Net-Zero America - Delaware data

October 29, 2021 (updated November 17, 2023)

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

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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)		14.6	0.01	0.01	0.009	0.006	0.001
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		5.93	4.36	2.9	2.63	1.77	0.736
Premature deaths from air pollution - Mobile - On-Road (deaths)		26.1	24.5	18.7	10.8	4.91	1.87
Premature deaths from air pollution - Gas Stations (deaths)		1.65	1.51	1.14	0.665	0.312	0.134
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		4.31	3.59	2.44	1.36	0.65	0.262
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		2.71	2.2	1.49	0.85	0.366	0.109
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.821	0.736	0.567	0.383	0.22	0.121
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.322	0.31	0.297	0.283	0.269	0.253
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		4.34	3.82	2.84	1.81	1.09	0.634
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.33	1.07	0.766	0.495	0.328	0.223
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.304	0.258	0.212	0.167	0.123	0.082
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.179	0.101	0.101	0.1	0.102	0.102
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		8.88	8.14	7.1	5.54	3.93	2.35
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		129	0.09	0.089	0.082	0.057	0.005
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		52.5	38.6	25.7	23.3	15.7	6.52
Monetary damages from air pollution - Mobile - On-Road (million $2019)		232	218	166	96.2	43.7	16.6
Monetary damages from air pollution - Gas Stations (million $2019)		14.6	13.4	10.1	5.89	2.76	1.18
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		38.2	31.8	21.6	12.1	5.76	2.33
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		24	19.5	13.2	7.53	3.24	0.967
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		7.27	6.52	5.03	3.39	1.95	1.07
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		2.85	2.74	2.63	2.5	2.38	2.24
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		38.4	33.9	25.1	16	9.67	5.61

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)		11.8	9.47	6.78	4.38	2.9	1.97
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		2.69	2.28	1.88	1.48	1.09	0.722
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		1.58	0.89	0.891	0.886	0.904	0.902
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		78.9	72.3	63	49.2	34.9	20.9

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		3.8	7.71	2.95	2.29	1.68	1.25
By economic sector - Construction (jobs)		1,157	1,093	1,405	1,414	2,997	4,672
By economic sector - Manufacturing (jobs)		880	1,577	1,618	1,384	1,975	2,205
By economic sector - Mining (jobs)		287	197	119	64.2	27.8	8.9
By economic sector - Other (jobs)		116	123	180	173	288	464
By economic sector - Pipeline (jobs)		81.8	67.9	52	36.7	21.4	39.3
By economic sector - Professional (jobs)		475	427	554	576	1,150	1,701
By economic sector - Trade (jobs)		359	317	374	366	684	1,042
By economic sector - Utilities (jobs)		1,295	1,149	1,543	1,835	4,358	6,673
By resource sector - Biomass (jobs)		16.3	21.3	8.39	6.88	6.13	5.33
By resource sector - CO2 (jobs)		0	0	0	0	0	224
By resource sector - Coal (jobs)		60.3	0	0	0	0	0
By resource sector - Grid (jobs)		1,533	1,562	2,384	2,802	8,501	13,175
By resource sector - Natural Gas (jobs)		1,224	934	898	1,048	701	713
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		583	435	275	147	58.8	0
By resource sector - Solar (jobs)		1,228	1,906	2,203	1,624	1,610	2,187
By resource sector - Wind (jobs)		9.84	100	81.4	224	626	504
By education level - All sectors - High school diploma or less (jobs)		1,968	2,134	2,517	2,502	4,955	7,261
By education level - All sectors - Associates degree or some college (jobs)		1,501	1,598	1,905	1,925	3,794	5,558
By education level - All sectors - Bachelors degree (jobs)		938	982	1,136	1,129	2,174	3,140
By education level - All sectors - Masters or professional degree (jobs)		220	219	260	263	521	763
By education level - All sectors - Doctoral degree (jobs)		28	26.3	31.4	31.3	59.3	86.6
Related work experience - All sectors - None (jobs)		679	716	850	856	1,694	2,488
Related work experience - All sectors - Up to 1 year (jobs)		911	1,004	1,182	1,164	2,276	3,316
Related work experience - All sectors - 1 to 4 years (jobs)		1,676	1,769	2,086	2,092	4,123	6,030
Related work experience - All sectors - 4 to 10 years (jobs)		1,096	1,149	1,359	1,368	2,692	3,937
Related work experience - All sectors - Over 10 years (jobs)		293	320	373	370	719	1,038
On-the-Job Training - All sectors - None (jobs)		244	258	303	298	575	839
On-the-Job Training - All sectors - Up to 1 year (jobs)		3,045	3,298	3,858	3,831	7,478	10,858

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)		1,003	1,047	1,252	1,271	2,532	3,731
On-the-Job Training - All sectors - 4 to 10 years (jobs)		316	303	377	394	815	1,233
On-the-Job Training - All sectors - Over 10 years (jobs)		45.8	52.2	59.8	57.3	104	148
On-Site or In-Plant Training - All sectors - None (jobs)		745	801	940	931	1,790	2,597
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		2,770	2,987	3,503	3,486	6,833	9,943
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		776	816	972	983	1,958	2,881
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		322	311	382	397	815	1,227
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		41.5	42.9	52.1	53.7	109	161
Wage income - All (million $2019)		273	287	342	350	705	1,048

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

Item	2020	2025	2030	2035	2040	2045	2050
Oil consumption - Annual (million bbls)		13.1	10.7	7.3	4.21	1.8	0
Oil consumption - Cumulative (million bbls)							229
Oil production - Annual (million bbls)		0	0	0	0	0	0
Natural gas consumption - Annual (tcf)		73.9	62.3	50	37.6	23.7	16.4
Natural gas consumption - Cumulative (tcf)							1,505
Natural gas production - Annual (tcf)		0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	81.4	75.7	67	56.1	46.1	40	37.3
Final energy use - Residential (PJ)	41.7	39.3	35.9	31.4	27.7	25.3	24.4
Final energy use - Commercial (PJ)	29.9	29.8	28.5	26.5	24.9	24.3	24.6
Final energy use - Industry (PJ)	16	16.3	16.6	16.9	17.1	17.5	18

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)		0.526	0.536	0.919	0.973	0.907	0.947

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	5.71	88	170	459	747	977	1,207
Vehicle stocks - LDV – All others (1000 units)	1,007	959	910	663	417	236	54.8
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		193	496	803	1,217	1,325	1,263
Public EV charging plugs - DC Fast (1000 units)	0.065		0.324		1.42		2.3
Public EV charging plugs - L2 (1000 units)	0.118		7.8		34.2		55.3

Table 7: *E+ scenario - PILLAR 1: Efficiency/Electrification - Residential*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	14.3	32.1	79.9	90.6	91	91	91
Sales of space heating units - Electric Resistance (%)	9.9	10.8	4.53	3.11	3.02	3.06	3.07
Sales of space heating units - Gas (%)	55.3	30.9	8.61	3.64	3.44	3.45	3.44
Sales of space heating units - Fossil (%)	20.5	26.2	6.99	2.7	2.51	2.5	2.49
Sales of water heating units - Electric Heat Pump (%)	0	9.43	49.9	59	59.4	59.4	59.4
Sales of water heating units - Electric Resistance (%)	30.2	45.9	40.3	39	38.9	38.9	38.9
Sales of water heating units - Gas Furnace (%)	65.2	41.3	7.81	0.329	0	0	0
Sales of water heating units - Other (%)	4.6	3.33	1.97	1.68	1.67	1.69	1.7
Sales of cooking units - Electric Resistance (%)	50.1	60.7	93.3	99.7	100	100	100
Sales of cooking units - Gas (%)	49.9	39.3	6.72	0.338	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		0.774	0.771				

