



Net-Zero America - Georgia data

October 29, 2021 (updated January 9, 2022)

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

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Table 1: E+ scenario - IMPACTS - Health

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		51.7	0.095	0.086	0.06	0.04	0.003
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		35	32.8	19.8	15	7.59	2.87
Premature deaths from air pollution - Mobile - On-Road (deaths)		388	375	295	176	82.2	32.5
Premature deaths from air pollution - Gas Stations (deaths)		36.7	35	27.2	16.5	8.04	3.66
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		44.5	37	24.8	13.9	7.13	4
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		1.45	1.21	0.858	0.532	0.271	0.128
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		4.42	4.04	3.18	2.18	1.27	0.712
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		2.78	2.73	2.65	2.56	2.46	2.34
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		22.9	20.5	15.1	9.47	6.01	4.39
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		2.14	1.86	1.51	1.15	0.832	0.559
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		2.17	1.92	1.64	1.34	1.03	0.702
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.6	0.969	0.99	1	1.04	1.06
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		47.1	45.4	42.3	33.8	25.6	16.2
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		458	0.84	0.762	0.536	0.353	0.029
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		310	291	175	133	67.2	25.4
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		3,449	3,336	2,621	1,565	731	289
Monetary damages from air pollution - Gas Stations (million \$2019)		325	310	241	146	71.2	32.4
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		395	327	219	123	63.2	35.4
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		12.9	10.7	7.61	4.71	2.41	1.13
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		39.2	35.8	28.2	19.3	11.3	6.31
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		24.6	24.1	23.5	22.7	21.8	20.7
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		203	182	133	83.9	53.2	38.8

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)		19	16.4	13.4	10.2	7.36	4.95
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		19.2	17	14.6	11.9	9.08	6.22
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		14.1	8.55	8.74	8.85	9.19	9.31
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		418	403	375	300	227	144

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		518	841	494	1,466	1,699	1,468
By economic sector - Construction (jobs)		8,121	13,736	26,055	24,836	36,551	40,475
By economic sector - Manufacturing (jobs)		5,270	8,145	8,583	8,043	9,747	10,031
By economic sector - Mining (jobs)		3,112	2,251	1,494	912	602	360
By economic sector - Other (jobs)		602	1,633	4,570	4,624	8,141	9,485
By economic sector - Pipeline (jobs)		733	929	757	444	412	396
By economic sector - Professional (jobs)		4,638	6,059	10,522	11,816	17,849	19,949
By economic sector - Trade (jobs)		3,338	4,085	7,150	7,315	11,500	13,267
By economic sector - Utilities (jobs)		12,270	14,730	20,124	21,715	27,082	31,878
By resource sector - Biomass (jobs)		1,824	2,220	1,284	4,341	6,208	6,302
By resource sector - CO2 (jobs)		54.7	2,697	2,528	1,044	1,978	2,463
By resource sector - Coal (jobs)		1,328	0	0	0	0	0
By resource sector - Grid (jobs)		13,077	17,056	29,306	32,706	45,422	56,210
By resource sector - Natural Gas (jobs)		7,360	6,976	5,694	6,745	4,317	3,553
By resource sector - Nuclear (jobs)		3,150	3,100	3,051	3,003	2,790	2,511
By resource sector - Oil (jobs)		7,190	5,570	3,788	2,362	1,358	666
By resource sector - Solar (jobs)		4,593	14,432	33,821	30,166	49,643	54,275
By resource sector - Wind (jobs)		25	357	277	805	1,868	1,330
By education level - All sectors - High school diploma or less (jobs)		16,010	22,423	34,319	34,883	48,767	54,458
By education level - All sectors - Associates degree or some college (jobs)		11,921	16,498	25,615	25,883	36,350	40,985
By education level - All sectors - Bachelors degree (jobs)		8,360	10,589	15,451	15,834	22,007	24,625
By education level - All sectors - Masters or professional degree (jobs)		2,033	2,550	3,815	3,986	5,609	6,300
By education level - All sectors - Doctoral degree (jobs)		278	349	551	585	850	942
Related work experience - All sectors - None (jobs)		5,571	7,636	11,681	11,943	16,742	18,810
Related work experience - All sectors - Up to 1 year (jobs)		7,516	10,563	16,316	16,649	23,504	26,203
Related work experience - All sectors - 1 to 4 years (jobs)		14,028	18,811	28,460	29,025	40,542	45,486
Related work experience - All sectors - 4 to 10 years (jobs)		9,053	12,158	18,487	18,711	26,097	29,306
Related work experience - All sectors - Over 10 years (jobs)		2,434	3,242	4,806	4,843	6,697	7,505
On-the-Job Training - All sectors - None (jobs)		2,100	2,825	4,376	4,431	6,304	7,046
On-the-Job Training - All sectors - Up to 1 year (jobs)		25,609	34,488	51,691	52,939	73,944	82,737

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)		8,049	11,073	17,153	17,269	24,112	27,140
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,487	3,511	5,741	5,764	8,145	9,201
On-the-Job Training - All sectors - Over 10 years (jobs)		359	512	789	769	1,077	1,186
On-Site or In-Plant Training - All sectors - None (jobs)		6,213	8,469	12,933	13,188	18,551	20,696
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		23,240	31,318	47,088	48,120	67,225	75,301
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		6,245	8,592	13,278	13,381	18,698	21,035
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,584	3,579	5,742	5,765	8,104	9,139
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		322	451	708	717	1,005	1,139
Wage income - All (million \$2019)		2,042	2,725	4,117	4,267	5,995	6,817

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

Item	2020	2025	2030	2035	2040	2045	2050
Oil consumption - Annual (million bbls)		162	137	101	67.5	41.5	21.7
Oil consumption - Cumulative (million bbls)							3,127
Oil production - Annual (million bbls)		0	0	0	0	0	0
Natural gas consumption - Annual (tcf)		572	482	387	291	183	127
Natural gas consumption - Cumulative (tcf)							11,650
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)	1,057	990	878	740	614	535	499
Final energy use - Residential (PJ)	362	344	319	286	259	244	240
Final energy use - Commercial (PJ)	252	253	245	233	223	221	224
Final energy use - Industry (PJ)	420	427	428	425	426	427	431

Table 5: *E+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand*

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion \$2018)		7.03	7.31	10.9	11.6	9.14	9.44

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	193	878	1,563	3,961	6,359	8,275	10,191
Vehicle stocks - LDV – All others (1000 units)	8,497	8,091	7,685	5,600	3,516	1,989	462
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		1,609	4,204	6,681	10,172	11,015	10,532
Public EV charging plugs - DC Fast (1000 units)	0.376		3.15		12.8		20.6
Public EV charging plugs - L2 (1000 units)	2.43		75.7		308		494

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 (%)	25.4	45	81.3	89.4	89.8	89.7	89.7
Sales of space heating units - Electric Resistance (%)	18.4	19.7	8.27	5.67	5.52	5.61	5.63
Sales of space heating units - Gas (%)	51.8	29.7	8.3	3.54	3.35	3.36	3.35
Sales of space heating units - Fossil (%)	4.42	5.56	2.13	1.36	1.33	1.31	1.31
Sales of water heating units - Electric Heat Pump (%)	0	11.6	61.4	72.5	73	72.9	72.9
Sales of water heating units - Electric Resistance (%)	47.2	57.2	31	25.2	24.9	24.9	24.9
Sales of water heating units - Gas Furnace (%)	50	29.1	5.49	0.232	0	0	0
Sales of water heating units - Other (%)	2.84	2.09	2.1	2.11	2.12	2.14	2.15
Sales of cooking units - Electric Resistance (%)	66.9	74	95.5	99.8	100	100	100
Sales of cooking units - Gas (%)	33.1	26	4.45	0.224	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		8.06	8.87				

