work experience - All sectors - 4 to 10 years (jobs)		3,350	3,938	4,411	4,850	5,005	6,041
Related work experience - All sectors - Over 10 years (jobs)		884	1,024	1,139	1,245	1,283	1,543
On-the-Job Training - All sectors - None (jobs)		755	914	1,011	1,100	1,137	1,416
On-the-Job Training - All sectors - Up to 1 year (jobs)		9,267	10,891	12,149	13,310	13,751	16,724
On-the-Job Training - All sectors - 1 to 4 years (jobs)		2,997	3,585	4,057	4,487	4,641	5,602
On-the-Job Training - All sectors - 4 to 10 years (jobs)		955	1,189	1,365	1,523	1,579	1,912

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

Item	2020	2025	2030	2035	2040	2045	2050
On-the-Job Training - All sectors - Over 10 years (jobs)		124	157	174	189	195	243
On-Site or In-Plant Training - All sectors - None (jobs)		2,230	2,680	2,988	3,275	3,382	4,166
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		8,441	9,928	11,087	12,153	12,558	15,254
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		2,317	2,772	3,134	3,463	3,582	4,331
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		990	1,211	1,379	1,532	1,586	1,911
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		121	145	168	188	195	235
Wage income - All (million $2019)		849	997	1,127	1,251	1,308	1,592

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	449	422	391	372	373	384	398
Final energy use - Residential (PJ)	241	228	225	225	227	233	239
Final energy use - Commercial (PJ)	189	191	193	193	194	199	210
Final energy use - Industry (PJ)	130	136	143	150	159	169	180

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)		2.72	2.74	4.82	5.09	5.1	5.33

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 (%)	15	40.3	41.5	42.8	43.7	44.6	45.9
Sales of space heating units - Electric Resistance (%)	13.7	12.7	12.4	12	11.7	10.8	9.45
Sales of space heating units - Gas (%)	56.6	31	38.4	41.1	40.8	40.8	40.9
Sales of space heating units - Fossil (%)	14.7	16.1	7.71	4.03	3.79	3.76	3.81
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	35.7	53	53	52.9	52.9	52.8	52.8
Sales of water heating units - Gas Furnace (%)	59.5	43.4	43.4	43.5	43.5	43.6	43.6
Sales of water heating units - Other (%)	4.77	3.57	3.58	3.59	3.6	3.6	3.61
Sales of cooking units - Electric Resistance (%)	58.7	58.7	58.7	58.7	58.7	58.7	58.7
Sales of cooking units - Gas (%)	41.3	41.3	41.3	41.3	41.3	41.3	41.3
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		4.7	4.34				

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 (%)	2.22	24.1	48.5	68.5	71.8	72.2	72.1
Sales of space heating units - Electric Resistance (%)	2.54	8.78	12.8	20.1	25.2	25.9	26
Sales of space heating units - Gas (%)	84.3	62.4	35.2	9.92	2.85	1.92	1.85
Sales of space heating units - Fossil (%)	11	4.72	3.48	1.49	0.219	0.018	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Electric Heat Pump (%)	0.097	0.269	0.266	0.268	0.269	0.268	0.269
Sales of water heating units - Electric Resistance (%)	2.5	6.69	6.63	6.64	6.67	6.65	6.66
Sales of water heating units - Gas (%)	93	88.5	88.5	88.6	88.5	88.5	88.6
Sales of water heating units - Other (%)	4.44	4.5	4.6	4.5	4.54	4.55	4.51
Sales of cooking units - Electric Resistance (%)	32	34.3	34.3	34.3	34.4	34.3	34.3
Sales of cooking units - Gas (%)	68	65.7	65.7	65.7	65.6	65.7	65.7
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		21,455	22,311				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	2,851	1,599	1,599	1,599	1,599	1,599	0
Installed thermal - Natural gas (MW)	4,401	7,065	7,065	7,582	9,862	11,289	11,129
Installed thermal - Nuclear (MW)	1,829	1,829	1,829	911	911	911	911
Installed renewables - Rooftop PV (MW)	851	1,276	1,695	2,240	2,899	3,650	4,510
Installed renewables - Solar - Base land use assumptions (MW)	389	389	389	389	389	389	389
Installed renewables - Wind - Base land use assumptions (MW)	191	191	191	191	191	191	191
Installed renewables - Offshore Wind - Base land use assumptions (MW)	0	0	0	0	0	0	1,551
Installed renewables - Solar - Constrained land use assumptions (MW)	4.27	4.27	4.27	4.27	4.27	4.27	4.27

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	758	758	758	758	758	758	758
Wind - Base land use assumptions (GWh)	786	786	786	786	786	786	786
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)	-4.41		-2.14				-1.92
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-0.235		-0.423				-0.44
Business-as-usual carbon sink - Total (Mt CO2e/y)	-4.65		-2.57				-2.36

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)							-18.8
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-183
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-511
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-71.1
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-288

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-125
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-31.1
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-67.1
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-184
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-1,480
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-28.2
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-642
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-922
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-104
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-576
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-240
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-46.6
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-477
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-365
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-3,401
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-37.6
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,101
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-1,332
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-140
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-864
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-356
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-62.1
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-886
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-5,324
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-546
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							3.08
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							140
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							260

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							25.8
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)							17.8
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							2.05
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							4.36
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							110
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							563
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							4.61
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							144
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							470
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							38.8
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)							25.8
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							3.08
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							31.5
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							221
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							938
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							6.15
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							149
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							679
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							51.5
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							33.8
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							4.11
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							25.2
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							181
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,130