Table 8: *E+ scenario - PILLAR 1: Efficiency/Electrification - Commercial*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	1.53	28.2	70.6	83.7	85	85.1	85.1
Sales of space heating units - Electric Resistance (%)	1.94	8.4	10.6	12.7	13.1	13.1	13.1
Sales of space heating units - Gas (%)	84.3	59.2	18.1	3.53	1.88	1.85	1.84
Sales of space heating units - Fossil (%)	12.2	4.23	0.808	0.035	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.078	10.5	54.6	64.4	64.9	64.9	64.9
Sales of water heating units - Electric Resistance (%)	1.96	10.8	28.3	32.2	32.4	32.4	32.4
Sales of water heating units - Gas (%)	93.3	74.5	14.1	0.593	0	0	0
Sales of water heating units - Other (%)	4.67	4.25	3.03	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)		3,472	3,883				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	446	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	1,625	2,963	2,679	2,967	4,449	4,449	4,007
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	110	165	219	290	375	472	584
Installed renewables - Solar - Base land use assumptions (MW)	39.5	164	309	597	597	597	597
Installed renewables - Wind - Base land use assumptions (MW)	2	2	2	2	2	2	2
Installed renewables - Offshore Wind - Base land use assumptions (MW)	0	0	0	0	0	4,059	8,319
Installed renewables - Solar - Constrained land use assumptions (MW)	38	38	134	317	317	317	317
Installed renewables - Wind - Constrained land use assumptions (MW)	2	2	2	2	2	2	2
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	2,240	8,324

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)		0.167	0.173	0.318	0	0	0
Capital invested - Offshore Wind - Base (billion $2018)		0	0	0	0	5.99	5.64
Capital invested - Solar PV - Constrained (billion $2018)		0.144	0.276	0.328	0	0	0
Capital invested - Offshore Wind - Constrained (billion $2018)		0	0	0	0	3.3	8.06
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)	75.2	309	579	1,122	1,122	1,122	1,122
Wind - Base land use assumptions (GWh)	8.07	8.07	8.07	8.07	8.07	8.07	8.07
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	17,643	37,615
Solar - Constrained land use assumptions (GWh)	0	0	180	522	522	522	522
Wind - Constrained land use assumptions (GWh)	8.07	8.07	8.07	8.07	8.07	8.07	8.07
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	17,643	37,615
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	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	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	0
Biomass purchases (million $2018/y)		0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	0	0	0	0
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	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Cumulative - All (MMT)		0	0	0	0	0	0
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	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	0	0	0	0	0
Spur (km)		0	0	0	0	0	166
All (km)		0	0	0	0	0	166
Cumulative investment - Trunk (million $2018)		0	0	0	0	0	0
Cumulative investment - Spur (million $2018)		0	0	0	0	0	122
Cumulative investment - All (million $2018)		0	0	0	0	0	122

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)							-3.48
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-34.3
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-77.3
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-13.9
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-69.4
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-29.2
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-2.7
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-6.51
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-25.8
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-263
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-5.21
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-120
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-139
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-20.4

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-139
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-56.4
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-4.05
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-46.2
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-51.2
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-581
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-6.94
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-206
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-201
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-27.3
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-208
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-83.5
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-5.4
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-85.9
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-901
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-76.6
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							0.567
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							26.1
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							39.3
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							5.03
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)							4.17
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							0.179
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							0.423
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							15.4
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							91.2

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							0.851
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							27
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							71
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							7.57
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)							6.05
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							0.268
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							3.06
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							30.9
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							147
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							1.13
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							27.8
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							103
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							10.1
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)							7.93
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							0.357
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							2.44
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							25.4
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							178

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)							-126
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-3.22
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-129
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-244
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-6.43
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-250
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)							88.6
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							5.85
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							94.5
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)							171
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							11.7
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							183

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)		14.6	0.01	0.01	0.009	0.006	0.001
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		5.37	3.48	1.51	0.651	0.213	0.146
Premature deaths from air pollution - Mobile - On-Road (deaths)		26.6	27	26.4	23.8	19	13.1
Premature deaths from air pollution - Gas Stations (deaths)		1.68	1.7	1.65	1.48	1.17	0.806

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)		4.34	4	3.57	2.95	2.2	1.45
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		2.75	2.65	2.53	2.21	1.64	1.03
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.832	0.84	0.836	0.767	0.616	0.445
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.322	0.31	0.297	0.283	0.269	0.253
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		4.37	4.32	4.16	3.72	3.04	2.28
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.34	1.18	1.02	0.838	0.684	0.548
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.304	0.277	0.249	0.221	0.193	0.166
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.174	0.101	0.102	0.102	0.103	0.1
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		8.85	7.69	6.2	5.07	4.27	3.1
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		129	0.09	0.089	0.082	0.057	0.005
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		47.6	30.8	13.4	5.77	1.89	1.29
Monetary damages from air pollution - Mobile - On-Road (million $2019)		237	240	234	212	169	116
Monetary damages from air pollution - Gas Stations (million $2019)		14.9	15.1	14.6	13.1	10.4	7.13
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		38.5	35.5	31.6	26.1	19.5	12.9
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		24.4	23.4	22.4	19.6	14.6	9.13
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		7.37	7.44	7.41	6.8	5.46	3.94
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		2.85	2.74	2.63	2.5	2.38	2.24
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		38.7	38.2	36.8	32.9	26.9	20.2
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		11.9	10.4	9.01	7.42	6.06	4.85
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		2.69	2.45	2.2	1.96	1.71	1.47
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		1.53	0.892	0.898	0.896	0.905	0.88

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)		78.6	68.3	55	45	37.9	27.6

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		4.63	5.93	2.26	1.46	1.32	1.27
By economic sector - Construction (jobs)		1,100	995	1,095	888	3,182	5,552
By economic sector - Manufacturing (jobs)		904	1,628	1,287	1,135	2,409	2,642
By economic sector - Mining (jobs)		314	205	144	97.6	61.7	28.2
By economic sector - Other (jobs)		113	117	152	133	296	513
By economic sector - Pipeline (jobs)		82.1	66	52.4	42.8	33.8	68.4
By economic sector - Professional (jobs)		455	396	426	351	1,204	1,975
By economic sector - Trade (jobs)		373	307	322	267	735	1,211
By economic sector - Utilities (jobs)		1,166	968	1,005	819	4,502	7,927
By resource sector - Biomass (jobs)		17.6	15.9	7.51	6.12	5.61	5.22
By resource sector - CO2 (jobs)		0	0	0	0	0	384
By resource sector - Coal (jobs)		177	59.1	0	0	0	0
By resource sector - Grid (jobs)		1,378	1,204	1,497	1,191	9,161	15,941
By resource sector - Natural Gas (jobs)		1,061	837	657	557	395	494
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		591	479	389	292	200	83
By resource sector - Solar (jobs)		1,277	1,987	1,863	1,470	1,745	2,219
By resource sector - Wind (jobs)		10.3	105	72.9	218	918	792
By education level - All sectors - High school diploma or less (jobs)		1,917	2,017	1,936	1,612	5,373	8,624
By education level - All sectors - Associates degree or some college (jobs)		1,446	1,503	1,445	1,206	4,077	6,578
By education level - All sectors - Bachelors degree (jobs)		911	935	880	731	2,353	3,715
By education level - All sectors - Masters or professional degree (jobs)		211	206	199	165	559	901
By education level - All sectors - Doctoral degree (jobs)		27.1	24.9	24.8	20.4	63.1	101
Related work experience - All sectors - None (jobs)		655	674	649	541	1,823	2,947
Related work experience - All sectors - Up to 1 year (jobs)		891	954	913	762	2,475	3,932
Related work experience - All sectors - 1 to 4 years (jobs)		1,626	1,670	1,600	1,330	4,450	7,145
Related work experience - All sectors - 4 to 10 years (jobs)		1,057	1,083	1,037	862	2,896	4,663
Related work experience - All sectors - Over 10 years (jobs)		284	305	286	239	781	1,231
On-the-Job Training - All sectors - None (jobs)		238	246	236	196	623	992
On-the-Job Training - All sectors - Up to 1 year (jobs)		2,966	3,133	2,972	2,478	8,113	12,873
On-the-Job Training - All sectors - 1 to 4 years (jobs)		963	981	949	788	2,716	4,420
On-the-Job Training - All sectors - 4 to 10 years (jobs)		300	277	282	232	860	1,459
On-the-Job Training - All sectors - Over 10 years (jobs)		44.6	50.4	46.9	39.3	114	175
On-Site or In-Plant Training - All sectors - None (jobs)		723	762	725	604	1,936	3,071
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		2,696	2,833	2,695	2,246	7,407	11,791