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 (%)	7.3	27.4	70.6	84	85.3	85.4	85.4
Sales of space heating units - Electric Resistance (%)	6.68	8.23	10.2	12.3	12.7	12.7	12.7
Sales of space heating units - Gas Furnace (%)	86	60.5	18.4	3.67	2	1.95	1.94
Sales of space heating units - Fossil (%)	0	3.85	0.732	0.031	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.221	10.5	54.6	64.4	64.8	64.8	64.8
Sales of water heating units - Electric Resistance (%)	5.5	10.9	28.4	32.3	32.5	32.5	32.5
Sales of water heating units - Gas Furnace (%)	92.1	74.6	14.1	0.594	0	0	0
Sales of water heating units - Other (%)	2.13	3.93	2.95	2.7	2.71	2.7	2.7
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)		34,949	38,935				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	9,817	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	16,644	16,340	19,883	20,348	12,711	12,877	13,973
Installed thermal - Nuclear (MW)	6,242	6,242	6,242	6,242	6,242	5,385	5,385
Installed renewables - Rooftop PV (MW)	381	614	869	1,237	1,756	2,428	3,288
Installed renewables - Solar - Base land use assumptions (MW)	1,091	1,091	6,520	27,243	41,337	73,177	100,462
Installed renewables - Solar - Constrained land use assumptions (MW)	1,062	1,062	6,241	20,181	41,990	70,525	95,524
Capital invested - Solar PV - Base (billion \$2018)		0	6.5	23.3	14.7	31.2	25.3
Capital invested - Solar PV - Constrained (billion \$2018)		1.41	10.8	26.5	21	26.4	28.1
Capital invested - Biomass power plant (billion \$2018)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Biomass w/ccu allam power plant (billion \$2018)	0	0	0	0.034	0	0	0.013
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	0	0.007	6.93	0.666	0.001

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	2,538	2,538	13,248	54,705	82,365	144,675	198,271
Wind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	2,371	2,371	12,565	39,857	82,678	138,608	187,741
Wind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0
Biomass power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu power plant (GWh)	0	0	0	8.06	7,781	8,528	8,529
Biomass w/ccu allam power plant (GWh)	0	0	0	33.7	33.7	33.7	47

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	1	6	7	8
Number of facilities - Allam power w ccu (quantity)	0	0	0	1	1	1	2
Number of facilities - Beccs hydrogen (quantity)	0	0	0	1	6	14	16
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	1	1	1	1
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	1	1	1	2
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	408	13,059	7,815	2,416
Biomass purchases (million \$2018/y)		0	0	18.6	628	1,015	1,134

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	0.55	18.4	25.9	31.9
Annual - BECCS (MMT)		0	0	0.47	16.5	25.8	28.8
Annual - NGCC (MMT)		0	0	0.08	1.93	0.05	3.05
Annual - Cement and lime (MMT)		0	0	0	0	0	0
Cumulative - All (MMT)		0	0	0.55	19	44.8	76.7
Cumulative - BECCS (MMT)		0	0	0.47	17	42.8	71.6
Cumulative - NGCC (MMT)		0	0	0.08	2.01	2.06	5.11
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	570	906	906	906	906
Spur (km)		0	0	376	1,159	2,199	2,645

Table 13: E+ scenario - PILLAR 4: CCUS - CO2 pipelines (continued)

Item	2020	2025	2030	2035	2040	2045	2050
All (km)		0	570	1,282	2,064	3,105	3,550
Cumulative investment - Trunk (million \$2018)		0	2,891	4,819	4,819	4,819	4,819
Cumulative investment - Spur (million \$2018)		0	0	206	978	1,906	2,226
Cumulative investment - All (million \$2018)		0	2,891	5,025	5,797	6,725	7,046

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual (MMT)		0	0	5.28	7.23	12.1	16.8
Injection wells (wells)		0	4	18	30	52	66
Resource characterization, appraisal, permitting costs (million \$2020)		101	277	379	379	379	379
Wells and facilities construction costs (million \$2020)		0	135	528	941	1,573	1,953

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)							-391
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-461
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-4,610
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-3,281
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-8,490
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-350
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-944
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-429
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,996
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-20,952
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-586
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,612
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-8,306
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-4,808
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-16,980
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-675
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-1,415
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-3,047
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-3,959

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-41,389
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-781
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-2,764
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-12,001
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-6,449
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-25,469
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,000
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-1,887
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-5,666
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-61,940
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-5,922
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							63.9
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							351
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,345
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							1,188
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)							50
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							62.4
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							27.9
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,188
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							5,276
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							95.8
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							363
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							4,232
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							1,788

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 - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							72.5
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							93.6
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							202
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,392
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							9,239
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							128
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							374
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							6,120
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							2,376
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)							95
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							125
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							161
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,963
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							11,342

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 tCO ₂ e/y)							-66
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO ₂ e/y)							-1,975
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO ₂ e/y)							-33.9
Carbon sink potential - Moderate deployment - Total (1000 tCO ₂ e/y)							-2,075

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-66
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-3,806
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-67.7
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-3,940
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							38.6
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							835
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							61.6
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							935
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							38.6
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							1,609
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							123
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							1,771

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)		51.7	0.095	0.086	0.06	0.04	0.003
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		34.8	23.7	9.91	3.38	1.04	0.593
Premature deaths from air pollution - Mobile - On-Road (deaths)		395	415	418	389	319	225
Premature deaths from air pollution - Gas Stations (deaths)		37.5	39.3	39.2	36.2	29.6	20.9
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		45	43	39.6	33.4	25.1	16.8
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		1.48	1.43	1.39	1.24	0.97	0.673
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		4.48	4.63	4.71	4.42	3.63	2.69
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		2.78	2.73	2.65	2.56	2.46	2.34
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		23.1	23.8	23.5	21.1	17	12.5

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		2.15	2.04	1.93	1.74	1.51	1.26
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		2.17	2.06	1.93	1.78	1.61	1.43
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.56	0.971	0.997	1.01	1.04	1.03
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		47	43.7	38.7	34.6	31.2	22.4
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		458	0.84	0.762	0.536	0.353	0.029
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		308	210	87.8	29.9	9.22	5.25
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		3,513	3,692	3,720	3,460	2,838	1,999
Monetary damages from air pollution - Gas Stations (million \$2019)		332	348	347	321	262	185
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		399	381	351	296	223	149
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		13.1	12.7	12.3	11	8.6	5.96
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		39.7	41.1	41.8	39.1	32.1	23.9
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		24.6	24.1	23.5	22.7	21.8	20.7
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		205	210	208	187	150	111
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		19	18.1	17.1	15.4	13.4	11.2
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		19.2	18.2	17.1	15.7	14.2	12.7
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		13.8	8.56	8.8	8.95	9.2	9.11
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		417	388	344	307	277	199

Table 18: E- scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		586	694	484	2,352	2,297	1,469
By economic sector - Construction (jobs)		7,984	13,887	22,771	23,361	39,803	40,985
By economic sector - Manufacturing (jobs)		5,405	8,245	7,384	8,409	12,220	11,033
By economic sector - Mining (jobs)		3,190	2,385	1,871	1,378	1,101	678
By economic sector - Other (jobs)		594	1,633	3,827	4,144	8,768	9,532
By economic sector - Pipeline (jobs)		737	1,144	977	587	674	678
By economic sector - Professional (jobs)		4,631	5,601	9,124	13,138	20,480	19,831