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)		747	766	739	615	2,104	3,414
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		306	286	288	237	862	1,452
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		39.5	39.9	39	32.4	116	191
Wage income - All (million $2019)		263	270	262	220	759	1,242

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	81.5	76.4	70.2	64.9	60.8	55.9	50.1
Final energy use - Residential (PJ)	41.7	39.5	38.4	37	34.6	31.5	28.6
Final energy use - Commercial (PJ)	29.9	29.9	29.5	28.9	28	27	26.5
Final energy use - Industry (PJ)	16	16.3	16.7	17.1	17.5	17.9	18.4

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)		0.457	0.458	0.597	0.614	0.89	0.939

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	4.42	28.6	52.8	165	277	525	773
Vehicle stocks - LDV – All others (1000 units)	1,011	1,011	1,011	959	907	699	491
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		0	31.3	65.7	222	699	1,018
Public EV charging plugs - DC Fast (1000 units)	0.065		0.1		0.527		1.47
Public EV charging plugs - L2 (1000 units)	0.118		2.42		12.7		35.4

Table 22: *E- scenario - PILLAR 1: Efficiency/Electrification - Residential*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	14.3	22.9	28.3	44	68	83.7	89.1
Sales of space heating units - Electric Resistance (%)	9.9	12	11.2	9.09	5.93	3.95	3.26
Sales of space heating units - Gas (%)	55.3	35.2	32.6	25.4	14.2	6.89	4.33
Sales of space heating units - Fossil (%)	20.5	29.9	27.8	21.5	11.8	5.49	3.29
Sales of water heating units - Electric Heat Pump (%)	0	1.62	6.23	19.5	39.9	53.2	57.8
Sales of water heating units - Electric Resistance (%)	30.2	47	46.3	44.4	41.6	39.8	39.1
Sales of water heating units - Gas Furnace (%)	65.2	47.8	44	33.1	16.2	5.18	1.35
Sales of water heating units - Other (%)	4.6	3.59	3.44	3	2.33	1.9	1.75
Sales of cooking units - Electric Resistance (%)	49.9	51.2	55.8	67.9	84.7	95.1	98.7
Sales of cooking units - Gas (%)	50.1	48.8	44.2	32.1	15.3	4.94	1.33
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		0.769	0.798				

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	1.53	20.1	24.9	38.9	61.1	76.8	82.8
Sales of space heating units - Electric Resistance (%)	1.94	8.06	8.33	9.15	10.6	12	12.8
Sales of space heating units - Gas (%)	84.3	66.9	62.2	48.4	26.6	10.7	4.3
Sales of space heating units - Fossil (%)	12.2	4.9	4.55	3.47	1.71	0.536	0.14
Sales of water heating units - Electric Heat Pump (%)	0.078	2.03	7.05	21.5	43.6	58.1	63.1
Sales of water heating units - Electric Resistance (%)	1.96	7.38	9.33	15.1	24	29.7	31.7
Sales of water heating units - Gas (%)	93.3	86.1	79.2	59.5	29.1	9.29	2.42
Sales of water heating units - Other (%)	4.67	4.49	4.43	3.93	3.32	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)		3,468	3,852				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	446	446	0	0	0	0	0
Installed thermal - Natural gas (MW)	1,629	2,286	1,958	1,670	1,330	1,330	2,061
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-3.48
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-34.3
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-77.3
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-13.9
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-69.4
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-29.2
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-2.7
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-6.51
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-25.8
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-263
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-5.21
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-120
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-139
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-20.4
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-139
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-56.4

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)							-4.05
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-46.2
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-51.2
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-581
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-6.94
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-206
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-201
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-27.3
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-208
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-83.5
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-5.4
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-85.9
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-901
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-76.6
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							0.567
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							26.1
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							39.3
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							5.03
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)							4.17
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							0.179
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							0.423
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							15.4
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							91.2
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							0.851

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)							27
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							71
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							7.57
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)							6.05
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							0.268
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							3.06
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							30.9
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							147
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							1.13
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							27.8
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							103
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							10.1
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)							7.93
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							0.357
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							2.44
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							25.4
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							178

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)							-126
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-3.22
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-129
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-244
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-6.43
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-250
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)							88.6
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							5.85
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							94.5
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)							171
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							11.7
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							183

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)		14.6	0.01	0.01	0.009	0.006	0.001
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		4.93	3.65	2.23	1.52	0.539	0.107
Premature deaths from air pollution - Mobile - On-Road (deaths)		26.1	24.5	18.7	10.8	4.91	1.87
Premature deaths from air pollution - Gas Stations (deaths)		1.65	1.51	1.14	0.665	0.312	0.134
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		4.31	3.59	2.44	1.36	0.65	0.262
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		2.71	2.2	1.49	0.85	0.366	0.109

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)		0.821	0.736	0.567	0.383	0.22	0.121
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.322	0.31	0.297	0.283	0.269	0.253
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		4.34	3.82	2.84	1.81	1.09	0.634
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.33	1.07	0.766	0.495	0.328	0.223
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.304	0.258	0.212	0.167	0.123	0.082
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.191	0.101	0.101	0.1	0.102	0.097
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		8.67	7.96	6.47	4.6	2.59	0.24
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		129	0.09	0.089	0.082	0.057	0.005
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		43.7	32.3	19.8	13.5	4.78	0.946
Monetary damages from air pollution - Mobile - On-Road (million $2019)		232	218	166	96.2	43.7	16.6
Monetary damages from air pollution - Gas Stations (million $2019)		14.6	13.4	10.1	5.89	2.76	1.18
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		38.2	31.8	21.6	12.1	5.76	2.33
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		24	19.5	13.2	7.53	3.24	0.967
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		7.27	6.52	5.03	3.39	1.95	1.07
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		2.85	2.74	2.63	2.5	2.38	2.24
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		38.4	33.9	25.1	16	9.67	5.61
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		11.8	9.47	6.78	4.38	2.9	1.97
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		2.69	2.28	1.88	1.48	1.09	0.722
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		1.69	0.89	0.89	0.884	0.903	0.853
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		77	70.7	57.5	40.9	23	2.13

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		3.82	7.93	2.93	1.87	1.51	1.1
By economic sector - Construction (jobs)		990	1,054	1,012	2,075	5,408	3,860
By economic sector - Manufacturing (jobs)		1,135	1,616	2,514	2,180	2,924	3,615
By economic sector - Mining (jobs)		307	191	105	45.4	9.67	5.25
By economic sector - Other (jobs)		90	125	120	207	432	791
By economic sector - Pipeline (jobs)		79.5	64.8	43.2	25.3	11.5	7.42
By economic sector - Professional (jobs)		421	426	402	831	1,999	1,651
By economic sector - Trade (jobs)		348	312	276	492	1,145	1,150
By economic sector - Utilities (jobs)		1,169	1,069	1,170	2,970	8,363	3,648
By resource sector - Biomass (jobs)		14.9	22.4	7.89	6.1	5.6	4.86
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Coal (jobs)		177	59.1	0	0	0	0
By resource sector - Grid (jobs)		1,391	1,352	1,767	5,475	17,219	6,924
By resource sector - Natural Gas (jobs)		1,053	898	726	777	497	668
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		583	427	257	107	0.002	0
By resource sector - Solar (jobs)		1,316	1,972	2,554	1,739	1,420	6,600
By resource sector - Wind (jobs)		9.59	134	333	723	1,151	531
By education level - All sectors - High school diploma or less (jobs)		1,930	2,091	2,449	3,797	8,765	6,350
By education level - All sectors - Associates degree or some college (jobs)		1,456	1,566	1,826	2,901	6,702	4,816
By education level - All sectors - Bachelors degree (jobs)		921	967	1,108	1,691	3,804	2,813
By education level - All sectors - Masters or professional degree (jobs)		210	215	236	394	921	663
By education level - All sectors - Doctoral degree (jobs)		25.9	26.1	25.9	44.6	102	84.4
Related work experience - All sectors - None (jobs)		657	701	807	1,289	2,997	2,148
Related work experience - All sectors - Up to 1 year (jobs)		898	988	1,168	1,764	3,994	3,029
Related work experience - All sectors - 1 to 4 years (jobs)		1,635	1,734	1,999	3,155	7,285	5,238
Related work experience - All sectors - 4 to 10 years (jobs)		1,062	1,127	1,295	2,058	4,755	3,392
Related work experience - All sectors - Over 10 years (jobs)		290	315	376	562	1,262	921
On-the-Job Training - All sectors - None (jobs)		238	254	290	444	1,002	779
On-the-Job Training - All sectors - Up to 1 year (jobs)		3,008	3,242	3,812	5,797	13,145	9,693
On-the-Job Training - All sectors - 1 to 4 years (jobs)		964	1,024	1,173	1,915	4,499	3,142
On-the-Job Training - All sectors - 4 to 10 years (jobs)		289	293	308	587	1,470	965
On-the-Job Training - All sectors - Over 10 years (jobs)		45.6	51.8	62.6	84.6	177	148
On-Site or In-Plant Training - All sectors - None (jobs)		728	790	920	1,393	3,122	2,380
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		2,730	2,934	3,440	5,277	12,036	8,805
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		749	798	918	1,485	3,476	2,444
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		297	302	319	592	1,465	967
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		39.4	41.8	47.8	81.2	194	131
Wage income - All (million $2019)		265	281	324	529	1,252	884

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	81.4	75.7	67	56.1	46.1	40	37.3
Final energy use - Residential (PJ)	41.7	39.3	35.9	31.4	27.7	25.3	24.4
Final energy use - Commercial (PJ)	29.9	29.8	28.5	26.5	24.9	24.3	24.6
Final energy use - Industry (PJ)	16	16.3	16.6	16.9	17.1	17.5	18

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)		0.526	0.536	0.919	0.973	0.907	0.947

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	5.71	88	170	459	747	977	1,207
Vehicle stocks - LDV – All others (1000 units)	1,007	959	910	663	417	236	54.8
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		193	496	803	1,217	1,325	1,263
Public EV charging plugs - DC Fast (1000 units)	0.065		0.324		1.42		2.3
Public EV charging plugs - L2 (1000 units)	0.118		7.8		34.2		55.3

Table 32: *E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Residential*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	14.3	32.1	79.9	90.6	91	91	91
Sales of space heating units - Electric Resistance (%)	9.9	10.8	4.53	3.11	3.02	3.06	3.07
Sales of space heating units - Gas (%)	55.3	30.9	8.61	3.64	3.44	3.45	3.44
Sales of space heating units - Fossil (%)	20.5	26.2	6.99	2.7	2.51	2.5	2.49
Sales of water heating units - Electric Heat Pump (%)	0	9.43	49.9	59	59.4	59.4	59.4
Sales of water heating units - Electric Resistance (%)	30.2	45.9	40.3	39	38.9	38.9	38.9
Sales of water heating units - Gas Furnace (%)	65.2	41.3	7.81	0.329	0	0	0
Sales of water heating units - Other (%)	4.6	3.33	1.97	1.68	1.67	1.69	1.7
Sales of cooking units - Electric Resistance (%)	50.1	60.7	93.3	99.7	100	100	100
Sales of cooking units - Gas (%)	49.9	39.3	6.72	0.338	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		0.774	0.771				

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	1.53	28.2	70.6	83.7	85	85.1	85.1
Sales of space heating units - Electric Resistance (%)	1.94	8.4	10.6	12.7	13.1	13.1	13.1
Sales of space heating units - Gas (%)	84.3	59.2	18.1	3.53	1.88	1.85	1.84
Sales of space heating units - Fossil (%)	12.2	4.23	0.808	0.035	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.078	10.5	54.6	64.4	64.9	64.9	64.9
Sales of water heating units - Electric Resistance (%)	1.96	10.8	28.3	32.2	32.4	32.4	32.4
Sales of water heating units - Gas (%)	93.3	74.5	14.1	0.593	0	0	0
Sales of water heating units - Other (%)	4.67	4.25	3.03	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)		3,472	3,883				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	446	446	0	0	0	0	0
Installed thermal - Natural gas (MW)	1,629	2,194	2,387	2,391	3,293	3,293	4,368
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	110	165	219	290	375	472	584
Installed renewables - Solar - Base land use assumptions (MW)	39.5	39.5	241	241	241	241	3,383
Installed renewables - Wind - Base land use assumptions (MW)	2	2	2	2	2	2	131
Installed renewables - Offshore Wind - Base land use assumptions (MW)	0	0	0	0	2,235	7,552	8,319
Installed renewables - Solar - Constrained land use assumptions (MW)	39.5	145	741	741	741	741	3,713
Installed renewables - Wind - Constrained land use assumptions (MW)	2.29	2.29	2.29	2.29	2.29	2.29	2.29
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	2,240	2,240	8,324
Capital invested - Solar PV - Base (billion $2018)		0	0.242	0	0	0	2.91
Capital invested - Wind - Base (billion $2018)		0	0	0	0	0	0.246
Capital invested - Offshore Wind - Base (billion $2018)		0	0	0	3.88	7.84	1.02

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	75.2	75.2	454	454	454	454	6,352
Wind - Base land use assumptions (GWh)	8.07	8.07	8.07	8.07	8.07	8.07	403
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	9,506	33,967	37,615
Solar - Constrained land use assumptions (GWh)	150	548	2,786	2,786	2,786	2,786	13,929
Wind - Constrained land use assumptions (GWh)	16.1	16.1	16.1	16.1	16.1	16.1	16.1
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	19,052	19,052	75,270