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Trade (jobs)		3,379	4,035	6,437	7,692	13,007	13,392
By economic sector - Utilities (jobs)		12,001	14,001	17,875	20,165	28,301	31,165
By resource sector - Biomass (jobs)		1,927	1,782	1,389	9,692	9,784	6,093
By resource sector - CO2 (jobs)		56.5	4,583	4,334	1,803	3,392	4,206
By resource sector - Coal (jobs)		1,550	113	0	0	0	0
By resource sector - Grid (jobs)		12,431	14,541	22,713	30,210	47,228	54,773
By resource sector - Natural Gas (jobs)		7,320	5,962	5,844	5,279	4,089	2,859
By resource sector - Nuclear (jobs)		3,150	3,100	3,051	3,003	2,622	2,108
By resource sector - Oil (jobs)		7,285	6,041	5,021	3,946	2,904	1,625
By resource sector - Solar (jobs)		4,761	15,129	28,154	26,509	53,877	54,994
By resource sector - Wind (jobs)		26.4	375	245	784	2,755	2,104
By education level - All sectors - High school diploma or less (jobs)		16,000	22,149	30,386	34,945	54,432	55,200
By education level - All sectors - Associates degree or some college (jobs)		11,856	16,283	22,640	25,295	40,194	41,425
By education level - All sectors - Bachelors degree (jobs)		8,347	10,383	13,833	16,235	24,757	24,867
By education level - All sectors - Masters or professional degree (jobs)		2,027	2,475	3,400	4,119	6,298	6,327
By education level - All sectors - Doctoral degree (jobs)		278	336	491	632	970	943
Related work experience - All sectors - None (jobs)		5,554	7,525	10,368	11,942	18,652	19,026
Related work experience - All sectors - Up to 1 year (jobs)		7,520	10,409	14,400	16,879	26,361	26,531
Related work experience - All sectors - 1 to 4 years (jobs)		13,996	18,508	25,283	29,025	45,167	45,989
Related work experience - All sectors - 4 to 10 years (jobs)		9,013	11,987	16,429	18,564	29,004	29,620
Related work experience - All sectors - Over 10 years (jobs)		2,425	3,197	4,268	4,817	7,467	7,598
On-the-Job Training - All sectors - None (jobs)		2,097	2,790	3,890	4,497	7,066	7,125
On-the-Job Training - All sectors - Up to 1 year (jobs)		25,596	33,909	45,881	53,619	82,877	83,732
On-the-Job Training - All sectors - 1 to 4 years (jobs)		7,997	10,940	15,196	16,819	26,598	27,426
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,459	3,473	5,083	5,536	8,907	9,271
On-the-Job Training - All sectors - Over 10 years (jobs)		358	514	701	755	1,203	1,208
On-Site or In-Plant Training - All sectors - None (jobs)		6,204	8,345	11,472	13,271	20,737	20,932
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		23,216	30,808	41,790	48,583	75,243	76,196
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		6,210	8,487	11,760	13,087	20,664	21,267
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,558	3,542	5,102	5,586	8,897	9,217
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		319	444	626	699	1,109	1,150
Wage income - All (million \$2019)		2,036	2,676	3,669	4,287	6,682	6,883

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	1,059	999	916	848	794	730	654
Final energy use - Residential (PJ)	362	345	337	326	309	288	268
Final energy use - Commercial (PJ)	252	254	251	248	242	237	235
Final energy use - Industry (PJ)	420	427	430	431	435	436	439

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)		5.72	5.83	7.6	7.92	9.61	10.1

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	149	350	551	1,481	2,411	4,469	6,527
Vehicle stocks - LDV – All others (1000 units)	8,532	8,532	8,532	8,093	7,654	5,898	4,142
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		0	274	545	1,871	5,792	8,472
Public EV charging plugs - DC Fast (1000 units)	0.376		1.11		4.86		13.2
Public EV charging plugs - L2 (1000 units)	2.43		26.7		117		316

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 (%)	25.4	38	42.2	54.2	72.4	84.2	88.3
Sales of space heating units - Electric Resistance (%)	18.4	21.9	20.5	16.6	10.8	7.24	5.98
Sales of space heating units - Gas (%)	51.8	33.9	31.4	24.5	13.8	6.68	4.21
Sales of space heating units - Fossil (%)	4.42	6.22	5.88	4.75	3	1.86	1.47
Sales of water heating units - Electric Heat Pump (%)	0	1.99	7.66	24	49	65.3	70.9
Sales of water heating units - Electric Resistance (%)	47.2	62.3	59.3	50.6	37.5	28.9	26
Sales of water heating units - Gas Furnace (%)	50	33.6	30.9	23.3	11.4	3.65	0.952
Sales of water heating units - Other (%)	2.84	2.09	2.1	2.12	2.13	2.14	2.15
Sales of cooking units - Electric Resistance (%)	66.8	67.7	70.7	78.7	89.9	96.7	99.1
Sales of cooking units - Gas (%)	33.2	32.3	29.3	21.3	10.1	3.27	0.881
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		7.98	8.75				

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 (%)	7.3	19.2	24.1	38.5	61	76.9	83
Sales of space heating units - Electric Resistance (%)	6.68	7.92	8.16	8.87	10.2	11.6	12.4
Sales of space heating units - Gas Furnace (%)	86	68.4	63.6	49.6	27.2	11	4.45
Sales of space heating units - Fossil (%)	0	4.46	4.13	3.1	1.52	0.487	0.128
Sales of water heating units - Electric Heat Pump (%)	0.221	2.04	7.05	21.5	43.6	58	63
Sales of water heating units - Electric Resistance (%)	5.5	7.53	9.45	15.2	24	29.8	31.8
Sales of water heating units - Gas Furnace (%)	92.1	86.3	79.4	59.6	29.1	9.31	2.42
Sales of water heating units - Other (%)	2.13	4.12	4.13	3.73	3.23	2.87	2.75
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)		34,927	38,922				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	9,817	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	16,847	16,448	16,209	13,020	10,571	8,599	6,080
Installed thermal - Nuclear (MW)	6,242	6,242	6,242	6,242	6,242	4,520	4,520

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)							-391
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-461
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-4,610
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-3,281
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-8,490
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-350
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-944
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-429
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,996
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-20,952
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-586
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,612
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-8,306
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-4,808
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-16,980
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-675
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-1,415
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-3,047
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-3,959
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-41,389
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-781
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-2,764
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-12,001
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-6,449
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-25,469

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,000
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-1,887
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-5,666
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-61,940
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-5,922
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							63.9
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							351
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,345
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							1,188
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)							50
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							62.4
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							27.9
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,188
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							5,276
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							95.8
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							363
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							4,232
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							1,788
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)							72.5
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							93.6
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							202

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 - Restore productivity (1000 hectares)							2,392
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							9,239
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							128
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							374
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							6,120
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							2,376
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)							95
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							125
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							161
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,963
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							11,342

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)							-66
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,975
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-33.9
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-2,075
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-66
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-3,806
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-67.7
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-3,940

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							38.6
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							835
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							61.6
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							935
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							38.6
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							1,609
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							123
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							1,771

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)		51.7	0.095	0.086	0.06	0.04	0.003
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		37.1	31.4	15.5	9.18	2.11	0.755
Premature deaths from air pollution - Mobile - On-Road (deaths)		388	375	295	176	82.2	32.5
Premature deaths from air pollution - Gas Stations (deaths)		36.7	35	27.2	16.5	8.04	3.66
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		44.5	37	24.8	13.9	7.13	4
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		1.45	1.21	0.858	0.532	0.271	0.128
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		4.42	4.04	3.18	2.18	1.27	0.712
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		2.78	2.73	2.65	2.56	2.46	2.34
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		22.9	20.5	15.1	9.47	6.01	4.39
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		2.14	1.86	1.51	1.15	0.832	0.559
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		2.17	1.92	1.64	1.34	1.03	0.702
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.71	0.969	0.99	1	1.04	1

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		46.3	44.7	39.5	29.1	18.1	2.68
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		458	0.84	0.762	0.536	0.353	0.029
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		329	278	138	81.3	18.7	6.69
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		3,449	3,336	2,621	1,565	731	289
Monetary damages from air pollution - Gas Stations (million \$2019)		325	310	241	146	71.2	32.4
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		395	327	219	123	63.2	35.4
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		12.9	10.7	7.61	4.71	2.41	1.13
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		39.2	35.8	28.2	19.3	11.3	6.31
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		24.6	24.1	23.5	22.7	21.8	20.7
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		203	182	133	83.9	53.2	38.8
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		19	16.4	13.4	10.2	7.36	4.95
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		19.2	17	14.6	11.9	9.08	6.22
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		15.1	8.55	8.73	8.84	9.19	8.87
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		411	397	350	258	161	23.8