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)							-3.48
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-34.3
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-77.3
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-13.9
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-69.4

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)							-29.2
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-2.7
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-6.51
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-25.8
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-263
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-5.21
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-120
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-139
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-20.4
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-139
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-56.4
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-4.05
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-46.2
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-51.2
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-581
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-6.94
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-206
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-201
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-27.3
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-208
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-83.5
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-5.4
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-85.9
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-901
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-76.6
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							0.567
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							26.1
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							39.3

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)							5.03
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)							4.17
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							0.179
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							0.423
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							15.4
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							91.2
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							0.851
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							27
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							71
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							7.57
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)							6.05
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							0.268
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							3.06
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							30.9
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							147
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							1.13
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							27.8
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							103
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							10.1
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)							7.93
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							0.357
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							2.44
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							25.4
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							178

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)							-126
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-3.22
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-129
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-244
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-6.43
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-250
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)							88.6
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							5.85
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							94.5
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)							171
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							11.7

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)							183

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)		14.6	0.01	0.01	0.009	0.006	0.001
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		5.79	4.72	5.44	4.16	1.66	0.482
Premature deaths from air pollution - Mobile - On-Road (deaths)		26.1	24.5	18.7	10.8	4.91	1.87
Premature deaths from air pollution - Gas Stations (deaths)		1.65	1.51	1.14	0.665	0.312	0.134
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		4.31	3.59	2.44	1.36	0.65	0.262
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		2.71	2.2	1.49	0.85	0.366	0.109
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.821	0.736	0.567	0.383	0.22	0.121
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.322	0.31	0.297	0.283	0.269	0.253
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		4.34	3.82	2.84	1.81	1.09	0.634
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.33	1.07	0.766	0.495	0.328	0.223
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.304	0.258	0.212	0.167	0.123	0.082
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.166	0.101	0.101	0.1	0.102	0.097
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		9.04	8.65	8.46	7.46	6.3	4.77
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		129	0.09	0.089	0.082	0.057	0.005
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		51.3	41.8	48.2	36.9	14.7	4.27
Monetary damages from air pollution - Mobile - On-Road (million $2019)		232	218	166	96.2	43.7	16.6
Monetary damages from air pollution - Gas Stations (million $2019)		14.6	13.4	10.1	5.89	2.76	1.18
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		38.2	31.8	21.6	12.1	5.76	2.33
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		24	19.5	13.2	7.53	3.24	0.967
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		7.27	6.52	5.03	3.39	1.95	1.07

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)		2.85	2.74	2.63	2.5	2.38	2.24
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		38.4	33.9	25.1	16	9.67	5.61
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		11.8	9.47	6.78	4.38	2.9	1.97
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		2.69	2.28	1.88	1.48	1.09	0.722
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		1.47	0.889	0.891	0.885	0.904	0.853
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		80.3	76.8	75.1	66.2	56	42.4

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		4.34	6.22	2.08	1.72	1.58	1.37
By economic sector - Construction (jobs)		856	776	934	1,088	1,142	1,806
By economic sector - Manufacturing (jobs)		672	681	612	548	575	509
By economic sector - Mining (jobs)		291	203	133	80.9	45.6	25.6
By economic sector - Other (jobs)		78.6	78.4	103	127	145	251
By economic sector - Pipeline (jobs)		84.2	72.3	63.9	53.4	41	83.5
By economic sector - Professional (jobs)		337	295	345	509	460	1,084
By economic sector - Trade (jobs)		286	244	251	302	293	564
By economic sector - Utilities (jobs)		894	804	1,033	1,870	1,543	4,804
By resource sector - Biomass (jobs)		15.2	15.9	7.13	6.41	6.19	5.7
By resource sector - CO2 (jobs)		0	0	0	0	0	434
By resource sector - Coal (jobs)		60.3	0	0	0	0	0
By resource sector - Grid (jobs)		923	814	1,434	1,822	2,152	2,675
By resource sector - Natural Gas (jobs)		1,023	971	830	905	871	803
By resource sector - Nuclear (jobs)		0	0	0	797	161	3,880
By resource sector - Oil (jobs)		582	435	275	147	67.5	21.1
By resource sector - Solar (jobs)		866	882	922	886	954	1,289
By resource sector - Wind (jobs)		32.1	40.7	7.88	16.1	34.7	18.7
By education level - All sectors - High school diploma or less (jobs)		1,481	1,345	1,488	1,671	1,755	2,525
By education level - All sectors - Associates degree or some college (jobs)		1,119	1,016	1,133	1,306	1,365	2,031
By education level - All sectors - Bachelors degree (jobs)		715	634	677	783	789	1,248
By education level - All sectors - Masters or professional degree (jobs)		166	146	159	192	191	322
By education level - All sectors - Doctoral degree (jobs)		21.2	18.4	19.8	25.5	23.8	48.3
Related work experience - All sectors - None (jobs)		509	461	511	583	610	899
Related work experience - All sectors - Up to 1 year (jobs)		684	622	685	776	808	1,199
Related work experience - All sectors - 1 to 4 years (jobs)		1,264	1,136	1,248	1,431	1,480	2,226
Related work experience - All sectors - 4 to 10 years (jobs)		824	741	817	942	972	1,473

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)		221	200	217	246	254	377
On-the-Job Training - All sectors - None (jobs)		185	166	180	206	211	326
On-the-Job Training - All sectors - Up to 1 year (jobs)		2,298	2,073	2,261	2,573	2,661	3,971
On-the-Job Training - All sectors - 1 to 4 years (jobs)		750	678	758	873	912	1,357
On-the-Job Training - All sectors - 4 to 10 years (jobs)		234	210	244	289	302	464
On-the-Job Training - All sectors - Over 10 years (jobs)		34.8	31.8	33.8	37.3	38.3	56.5
On-Site or In-Plant Training - All sectors - None (jobs)		561	506	551	633	651	999
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		2,089	1,884	2,061	2,345	2,430	3,615
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		581	525	586	672	702	1,039
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		240	216	247	290	302	463
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		30.7	27.9	31.9	37.2	39.1	58.1
Wage income - All (million $2019)		206	186	208	242	253	387

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	81.4	75.7	67	56.1	46.1	40	37.3
Final energy use - Residential (PJ)	41.7	39.3	35.9	31.4	27.7	25.3	24.4
Final energy use - Commercial (PJ)	29.9	29.8	28.5	26.5	24.9	24.3	24.6
Final energy use - Industry (PJ)	16	16.3	16.6	16.9	17.1	17.5	18

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)		0.526	0.536	0.919	0.973	0.907	0.947

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	5.71	88	170	459	747	977	1,207
Vehicle stocks - LDV – All others (1000 units)	1,007	959	910	663	417	236	54.8
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		193	496	803	1,217	1,325	1,263
Public EV charging plugs - DC Fast (1000 units)	0.065		0.324		1.42		2.3
Public EV charging plugs - L2 (1000 units)	0.118		7.8		34.2		55.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	14.3	32.1	79.9	90.6	91	91	91
Sales of space heating units - Electric Resistance (%)	9.9	10.8	4.53	3.11	3.02	3.06	3.07
Sales of space heating units - Gas (%)	55.3	30.9	8.61	3.64	3.44	3.45	3.44
Sales of space heating units - Fossil (%)	20.5	26.2	6.99	2.7	2.51	2.5	2.49

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	9.43	49.9	59	59.4	59.4	59.4
Sales of water heating units - Electric Resistance (%)	30.2	45.9	40.3	39	38.9	38.9	38.9
Sales of water heating units - Gas Furnace (%)	65.2	41.3	7.81	0.329	0	0	0
Sales of water heating units - Other (%)	4.6	3.33	1.97	1.68	1.67	1.69	1.7
Sales of cooking units - Electric Resistance (%)	50.1	60.7	93.3	99.7	100	100	100
Sales of cooking units - Gas (%)	49.9	39.3	6.72	0.338	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		0.774	0.771				

Table 44: *E+RE- scenario - PILLAR 1: Efficiency/Electrification - Commercial*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	1.53	28.2	70.6	83.7	85	85.1	85.1
Sales of space heating units - Electric Resistance (%)	1.94	8.4	10.6	12.7	13.1	13.1	13.1
Sales of space heating units - Gas (%)	84.3	59.2	18.1	3.53	1.88	1.85	1.84
Sales of space heating units - Fossil (%)	12.2	4.23	0.808	0.035	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.078	10.5	54.6	64.4	64.9	64.9	64.9
Sales of water heating units - Electric Resistance (%)	1.96	10.8	28.3	32.2	32.4	32.4	32.4
Sales of water heating units - Gas (%)	93.3	74.5	14.1	0.593	0	0	0
Sales of water heating units - Other (%)	4.67	4.25	3.03	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)		3,472	3,883				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	446	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	1,598	1,746	1,414	2,038	2,558	3,610	3,168
Installed thermal - Nuclear (MW)	0	0	0	0	340	340	1,978
Installed renewables - Rooftop PV (MW)	110	165	219	290	375	472	584
Installed renewables - Solar - Base land use assumptions (MW)	39.5	39.5	39.5	39.5	39.5	39.5	39.5
Installed renewables - Wind - Base land use assumptions (MW)	2	2	2	2	2	2	2
Installed renewables - Solar - Constrained land use assumptions (MW)	39.5	39.5	145	395	395	616	616
Installed renewables - Wind - Constrained land use assumptions (MW)	2	2	2	2	2	2	2
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	241	321
Capital invested - Solar PV - Base (billion $2018)		0	0	0	0	0	0
Capital invested - Wind - Base (billion $2018)		0	0	0	0	0	0
Capital invested - Solar PV - Constrained (billion $2018)		0	0.127	0.275	0	0.217	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	0.356	0.106

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	75.2	75.2	75.2	75.2	75.2	75.2	75.2
Wind - Base land use assumptions (GWh)	8.07	8.07	8.07	8.07	8.07	8.07	8.07
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	75.2	75.2	274	743	743	1,157	1,157
Wind - Constrained land use assumptions (GWh)	8.07	8.07	8.07	8.07	8.07	8.07	8.07
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	1,008	1,348

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)							-3.48
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-34.3
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-77.3
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-13.9
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-69.4
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-29.2
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-2.7
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-6.51
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-25.8
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-263
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-5.21
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-120
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-139
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-20.4
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-139
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-56.4
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-4.05
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-46.2
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-51.2
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-581

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)							-6.94
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-206
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-201
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-27.3
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-208
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-83.5
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-5.4
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-85.9
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-901
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-76.6
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							0.567
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							26.1
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							39.3
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							5.03
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)							4.17
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							0.179
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							0.423
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							15.4
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							91.2
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							0.851
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							27
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							71
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							7.57

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)							6.05
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							0.268
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							3.06
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							30.9
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							147
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							1.13
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							27.8
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							103
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							10.1
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)							7.93
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							0.357
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							2.44
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							25.4
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							178

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)							-126
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-3.22
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-129

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)							-244
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-6.43
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-250
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)							88.6
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							5.85
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							94.5
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)							171
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							11.7
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							183

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)		14.6	0.01	0.01	0.009	0.006	0.001
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		5.26	3.19	1.79	1.29	0.751	0.223
Premature deaths from air pollution - Mobile - On-Road (deaths)		26.6	27	26.4	23.8	19	13.1
Premature deaths from air pollution - Gas Stations (deaths)		1.68	1.7	1.65	1.48	1.17	0.806
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		4.34	4	3.57	2.95	2.2	1.45
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		2.75	2.65	2.53	2.21	1.64	1.03
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.832	0.84	0.836	0.767	0.616	0.445
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.322	0.31	0.297	0.283	0.269	0.253
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		4.37	4.32	4.16	3.72	3.04	2.28

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)		1.34	1.18	1.02	0.838	0.684	0.548
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.304	0.277	0.249	0.221	0.193	0.166
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.178	0.101	0.102	0.102	0.104	0.103
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		8.85	7.69	6.2	5.07	4.27	3.1
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		129	0.09	0.089	0.082	0.057	0.005
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		46.6	28.3	15.9	11.4	6.65	1.97
Monetary damages from air pollution - Mobile - On-Road (million $2019)		237	240	234	212	169	116
Monetary damages from air pollution - Gas Stations (million $2019)		14.9	15.1	14.6	13.1	10.4	7.13
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		38.5	35.5	31.6	26.1	19.5	12.9
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		24.4	23.4	22.4	19.6	14.6	9.13
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		7.37	7.44	7.41	6.8	5.46	3.94
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		2.85	2.74	2.63	2.5	2.38	2.24
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		38.7	38.2	36.8	32.9	26.9	20.2
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		11.9	10.4	9.01	7.42	6.06	4.85
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		2.69	2.45	2.2	1.96	1.71	1.47
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		1.57	0.892	0.898	0.897	0.916	0.908
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		78.6	68.3	55	45	37.9	27.6

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		4.24	5.93	2.22	1.64	1.36	55.9
By economic sector - Construction (jobs)		1,096	992	1,057	982	2,321	4,585
By economic sector - Manufacturing (jobs)		894	1,613	1,112	816	1,542	2,228
By economic sector - Mining (jobs)		312	204	145	103	61.3	25.1
By economic sector - Other (jobs)		112	117	144	136	236	448
By economic sector - Pipeline (jobs)		81.3	65.9	53.2	44.4	32.9	67.9
By economic sector - Professional (jobs)		454	395	410	395	887	1,726

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Trade (jobs)		373	306	313	292	557	1,033
By economic sector - Utilities (jobs)		1,162	967	978	1,018	3,170	6,389
By resource sector - Biomass (jobs)		16.8	16	7.5	6.88	6.3	264
By resource sector - CO2 (jobs)		0	0	0	0	0	394
By resource sector - Coal (jobs)		177	59.1	0	0	0	0
By resource sector - Grid (jobs)		1,378	1,204	1,433	1,446	6,243	12,719
By resource sector - Natural Gas (jobs)		1,051	835	666	711	477	432
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		591	479	389	314	202	70.1
By resource sector - Solar (jobs)		1,264	1,965	1,655	1,194	1,336	2,157
By resource sector - Wind (jobs)		10.6	108	63.9	117	543	521
By education level - All sectors - High school diploma or less (jobs)		1,907	2,008	1,816	1,623	3,800	7,173
By education level - All sectors - Associates degree or some college (jobs)		1,438	1,497	1,358	1,230	2,891	5,442
By education level - All sectors - Bachelors degree (jobs)		906	931	827	740	1,672	3,101
By education level - All sectors - Masters or professional degree (jobs)		210	206	189	173	399	754
By education level - All sectors - Doctoral degree (jobs)		27	24.8	23.8	21.9	46.2	87.3
Related work experience - All sectors - None (jobs)		652	671	612	554	1,295	2,450
Related work experience - All sectors - Up to 1 year (jobs)		886	950	854	757	1,749	3,288
Related work experience - All sectors - 1 to 4 years (jobs)		1,617	1,663	1,505	1,357	3,157	5,934
Related work experience - All sectors - 4 to 10 years (jobs)		1,052	1,079	977	883	2,057	3,866
Related work experience - All sectors - Over 10 years (jobs)		282	303	267	237	550	1,020
On-the-Job Training - All sectors - None (jobs)		237	245	222	198	444	830
On-the-Job Training - All sectors - Up to 1 year (jobs)		2,951	3,118	2,783	2,482	5,736	10,729
On-the-Job Training - All sectors - 1 to 4 years (jobs)		958	977	895	815	1,929	3,650
On-the-Job Training - All sectors - 4 to 10 years (jobs)		298	276	270	255	619	1,202
On-the-Job Training - All sectors - Over 10 years (jobs)		44.4	50.2	43.5	37.6	80.5	146
On-Site or In-Plant Training - All sectors - None (jobs)		719	759	679	606	1,374	2,564
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		2,682	2,821	2,526	2,258	5,239	9,816
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		743	762	696	632	1,493	2,822
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		305	285	275	258	620	1,198
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		39.3	39.7	36.9	34	82.3	157
Wage income - All (million $2019)		262	269	247	226	539	1,031