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		520	859	488	1,339	1,456	1,461
By economic sector - Construction (jobs)		9,278	14,400	38,803	45,822	44,252	55,047
By economic sector - Manufacturing (jobs)		6,439	8,450	12,699	11,599	11,687	19,200
By economic sector - Mining (jobs)		3,049	2,111	1,239	615	220	40.7
By economic sector - Other (jobs)		764	1,964	7,811	9,895	10,079	12,163
By economic sector - Pipeline (jobs)		715	591	407	250	125	57.4
By economic sector - Professional (jobs)		5,080	6,760	15,816	20,563	20,935	26,006
By economic sector - Trade (jobs)		3,573	4,472	10,802	13,486	13,756	17,319
By economic sector - Utilities (jobs)		13,582	14,414	23,196	30,071	31,556	46,455
By resource sector - Biomass (jobs)		1,706	2,312	1,222	4,273	5,419	6,465
By resource sector - CO2 (jobs)		0	0	0	0	0.001	0
By resource sector - Coal (jobs)		1,328	0	0	0	0	0
By resource sector - Grid (jobs)		15,183	18,972	38,704	52,754	59,164	91,724
By resource sector - Natural Gas (jobs)		7,871	6,844	4,869	5,477	3,180	3,729
By resource sector - Nuclear (jobs)		3,150	3,100	2,705	2,175	1,690	605
By resource sector - Oil (jobs)		7,192	5,486	3,606	1,945	689	0.253

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

Item	2020	2025	2030	2035	2040	2045	2050
By resource sector - Solar (jobs)		6,548	16,823	58,936	64,608	60,238	72,975
By resource sector - Wind (jobs)		23.1	485	1,220	2,407	3,687	2,251
By education level - All sectors - High school diploma or less (jobs)		17,905	23,104	48,121	57,615	57,660	76,386
By education level - All sectors - Associates degree or some college (jobs)		13,382	16,940	35,772	43,007	43,179	57,611
By education level - All sectors - Bachelors degree (jobs)		9,187	10,946	21,295	25,561	25,701	33,967
By education level - All sectors - Masters or professional degree (jobs)		2,225	2,659	5,280	6,474	6,544	8,562
By education level - All sectors - Doctoral degree (jobs)		301	373	793	983	984	1,222
Related work experience - All sectors - None (jobs)		6,211	7,844	16,261	19,663	19,768	26,240
Related work experience - All sectors - Up to 1 year (jobs)		8,407	10,980	23,162	27,732	27,770	36,523
Related work experience - All sectors - 1 to 4 years (jobs)		15,592	19,380	39,554	47,613	47,819	63,460
Related work experience - All sectors - 4 to 10 years (jobs)		10,079	12,485	25,637	30,756	30,813	40,936
Related work experience - All sectors - Over 10 years (jobs)		2,712	3,332	6,647	7,875	7,898	10,590
On-the-Job Training - All sectors - None (jobs)		2,323	2,940	6,204	7,424	7,422	9,655
On-the-Job Training - All sectors - Up to 1 year (jobs)		28,482	35,639	72,120	86,599	87,074	115,636
On-the-Job Training - All sectors - 1 to 4 years (jobs)		9,009	11,334	23,813	28,585	28,602	38,075
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,784	3,581	7,997	9,734	9,697	12,729
On-the-Job Training - All sectors - Over 10 years (jobs)		404	528	1,127	1,298	1,272	1,654
On-Site or In-Plant Training - All sectors - None (jobs)		6,920	8,766	18,209	21,831	21,839	28,671
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		25,851	32,340	65,646	78,810	79,235	105,305
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		6,987	8,809	18,466	22,152	22,180	29,530
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,880	3,647	7,958	9,656	9,616	12,634
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		363	460	981	1,190	1,197	1,608
Wage income - All (million \$2019)		2,260	2,799	5,663	6,914	7,037	9,469

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	1,057	990	878	740	614	535	499
Final energy use - Residential (PJ)	362	344	319	286	259	244	240
Final energy use - Commercial (PJ)	252	253	245	233	223	221	224
Final energy use - Industry (PJ)	420	427	428	425	426	427	431

Table 30: E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion \$2018)		7.03	7.31	10.9	11.6	9.14	9.44

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	193	878	1,563	3,961	6,359	8,275	10,191
Vehicle stocks - LDV – All others (1000 units)	8,497	8,091	7,685	5,600	3,516	1,989	462
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		1,609	4,204	6,681	10,172	11,015	10,532
Public EV charging plugs - DC Fast (1000 units)	0.376		3.15		12.8		20.6
Public EV charging plugs - L2 (1000 units)	2.43		75.7		308		494

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 (%)	25.4	45	81.3	89.4	89.8	89.7	89.7
Sales of space heating units - Electric Resistance (%)	18.4	19.7	8.27	5.67	5.52	5.61	5.63
Sales of space heating units - Gas (%)	51.8	29.7	8.3	3.54	3.35	3.36	3.35
Sales of space heating units - Fossil (%)	4.42	5.56	2.13	1.36	1.33	1.31	1.31
Sales of water heating units - Electric Heat Pump (%)	0	11.6	61.4	72.5	73	72.9	72.9
Sales of water heating units - Electric Resistance (%)	47.2	57.2	31	25.2	24.9	24.9	24.9
Sales of water heating units - Gas Furnace (%)	50	29.1	5.49	0.232	0	0	0
Sales of water heating units - Other (%)	2.84	2.09	2.1	2.11	2.12	2.14	2.15
Sales of cooking units - Electric Resistance (%)	66.9	74	95.5	99.8	100	100	100
Sales of cooking units - Gas (%)	33.1	26	4.45	0.224	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		8.06	8.87				

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 (%)	7.3	27.4	70.6	84	85.3	85.4	85.4
Sales of space heating units - Electric Resistance (%)	6.68	8.23	10.2	12.3	12.7	12.7	12.7
Sales of space heating units - Gas Furnace (%)	86	60.5	18.4	3.67	2	1.95	1.94
Sales of space heating units - Fossil (%)	0	3.85	0.732	0.031	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.221	10.5	54.6	64.4	64.8	64.8	64.8
Sales of water heating units - Electric Resistance (%)	5.5	10.9	28.4	32.3	32.5	32.5	32.5
Sales of water heating units - Gas Furnace (%)	92.1	74.6	14.1	0.594	0	0	0
Sales of water heating units - Other (%)	2.13	3.93	2.95	2.7	2.71	2.7	2.7
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)		34,949	38,935				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	9,817	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	16,847	20,418	21,484	18,855	9,757	8,130	15,585
Installed thermal - Nuclear (MW)	6,242	6,242	6,242	4,520	4,520	2,200	0

Table 34: E+RE+ scenario - PILLAR 2: Clean Electricity - Generating capacity (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Installed renewables - Rooftop PV (MW)	381	614	869	1,237	1,756	2,428	3,288
Installed renewables - Solar - Base land use assumptions (MW)	1,091	1,725	8,604	48,130	85,743	111,876	145,494
Installed renewables - Offshore Wind - Base land use assumptions (MW)	0	0	0	0	0	145	14,875
Installed renewables - Solar - Constrained land use assumptions (MW)	1,092	2,736	17,775	50,967	86,438	121,621	155,268
Installed renewables - Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	14,499
Capital invested - Solar PV - Base (billion \$2018)		0.849	8.24	44	39.1	25.6	31.1
Capital invested - Offshore Wind - Base (billion \$2018)		0	0	0	0	0.214	18.5

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	2,538	3,787	17,297	95,627	169,536	220,970	287,120
Wind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	514	52,926
Solar - Constrained land use assumptions (GWh)	5,076	11,571	70,639	200,934	340,126	478,238	610,957
Wind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	103,114

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)							-391
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-461
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-4,610
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-3,281
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-8,490
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-350
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-944
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-429
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,996
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-20,952
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-586
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,612
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-8,306

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-4,808
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-16,980
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-675
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-1,415
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-3,047
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-3,959
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-41,389
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-781
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-2,764
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-12,001
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-6,449
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-25,469
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,000
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-1,887
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-5,666
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-61,940
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-5,922
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							63.9
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							351
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,345
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							1,188
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)							50
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							62.4
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							27.9
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,188

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 - Total impacted (over 30 years) (1000 hectares)							5,276
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							95.8
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							363
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							4,232
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							1,788
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)							72.5
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							93.6
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							202
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,392
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							9,239
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							128
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							374
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							6,120
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							2,376
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)							95
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							125
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							161
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,963
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							11,342