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	81.5	76.4	70.2	64.9	60.8	55.9	50.1
Final energy use - Residential (PJ)	41.7	39.5	38.4	37	34.6	31.5	28.6
Final energy use - Commercial (PJ)	29.9	29.9	29.5	28.9	28	27	26.5
Final energy use - Industry (PJ)	16	16.3	16.7	17.1	17.5	17.9	18.4

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)		0.457	0.458	0.597	0.614	0.89	0.939

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	4.42	28.6	52.8	165	277	525	773
Vehicle stocks - LDV – All others (1000 units)	1,011	1,011	1,011	959	907	699	491
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		0	31.3	65.7	222	699	1,018
Public EV charging plugs - DC Fast (1000 units)	0.065		0.1		0.527		1.47
Public EV charging plugs - L2 (1000 units)	0.118		2.42		12.7		35.4

Table 54: *E-B+ scenario - PILLAR 1: Efficiency/Electrification - Residential*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	14.3	22.9	28.3	44	68	83.7	89.1
Sales of space heating units - Electric Resistance (%)	9.9	12	11.2	9.09	5.93	3.95	3.26
Sales of space heating units - Gas (%)	55.3	35.2	32.6	25.4	14.2	6.89	4.33
Sales of space heating units - Fossil (%)	20.5	29.9	27.8	21.5	11.8	5.49	3.29
Sales of water heating units - Electric Heat Pump (%)	0	1.62	6.23	19.5	39.9	53.2	57.8
Sales of water heating units - Electric Resistance (%)	30.2	47	46.3	44.4	41.6	39.8	39.1
Sales of water heating units - Gas Furnace (%)	65.2	47.8	44	33.1	16.2	5.18	1.35
Sales of water heating units - Other (%)	4.6	3.59	3.44	3	2.33	1.9	1.75
Sales of cooking units - Electric Resistance (%)	49.9	51.2	55.8	67.9	84.7	95.1	98.7
Sales of cooking units - Gas (%)	50.1	48.8	44.2	32.1	15.3	4.94	1.33
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		0.769	0.798				

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	1.53	20.1	24.9	38.9	61.1	76.8	82.8
Sales of space heating units - Electric Resistance (%)	1.94	8.06	8.33	9.15	10.6	12	12.8
Sales of space heating units - Gas (%)	84.3	66.9	62.2	48.4	26.6	10.7	4.3
Sales of space heating units - Fossil (%)	12.2	4.9	4.55	3.47	1.71	0.536	0.14
Sales of water heating units - Electric Heat Pump (%)	0.078	2.03	7.05	21.5	43.6	58.1	63.1
Sales of water heating units - Electric Resistance (%)	1.96	7.38	9.33	15.1	24	29.7	31.7
Sales of water heating units - Gas (%)	93.3	86.1	79.2	59.5	29.1	9.29	2.42
Sales of water heating units - Other (%)	4.67	4.49	4.43	3.93	3.32	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)		3,468	3,852				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	446	446	0	0	0	0	0
Installed thermal - Natural gas (MW)	1,627	2,286	1,958	1,670	2,142	2,142	2,061
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
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	1
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	772
Biomass purchases (million $2018/y)		0	0	0	0	0	69.2

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	0	0	0	0
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	0	0	0
Cumulative - All (MMT)		0	0	0	0	0	0
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	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	0	0	0	0	0
Spur (km)		0	0	0	0	0	0
All (km)		0	0	0	0	0	0
Cumulative investment - Trunk (million $2018)		0	0	0	0	0	0
Cumulative investment - Spur (million $2018)		0	0	0	0	0	0

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	0	0	0	0

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)							-3.48
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-34.3
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-77.3
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-13.9
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-69.4
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-29.2
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-2.7
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-6.51
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-25.8
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-263
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-5.21
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-120
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-139
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-20.4
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-139
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-56.4
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-4.05
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-46.2
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-51.2
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-581
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-6.94
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-206

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)							-201
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-27.3
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-208
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-83.5
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-5.4
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-85.9
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-901
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-76.6
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							0.567
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							26.1
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							39.3
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							5.03
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)							4.17
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							0.179
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							0.423
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							15.4
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							91.2
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							0.851
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							27
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							71
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							7.57
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)							6.05

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)							0.268
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							3.06
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							30.9
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							147
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							1.13
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							27.8
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							103
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							10.1
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)							7.93
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							0.357
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							2.44
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							25.4
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							178

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)							-25.9
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-116
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-2.8
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)							-145

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)							-25.9
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-225
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-5.61
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)							-257
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							13.8
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							81.5
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							5.1
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)							3.07
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)							0.14
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							104
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							13.8
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							390
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							10.2
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)							3.07
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)							0.14
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							417

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)		38.9	24.3	22.8	22.2	21.8	19.9

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)		4.15	4.63	6.08	6.31	6.31	5.9
Premature deaths from air pollution - Mobile - On-Road (deaths)		26.6	27.3	28.1	28.9	29.8	30.6
Premature deaths from air pollution - Gas Stations (deaths)		1.68	1.72	1.75	1.8	1.85	1.88
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		4.28	4.02	3.86	3.81	3.82	3.81
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		2.64	2.22	1.59	1.03	0.628	0.402
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.794	0.784	0.785	0.798	0.815	0.829
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.336	0.339	0.341	0.342	0.342	0.341
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		4.4	4.41	4.21	3.97	3.94	4.13
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.36	1.23	1.08	0.909	0.811	0.761
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.318	0.328	0.339	0.348	0.357	0.367
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.324	0.241	0.207	0.2	0.197	0.189
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		8.92	9.67	10.1	9.7	9.81	9.51
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		345	215	202	196	193	177
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		36.8	41	53.9	55.9	55.9	52.3
Monetary damages from air pollution - Mobile - On-Road (million $2019)		236	243	249	257	265	272
Monetary damages from air pollution - Gas Stations (million $2019)		14.8	15.2	15.5	16	16.3	16.7
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		38	35.6	34.2	33.7	33.9	33.8
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		23.4	19.7	14.1	9.14	5.56	3.56
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		7.03	6.95	6.95	7.08	7.22	7.35
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		2.98	3	3.02	3.02	3.03	3.01
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		39	39	37.3	35.2	34.9	36.5
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		12	10.9	9.56	8.04	7.18	6.74

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)		2.81	2.91	3	3.08	3.16	3.24
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		2.86	2.13	1.82	1.76	1.74	1.67
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		79.2	85.9	89.6	86.1	87.1	84.5

Table 65: *REF scenario - IMPACTS - Jobs*

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		4.02	3.6	3.56	2.9	2.89	3.14
By economic sector - Construction (jobs)		726	925	1,112	1,360	1,555	2,287
By economic sector - Manufacturing (jobs)		277	320	362	453	470	895
By economic sector - Mining (jobs)		317	257	209	168	143	110
By economic sector - Other (jobs)		34.2	84.8	110	141	163	288
By economic sector - Pipeline (jobs)		83.8	87.2	88.1	82.5	83.3	82.3
By economic sector - Professional (jobs)		329	372	445	552	610	890
By economic sector - Trade (jobs)		290	307	337	393	430	613
By economic sector - Utilities (jobs)		1,132	1,064	1,343	1,767	2,043	2,796
By resource sector - Biomass (jobs)		15.5	14.5	13.5	12	12.3	12.5
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Coal (jobs)		177	167	158	150	143	55
By resource sector - Grid (jobs)		1,314	1,183	1,616	2,287	2,901	4,636
By resource sector - Natural Gas (jobs)		1,079	1,062	1,199	1,378	1,351	1,260
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		594	488	418	383	365	352
By resource sector - Solar (jobs)			470	571	675	721	1,353
By resource sector - Wind (jobs)		13.5	36.8	33.7	33	6.68	295
By education level - All sectors - High school diploma or less (jobs)		1,327	1,443	1,694	2,078	2,335	3,408
By education level - All sectors - Associates degree or some college (jobs)		1,024	1,104	1,308	1,617	1,812	2,621
By education level - All sectors - Bachelors degree (jobs)		663	688	792	960	1,061	1,519
By education level - All sectors - Masters or professional degree (jobs)		159	165	192	234	259	371
By education level - All sectors - Doctoral degree (jobs)		19.8	21.5	24.7	29.5	32.2	46
Related work experience - All sectors - None (jobs)		469	503	593	730	818	1,181
Related work experience - All sectors - Up to 1 year (jobs)		595	655	768	942	1,057	1,560
Related work experience - All sectors - 1 to 4 years (jobs)		1,168	1,241	1,451	1,778	1,987	2,865
Related work experience - All sectors - 4 to 10 years (jobs)		762	811	952	1,168	1,304	1,872
Related work experience - All sectors - Over 10 years (jobs)		198	210	245	300	335	487
On-the-Job Training - All sectors - None (jobs)		165	179	207	252	280	408
On-the-Job Training - All sectors - Up to 1 year (jobs)		2,076	2,213	2,582	3,162	3,531	5,135
On-the-Job Training - All sectors - 1 to 4 years (jobs)		696	748	884	1,091	1,224	1,760
On-the-Job Training - All sectors - 4 to 10 years (jobs)		229	250	299	369	417	590

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)		27.9	31.5	36.6	44.3	48.9	72
On-Site or In-Plant Training - All sectors - None (jobs)		498	539	630	770	857	1,246
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		1,896	2,021	2,360	2,892	3,232	4,696
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		536	576	681	839	941	1,357
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		234	253	301	371	417	589
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		29	31.2	37.5	46.7	52.6	75.4
Wage income - All (million $2019)		193	206	244	303	343	497

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	81.4	76.3	70.4	66.8	66.7	68.4	70.6
Final energy use - Residential (PJ)	41.7	39.3	38.7	38.6	39	40	41.1
Final energy use - Commercial (PJ)	29.9	30.3	30.5	30.5	30.7	31.5	33.2
Final energy use - Industry (PJ)	16	16.8	17.7	18.8	20	21.3	22.7

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)		0.488	0.492	0.647	0.67	0.83	0.869

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 (%)	11.1	37.9	39.1	40.3	41.2	41.9	42.9
Sales of space heating units - Electric Resistance (%)	10.4	9.91	9.75	9.4	9.02	8.38	7.34
Sales of space heating units - Gas (%)	57.3	30.9	39.4	42.7	42.6	42.6	42.6
Sales of space heating units - Fossil (%)	21.2	21.3	11.8	7.55	7.21	7.18	7.25
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	30.2	47.2	47.2	47.1	47	47	46.9
Sales of water heating units - Gas Furnace (%)	65.2	49.1	49.2	49.2	49.3	49.4	49.4
Sales of water heating units - Other (%)	4.6	3.64	3.64	3.65	3.66	3.66	3.67
Sales of cooking units - Electric Resistance (%)	49.4	49.4	49.4	49.4	49.4	49.4	49.4
Sales of cooking units - Gas (%)	50.6	50.6	50.6	50.6	50.6	50.6	50.6
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		0.756	0.716				

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	1.53	24.1	48.5	68.4	71.7	72.1	72.1
Sales of space heating units - Electric Resistance (%)	1.94	8.79	12.8	20.1	25.2	25.9	26
Sales of space heating units - Gas (%)	84.3	62.4	35.2	9.91	2.84	1.91	1.84
Sales of space heating units - Fossil (%)	12.2	4.76	3.52	1.51	0.221	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 (%)	0.078	0.268	0.265	0.267	0.268	0.267	0.268
Sales of water heating units - Electric Resistance (%)	1.96	6.67	6.62	6.62	6.65	6.63	6.65
Sales of water heating units - Gas (%)	93.3	88.5	88.5	88.6	88.5	88.5	88.5
Sales of water heating units - Other (%)	4.67	4.54	4.63	4.53	4.56	4.58	4.53
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)		3,421	3,558				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	446	446	446	446	446	446	0
Installed thermal - Natural gas (MW)	1,620	2,286	1,958	2,627	4,157	5,313	5,232
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	110	165	219	290	375	472	584
Installed renewables - Solar - Base land use assumptions (MW)	39.5	39.5	39.5	39.5	39.5	39.5	39.5
Installed renewables - Wind - Base land use assumptions (MW)	2	2	2	2	2	2	2
Installed renewables - Offshore Wind - Base land use assumptions (MW)	0	0	0	0	0	0	1,497

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	75.2	75.2	75.2	75.2	75.2	75.2	75.2
Wind - Base land use assumptions (GWh)	8.07	8.07	8.07	8.07	8.07	8.07	8.07
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)	-0.69		-0.314				-0.281
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-0.057		-0.102				-0.106
Business-as-usual carbon sink - Total (Mt CO2e/y)	-0.747		-0.416				-0.387

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)							-3.48
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-34.3
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-77.3
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-13.9
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-69.4
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-29.2

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-2.7
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-6.51
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-25.8
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-263
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-5.21
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-120
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-139
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-20.4
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-139
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-56.4
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-4.05
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-46.2
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-51.2
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-581
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-6.94
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-206
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-201
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-27.3
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-208
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-83.5
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-5.4
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-85.9
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-901
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-76.6
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							0.567
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							26.1
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							39.3
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							5.03

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 - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							4.17
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							0.179
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							0.423
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							15.4
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							91.2
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							0.851
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							27
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							71
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							7.57
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)							6.05
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							0.268
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							3.06
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							30.9
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							147
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							1.13
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							27.8
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							103
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							10.1
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)							7.93

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 - Reforest cropland (1000 hectares)							0.357
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							2.44
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							25.4
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							178