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)							-66
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,975
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-33.9
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-2,075
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-66
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-3,806
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-67.7
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-3,940
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							38.6
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							835
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							61.6
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							935
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							38.6
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							1,609
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							123
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							1,771

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)		51.7	0.095	0.086	0.06	0.04	0.003
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		35.5	33.1	34.3	27	9.2	2.83
Premature deaths from air pollution - Mobile - On-Road (deaths)		388	375	295	176	82.2	32.5
Premature deaths from air pollution - Gas Stations (deaths)		36.7	35	27.2	16.5	8.04	3.66

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		44.5	37	24.8	13.9	7.13	4
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		1.45	1.21	0.858	0.532	0.271	0.128
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		4.42	4.04	3.18	2.18	1.27	0.712
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		2.78	2.73	2.65	2.56	2.46	2.34
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		22.9	20.5	15.1	9.47	6.01	4.39
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		2.14	1.86	1.51	1.15	0.832	0.559
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		2.17	1.92	1.64	1.34	1.03	0.702
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.5	0.968	0.99	1	1.04	1
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		47.7	47.4	47.7	41.5	35.5	27
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		458	0.84	0.762	0.536	0.353	0.029
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		315	293	303	240	81.5	25.1
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		3,449	3,336	2,621	1,565	731	289
Monetary damages from air pollution - Gas Stations (million \$2019)		325	310	241	146	71.2	32.4
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		395	327	219	123	63.2	35.4
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		12.9	10.7	7.61	4.71	2.41	1.13
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		39.2	35.8	28.2	19.3	11.3	6.31
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		24.6	24.1	23.5	22.7	21.8	20.7
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		203	182	133	83.9	53.2	38.8
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		19	16.4	13.4	10.2	7.36	4.95
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		19.2	17	14.6	11.9	9.08	6.22
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		13.2	8.54	8.74	8.85	9.2	8.86

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		424	421	423	369	315	240

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		563	718	470	1,952	1,888	1,473
By economic sector - Construction (jobs)		8,452	10,963	14,060	16,945	21,535	19,384
By economic sector - Manufacturing (jobs)		4,705	4,836	4,522	5,206	5,469	4,783
By economic sector - Mining (jobs)		3,190	2,392	1,765	1,191	945	646
By economic sector - Other (jobs)		651	799	1,520	2,343	3,685	2,872
By economic sector - Pipeline (jobs)		752	1,257	1,113	669	751	793
By economic sector - Professional (jobs)		4,696	4,615	5,523	9,468	11,504	11,130
By economic sector - Trade (jobs)		3,408	3,231	3,736	5,196	6,607	5,937
By economic sector - Utilities (jobs)		12,466	15,515	17,036	19,834	21,938	31,631
By resource sector - Biomass (jobs)		1,734	1,782	1,373	7,147	7,399	6,156
By resource sector - CO2 (jobs)		57.2	5,182	4,905	2,030	3,822	4,748
By resource sector - Coal (jobs)		1,550	318	301	286	273	105
By resource sector - Grid (jobs)		13,287	14,321	20,018	26,767	30,447	31,406
By resource sector - Natural Gas (jobs)		7,491	8,821	6,850	8,256	7,691	6,517
By resource sector - Nuclear (jobs)		3,150	3,100	3,051	3,003	2,622	15,054
By resource sector - Oil (jobs)		7,188	5,570	3,788	2,362	1,447	909
By resource sector - Solar (jobs)		4,314	5,093	9,445	12,915	20,512	13,710
By resource sector - Wind (jobs)		110	140	13.6	40.4	108	45.8
By education level - All sectors - High school diploma or less (jobs)		16,157	18,759	21,184	26,845	31,756	32,560
By education level - All sectors - Associates degree or some college (jobs)		12,016	14,069	15,976	19,714	23,579	24,578
By education level - All sectors - Bachelors degree (jobs)		8,382	9,031	9,854	12,559	14,663	16,608
By education level - All sectors - Masters or professional degree (jobs)		2,047	2,182	2,412	3,194	3,747	4,281
By education level - All sectors - Doctoral degree (jobs)		281	284	319	466	555	623
Related work experience - All sectors - None (jobs)		5,620	6,519	7,328	9,278	11,002	11,407
Related work experience - All sectors - Up to 1 year (jobs)		7,566	8,623	9,795	12,732	15,119	15,616
Related work experience - All sectors - 1 to 4 years (jobs)		14,140	16,014	17,892	22,531	26,615	28,379
Related work experience - All sectors - 4 to 10 years (jobs)		9,120	10,429	11,685	14,491	17,163	18,377
Related work experience - All sectors - Over 10 years (jobs)		2,437	2,740	3,047	3,746	4,401	4,873
On-the-Job Training - All sectors - None (jobs)		2,113	2,335	2,634	3,376	4,029	4,363
On-the-Job Training - All sectors - Up to 1 year (jobs)		25,738	28,915	32,203	41,224	48,518	51,531
On-the-Job Training - All sectors - 1 to 4 years (jobs)		8,132	9,551	10,828	13,220	15,758	16,633
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,542	3,112	3,614	4,398	5,321	5,407
On-the-Job Training - All sectors - Over 10 years (jobs)		359	413	466	560	672	718
On-Site or In-Plant Training - All sectors - None (jobs)		6,247	7,055	7,906	10,126	12,020	12,807
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		23,370	26,331	29,391	37,419	44,085	46,857

Table 39: E+RE- 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)		6,306	7,368	8,348	10,240	12,194	12,823
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,634	3,177	3,650	4,439	5,336	5,498
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		326	394	451	555	664	666
Wage income - All (million \$2019)		2,058	2,351	2,642	3,368	4,004	4,488

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	1,057	990	878	740	614	535	499
Final energy use - Residential (PJ)	362	344	319	286	259	244	240
Final energy use - Commercial (PJ)	252	253	245	233	223	221	224
Final energy use - Industry (PJ)	420	427	428	425	426	427	431

Table 41: E+RE- scenario - PILLAR 1: Efficiency/Electrification - Electricity demand

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion \$2018)		7.03	7.31	10.9	11.6	9.14	9.44

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	193	878	1,563	3,961	6,359	8,275	10,191
Vehicle stocks - LDV – All others (1000 units)	8,497	8,091	7,685	5,600	3,516	1,989	462
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		1,609	4,204	6,681	10,172	11,015	10,532
Public EV charging plugs - DC Fast (1000 units)	0.376		3.15		12.8		20.6
Public EV charging plugs - L2 (1000 units)	2.43		75.7		308		494

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 (%)	25.4	45	81.3	89.4	89.8	89.7	89.7
Sales of space heating units - Electric Resistance (%)	18.4	19.7	8.27	5.67	5.52	5.61	5.63
Sales of space heating units - Gas (%)	51.8	29.7	8.3	3.54	3.35	3.36	3.35
Sales of space heating units - Fossil (%)	4.42	5.56	2.13	1.36	1.33	1.31	1.31
Sales of water heating units - Electric Heat Pump (%)	0	11.6	61.4	72.5	73	72.9	72.9
Sales of water heating units - Electric Resistance (%)	47.2	57.2	31	25.2	24.9	24.9	24.9
Sales of water heating units - Gas Furnace (%)	50	29.1	5.49	0.232	0	0	0
Sales of water heating units - Other (%)	2.84	2.09	2.1	2.11	2.12	2.14	2.15
Sales of cooking units - Electric Resistance (%)	66.9	74	95.5	99.8	100	100	100
Sales of cooking units - Gas (%)	33.1	26	4.45	0.224	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		8.06	8.87				

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 (%)	7.3	27.4	70.6	84	85.3	85.4	85.4
Sales of space heating units - Electric Resistance (%)	6.68	8.23	10.2	12.3	12.7	12.7	12.7
Sales of space heating units - Gas Furnace (%)	86	60.5	18.4	3.67	2	1.95	1.94
Sales of space heating units - Fossil (%)	0	3.85	0.732	0.031	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.221	10.5	54.6	64.4	64.8	64.8	64.8
Sales of water heating units - Electric Resistance (%)	5.5	10.9	28.4	32.3	32.5	32.5	32.5
Sales of water heating units - Gas Furnace (%)	92.1	74.6	14.1	0.594	0	0	0
Sales of water heating units - Other (%)	2.13	3.93	2.95	2.7	2.71	2.7	2.7
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)		34,949	38,935				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	9,817	850	850	850	850	850	0
Installed thermal - Natural gas (MW)	16,646	15,954	17,543	20,454	23,657	27,087	27,732
Installed thermal - Nuclear (MW)	6,242	6,242	6,242	6,242	6,242	4,520	10,219
Installed renewables - Rooftop PV (MW)	381	614	869	1,237	1,756	2,428	3,288
Installed renewables - Solar - Base land use assumptions (MW)	1,091	1,533	2,388	6,587	14,619	29,933	31,192
Installed renewables - Solar - Constrained land use assumptions (MW)	1,092	1,092	1,092	8,102	17,419	29,506	30,160
Installed renewables - Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion \$2018)		0.592	1.02	4.63	8.35	15	1.17
Capital invested - Solar PV - Constrained (billion \$2018)		0	0	7.72	9.68	11.9	0.605

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	2,538	3,410	5,100	13,337	29,100	59,194	61,675
Wind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	2,538	2,538	2,538	16,270	34,550	58,217	59,496
Wind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-391

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-461
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-4,610
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-3,281
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-8,490
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-350
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-944
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-429
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,996
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-20,952
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-586
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,612
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-8,306
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-4,808
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-16,980
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-675
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-1,415
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-3,047
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-3,959
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-41,389
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-781
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-2,764
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-12,001
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-6,449
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-25,469
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,000
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-1,887
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-5,666
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-61,940
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-5,922
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							63.9

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 - Low - Avoid deforestation (over 30 years) (1000 hectares)							351
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,345
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							1,188
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)							50
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							62.4
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							279
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,188
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							5,276
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							95.8
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							363
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							4,232
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							1,788
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)							72.5
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							93.6
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							202
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,392
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							9,239
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							128
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							374
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							6,120

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 - High - Improve plantations (1000 hectares)							2,376
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)							95
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							125
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							161
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,963
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							11,342

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)							-66
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,975
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-33.9
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-2,075
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-66
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-3,806
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-67.7
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-3,940
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							38.6
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							835
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							61.6
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							935
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							38.6

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							1,609
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							123
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							1,771

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)		51.7	0.095	0.086	0.06	0.04	0.003
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		39.8	24.3	11	6.66	3.37	1.38
Premature deaths from air pollution - Mobile - On-Road (deaths)		395	415	418	389	319	225
Premature deaths from air pollution - Gas Stations (deaths)		37.5	39.3	39.2	36.2	29.6	20.9
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		45	43	39.6	33.4	25.1	16.8
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		1.48	1.43	1.39	1.24	0.97	0.673
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		4.48	4.63	4.71	4.42	3.63	2.69
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		2.78	2.73	2.65	2.56	2.46	2.34
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		23.1	23.8	23.5	21.1	17	12.5
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		2.15	2.04	1.93	1.74	1.51	1.26
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		2.17	2.06	1.93	1.78	1.61	1.43
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.6	0.97	0.997	1.01	1.05	1.06
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		47	43.7	38.7	34.6	31.2	22.4
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		458	0.84	0.762	0.536	0.353	0.029
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		352	215	97.2	59	29.9	12.2
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		3,513	3,692	3,720	3,460	2,838	1,999
Monetary damages from air pollution - Gas Stations (million \$2019)		332	348	347	321	262	185
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		399	381	351	296	223	149

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		13.1	12.7	12.3	11	8.6	5.96
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		39.7	41.1	41.8	39.1	32.1	23.9
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		24.6	24.1	23.5	22.7	21.8	20.7
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		205	210	208	187	150	111
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		19	18.1	17.1	15.4	13.4	11.2
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		19.2	18.2	17.1	15.7	14.2	12.7
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		14.1	8.56	8.8	8.95	9.3	9.37
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		417	388	344	307	277	199

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		554	694	1,403	1,512	1,783	1,615
By economic sector - Construction (jobs)		8,279	13,878	21,567	18,981	29,312	36,114
By economic sector - Manufacturing (jobs)		5,437	8,202	7,150	6,262	8,693	9,771
By economic sector - Mining (jobs)		3,132	2,380	1,881	1,450	1,115	640
By economic sector - Other (jobs)		617	1,623	3,435	3,239	6,107	8,486
By economic sector - Pipeline (jobs)		730	1,157	996	606	676	674
By economic sector - Professional (jobs)		4,754	5,618	9,668	10,066	15,417	18,461
By economic sector - Trade (jobs)		3,401	4,043	6,274	6,218	9,656	12,133
By economic sector - Utilities (jobs)		12,606	14,203	17,824	17,265	22,674	27,005
By resource sector - Biomass (jobs)		1,869	1,782	4,521	6,146	8,244	7,652
By resource sector - CO2 (jobs)		56.6	4,694	4,441	1,865	3,493	4,292
By resource sector - Coal (jobs)		1,328	0	0	0	0	0
By resource sector - Grid (jobs)		13,339	14,078	23,499	24,686	36,047	45,739
By resource sector - Natural Gas (jobs)		7,738	6,771	4,914	5,038	3,539	2,372
By resource sector - Nuclear (jobs)		3,150	3,100	3,051	3,003	2,790	2,511
By resource sector - Oil (jobs)		7,286	6,041	5,021	4,172	2,930	1,493
By resource sector - Solar (jobs)		4,716	14,944	24,539	20,282	36,770	49,459
By resource sector - Wind (jobs)		27.5	387	212	408	1,621	1,381
By education level - All sectors - High school diploma or less (jobs)		16,390	22,193	30,319	28,107	40,895	49,159
By education level - All sectors - Associates degree or some college (jobs)		12,214	16,359	22,128	20,521	30,172	36,733
By education level - All sectors - Bachelors degree (jobs)		8,545	10,424	13,817	13,150	18,834	22,408
By education level - All sectors - Masters or professional degree (jobs)		2,078	2,485	3,430	3,320	4,796	5,728
By education level - All sectors - Doctoral degree (jobs)		284	337	504	500	737	872
Related work experience - All sectors - None (jobs)		5,706	7,555	10,315	9,637	14,048	16,959

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

Item	2020	2025	2030	2035	2040	2045	2050
Related work experience - All sectors - Up to 1 year (jobs)		7,692	10,420	14,419	13,481	19,773	23,777
Related work experience - All sectors - 1 to 4 years (jobs)		14,358	18,574	25,094	23,489	34,073	41,010
Related work experience - All sectors - 4 to 10 years (jobs)		9,266	12,041	16,173	15,077	21,896	26,384
Related work experience - All sectors - Over 10 years (jobs)		2,490	3,208	4,198	3,914	5,644	6,771
On-the-Job Training - All sectors - None (jobs)		2,145	2,796	3,854	3,623	5,319	6,409
On-the-Job Training - All sectors - Up to 1 year (jobs)		26,210	33,999	45,887	43,133	62,507	74,938
On-the-Job Training - All sectors - 1 to 4 years (jobs)		8,242	10,992	14,846	13,702	20,014	24,285
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,548	3,496	4,934	4,528	6,696	8,189
On-the-Job Training - All sectors - Over 10 years (jobs)		367	515	677	611	897	1,079
On-Site or In-Plant Training - All sectors - None (jobs)		6,359	8,373	11,402	10,666	15,588	18,753
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		23,782	30,890	41,698	39,146	56,757	68,125
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		6,394	8,522	11,518	10,645	15,544	18,845
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,645	3,565	4,969	4,572	6,709	8,160
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		330	447	612	568	835	1,018
Wage income - All (million \$2019)		2,089	2,687	3,655	3,480	5,068	6,151

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	1,059	999	916	848	794	730	654
Final energy use - Residential (PJ)	362	345	337	326	309	288	268
Final energy use - Commercial (PJ)	252	254	251	248	242	237	235
Final energy use - Industry (PJ)	420	427	430	431	435	436	439

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)		5.72	5.83	7.6	7.92	9.61	10.1

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	149	350	551	1,481	2,411	4,469	6,527
Vehicle stocks - LDV – All others (1000 units)	8,532	8,532	8,532	8,093	7,654	5,898	4,142
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		0	274	545	1,871	5,792	8,472
Public EV charging plugs - DC Fast (1000 units)	0.376		1.11		4.86		13.2
Public EV charging plugs - L2 (1000 units)	2.43		26.7		117		316

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 (%)	25.4	38	42.2	54.2	72.4	84.2	88.3
Sales of space heating units - Electric Resistance (%)	18.4	21.9	20.5	16.6	10.8	7.24	5.98
Sales of space heating units - Gas (%)	51.8	33.9	31.4	24.5	13.8	6.68	4.21
Sales of space heating units - Fossil (%)	4.42	6.22	5.88	4.75	3	1.86	1.47
Sales of water heating units - Electric Heat Pump (%)	0	1.99	7.66	24	49	65.3	70.9
Sales of water heating units - Electric Resistance (%)	47.2	62.3	59.3	50.6	37.5	28.9	26
Sales of water heating units - Gas Furnace (%)	50	33.6	30.9	23.3	11.4	3.65	0.952
Sales of water heating units - Other (%)	2.84	2.09	2.1	2.12	2.13	2.14	2.15
Sales of cooking units - Electric Resistance (%)	66.8	67.7	70.7	78.7	89.9	96.7	99.1
Sales of cooking units - Gas (%)	33.2	32.3	29.3	21.3	10.1	3.27	0.881
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		7.98	8.75				

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 (%)	7.3	19.2	24.1	38.5	61	76.9	83
Sales of space heating units - Electric Resistance (%)	6.68	7.92	8.16	8.87	10.2	11.6	12.4
Sales of space heating units - Gas Furnace (%)	86	68.4	63.6	49.6	27.2	11	4.45
Sales of space heating units - Fossil (%)	0	4.46	4.13	3.1	1.52	0.487	0.128
Sales of water heating units - Electric Heat Pump (%)	0.221	2.04	7.05	21.5	43.6	58	63
Sales of water heating units - Electric Resistance (%)	5.5	7.53	9.45	15.2	24	29.8	31.8
Sales of water heating units - Gas Furnace (%)	92.1	86.3	79.4	59.6	29.1	9.31	2.42
Sales of water heating units - Other (%)	2.13	4.12	4.13	3.73	3.23	2.87	2.75
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)		34,927	38,922				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	1	1	1	1	1	1	1
Installed thermal - Natural gas (MW)	1	1	1	1	1	1	1
Installed thermal - Nuclear (MW)	1	1	1	1	1	1	1
Capital invested - Biomass power plant (billion \$2018)	1	1	1	1	1	1	1
Capital invested - Biomass w/ccu allam power plant (billion \$2018)	2	1	1	1	1	1	1
Capital invested - Biomass w/ccu power plant (billion \$2018)	1	1	1	1	1	1	1

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass power plant (GWh)	1	1	1	1	1	1	1
Biomass w/ccu power plant (GWh)	1	1	1	1	1	1	1

Table 57: E-B+ scenario - PILLAR 2: Clean Electricity - Generation (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Biomass w/ccu allam power plant (GWh)	2	1	1	1	1	1	1

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	18	30	30	30
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	9	10
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	18,864	12,338	8,109	678
Biomass purchases (million \$2018/y)		0	0	1,341	2,217	2,884	2,939

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	22.9	37.8	48.2	48.1
Annual - BECCS (MMT)		0	0	22.8	37.8	48.2	48.1
Annual - NGCC (MMT)		0	0	0.07	0.05	0.05	0.04
Annual - Cement and lime (MMT)		0	0	0	0	0	0
Cumulative - All (MMT)		0	0	22.9	60.7	109	157
Cumulative - BECCS (MMT)		0	0	22.8	60.6	109	157
Cumulative - NGCC (MMT)		0	0	0.07	0.12	0.17	0.21
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	570	906	906	906	906
Spur (km)		0	0	1,095	1,945	2,525	3,144
All (km)		0	570	2,000	2,851	3,430	4,050
Cumulative investment - Trunk (million \$2018)		0	2,891	4,819	5,012	5,012	5,012
Cumulative investment - Spur (million \$2018)		0	0	1,333	2,272	3,144	3,560
Cumulative investment - All (million \$2018)		0	2,891	6,153	7,284	8,156	8,572

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual (MMT)		0	0	6.42	11.9	15.8	16.7
Injection wells (wells)		0	4	18	32	54	68
Resource characterization, appraisal, permitting costs (million \$2020)		101	292	404	404	404	404
Wells and facilities construction costs (million \$2020)		0	141	548	976	1,633	2,027

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)							-391
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-461
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-4,610
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-3,281
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-8,490
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-350
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-944
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-429
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,996
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-20,952
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-586
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,612
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-8,306
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-4,808
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-16,980
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-675
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-1,415
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-3,047
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-3,959
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-41,389
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-781
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-2,764
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-12,001
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-6,449
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-25,469
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,000
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-1,887
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-5,666
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-61,940
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-5,922

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 - Low - Accelerate regeneration (1000 hectares)							63.9
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							351
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,345
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							1,188
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)							50
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							62.4
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							27.9
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,188
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							5,276
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							95.8
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							363
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							4,232
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							1,788
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)							72.5
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							93.6
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							202
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,392
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							9,239
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							128
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							374

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 - High - Extend rotation length (1000 hectares)							6,120
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							2,376
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)							95
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							125
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							161
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,963
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							11,342

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)							-306
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,784
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-29.3
Carbon sink potential - Moderate deployment - Cropland to woody energy crops (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Pasture to energy crops (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-2,120
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-306
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-3,445
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-58.6
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)							-3,810

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							191
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							757
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							53.3
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)							85.3
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)							147
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,233
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							191
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							3,605
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							107
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)							85.3
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)							147
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							4,135

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)		221	150	122	110	106	105
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		34.5	43	45.1	49.6	54.5	59.4
Premature deaths from air pollution - Mobile - On-Road (deaths)		394	420	445	473	500	528
Premature deaths from air pollution - Gas Stations (deaths)		37.4	39.6	41.7	44.1	46.3	48.5
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		43.8	41.2	38.7	37.6	38.4	39.6
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		1.44	1.26	0.96	0.682	0.47	0.348
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		4.22	4.23	4.33	4.51	4.73	4.94
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		2.91	2.98	3.05	3.1	3.13	3.15

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		23.2	23.2	22	20.5	20.3	21.4
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		2.22	2.31	2.35	2.34	2.34	2.38
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		2.26	2.44	2.62	2.8	2.97	3.15
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		2.81	2.17	1.91	1.88	1.89	1.85
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		47.3	51.4	54.1	53.2	54.2	52
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		1,960	1,332	1,081	978	936	927
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		306	381	400	439	483	526
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		3,505	3,734	3,959	4,203	4,447	4,695
Monetary damages from air pollution - Gas Stations (million \$2019)		331	351	369	390	410	430
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		388	365	343	333	340	351
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		12.8	11.2	8.51	6.05	4.17	3.09
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		37.4	37.5	38.3	40	41.9	43.8
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		25.7	26.4	27	27.4	27.7	27.9
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		205	205	194	182	180	190
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		19.7	20.4	20.8	20.7	20.7	21
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		20	21.6	23.2	24.8	26.3	27.9
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		24.8	19.1	16.9	16.6	16.7	16.3
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		420	456	481	472	481	462

Table 65: REF scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		536	502	498	444	443	464
By economic sector - Construction (jobs)		7,733	9,594	10,518	9,911	10,329	12,757
By economic sector - Manufacturing (jobs)		3,328	3,622	3,696	3,532	3,461	5,005
By economic sector - Mining (jobs)		3,382	2,725	2,215	1,664	1,414	1,198

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Other (jobs)		386	693	836	920	1,050	1,577
By economic sector - Pipeline (jobs)		750	772	778	735	745	741
By economic sector - Professional (jobs)		4,731	5,058	5,169	4,812	4,726	5,697
By economic sector - Trade (jobs)		3,527	3,586	3,537	3,191	3,207	3,894
By economic sector - Utilities (jobs)		14,056	15,094	15,906	14,414	14,020	16,400
By resource sector - Biomass (jobs)		1,758	1,663	1,565	1,437	1,450	1,458
By resource sector - CO2 (jobs)		0	0.028	0.036	0.039	0.043	0.046
By resource sector - Coal (jobs)		2,481	1,651	1,564	565	0	0
By resource sector - Grid (jobs)		15,918	17,837	19,873	15,471	16,363	20,624
By resource sector - Natural Gas (jobs)		7,755	8,806	8,551	10,295	9,686	10,332
By resource sector - Nuclear (jobs)		3,150	3,100	3,051	2,834	2,551	2,511
By resource sector - Oil (jobs)		7,323	6,167	5,372	4,962	4,732	4,573
By resource sector - Solar (jobs)			2,291	3,057	3,948	4,603	7,449
By resource sector - Wind (jobs)		44.7	132	119	113	11.4	786
By education level - All sectors - High school diploma or less (jobs)		15,836	17,359	18,109	16,572	16,623	20,251
By education level - All sectors - Associates degree or some college (jobs)		11,891	13,060	13,635	12,591	12,534	15,296
By education level - All sectors - Bachelors degree (jobs)		8,362	8,774	8,916	8,170	7,999	9,531
By education level - All sectors - Masters or professional degree (jobs)		2,062	2,163	2,201	2,019	1,975	2,344
By education level - All sectors - Doctoral degree (jobs)		278	291	293	272	265	312
Related work experience - All sectors - None (jobs)		5,569	6,066	6,310	5,814	5,796	7,034
Related work experience - All sectors - Up to 1 year (jobs)		7,338	8,032	8,357	7,651	7,666	9,373
Related work experience - All sectors - 1 to 4 years (jobs)		14,062	15,158	15,668	14,362	14,253	17,219
Related work experience - All sectors - 4 to 10 years (jobs)		9,062	9,809	10,155	9,352	9,263	11,183
Related work experience - All sectors - Over 10 years (jobs)		2,398	2,581	2,664	2,446	2,417	2,924
On-the-Job Training - All sectors - None (jobs)		2,062	2,218	2,279	2,097	2,081	2,516
On-the-Job Training - All sectors - Up to 1 year (jobs)		25,401	27,330	28,212	25,818	25,645	31,068
On-the-Job Training - All sectors - 1 to 4 years (jobs)		8,075	8,865	9,255	8,540	8,500	10,311
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,558	2,866	3,024	2,810	2,814	3,402
On-the-Job Training - All sectors - Over 10 years (jobs)		334	369	383	359	357	437
On-Site or In-Plant Training - All sectors - None (jobs)		6,099	6,600	6,815	6,290	6,233	7,562
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		23,102	24,890	25,718	23,528	23,385	28,328
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		6,252	6,853	7,150	6,586	6,562	7,967
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,651	2,941	3,087	2,865	2,860	3,443
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		326	363	382	355	355	432
Wage income - All (million \$2019)		2,059	2,235	2,336	2,170	2,176	2,645

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	1,058	1,005	938	900	906	935	973

Table 66: REF scenario - PILLAR 1: Efficiency/Electrification - Overview (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Residential (PJ)	362	345	342	342	347	357	368
Final energy use - Commercial (PJ)	252	257	260	262	266	276	290
Final energy use - Industry (PJ)	420	441	459	477	500	522	549

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)		7.5	7.83	10.5	11.1	9.45	9.79

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 (%)	23.1	53.2	54.3	56	57.1	58.3	60.1
Sales of space heating units - Electric Resistance (%)	19	17.4	17.2	16.5	15.9	14.8	12.9
Sales of space heating units - Gas (%)	53.4	25.6	24.8	23.8	23.3	23.2	23.3
Sales of space heating units - Fossil (%)	4.53	3.7	3.73	3.74	3.7	3.7	3.74
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	47.2	63.3	63.3	63.2	63.1	63	63
Sales of water heating units - Gas Furnace (%)	50	34.6	34.6	34.7	34.8	34.8	34.9
Sales of water heating units - Other (%)	2.84	2.09	2.1	2.12	2.13	2.15	2.16
Sales of cooking units - Electric Resistance (%)	66.5	66.5	66.5	66.5	66.5	66.5	66.5
Sales of cooking units - Gas (%)	33.5	33.5	33.5	33.5	33.5	33.5	33.5
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		7.85	7.66				

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 (%)	7.3	29.1	63.5	71.8	72.4	72.4	72.4
Sales of space heating units - Electric Resistance (%)	6.68	9.42	14.6	20.2	24.8	25.6	25.6
Sales of space heating units - Gas Furnace (%)	86	57.4	19.3	6.83	2.61	2	1.94
Sales of space heating units - Fossil (%)	0	4.09	2.54	1.21	0.181	0.016	0
Sales of water heating units - Electric Heat Pump (%)	0.221	0.279	0.274	0.275	0.276	0.274	0.275
Sales of water heating units - Electric Resistance (%)	5.5	6.83	6.74	6.75	6.78	6.74	6.75
Sales of water heating units - Gas Furnace (%)	92.1	88.7	88.7	88.7	88.7	88.7	88.7
Sales of water heating units - Other (%)	2.13	4.16	4.3	4.23	4.29	4.32	4.3
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)		34,430	35,753				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	9,817	4,414	4,414	4,414	0	0	0
Installed thermal - Natural gas (MW)	16,644	18,376	22,832	22,892	17,795	24,102	33,824

Table 70: REF scenario - PILLAR 2: Clean Electricity - Generating capacity (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Nuclear (MW)	6,242	6,242	6,242	6,242	5,385	5,385	5,385
Installed renewables - Rooftop PV (MW)	381	614	869	1,237	1,756	2,428	3,288
Installed renewables - Solar - Base land use assumptions (MW)	1,091	1,091	1,091	1,091	1,091	1,091	1,091

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	2,538	2,538	2,538	2,538	2,538	2,538	2,538
Wind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
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)	-11.1		-19				-15.4
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-6.93		-11.6				-12.2
Business-as-usual carbon sink - Total (Mt CO2e/y)	-18		-30.5				-27.5

Table 73: REF scenario - PILLAR 6: Land sinks - Forests

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-391
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-461
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-4,610
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-3,281
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-8,490
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-350
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-944
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-429
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,996
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-20,952
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-586
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,612
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-8,306
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-4,808
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-16,980
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-675
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-1,415

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Reforest pasture (1000 tCO ₂ e/y)							-3,047
Carbon sink potential - Mid - Restore productivity (1000 tCO ₂ e/y)							-3,959
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO ₂ e/y)							-41,389
Carbon sink potential - High - Accelerate regeneration (1000 tCO ₂ e/y)							-781
Carbon sink potential - High - Avoid deforestation (1000 tCO ₂ e/y)							-2,764
Carbon sink potential - High - Extend rotation length (1000 tCO ₂ e/y)							-12,001
Carbon sink potential - High - Improve plantations (1000 tCO ₂ e/y)							-6,449
Carbon sink potential - High - Increase retention of HWP (1000 tCO ₂ e/y)							-25,469
Carbon sink potential - High - Increase trees outside forests (1000 tCO ₂ e/y)							-1,000
Carbon sink potential - High - Reforest cropland (1000 tCO ₂ e/y)							-1,887
Carbon sink potential - High - Reforest pasture (1000 tCO ₂ e/y)							-5,666
Carbon sink potential - High - All (not counting overlap) (1000 tCO ₂ e/y)							-61,940
Carbon sink potential - High - Restore productivity (1000 tCO ₂ e/y)							-5,922
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							63.9
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							351
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,345
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							1,188
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)							50
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							62.4
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							279
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,188
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							5,276
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							95.8
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							363

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							4,232
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							1,788
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)							72.5
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							93.6
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							202
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,392
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							9,239
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							128
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							374
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							6,120
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							2,376
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)							95
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							125
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							161
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,963
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							11,342