



Net-Zero America - West Virginia 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)		49.9	0.05	0.05	0.046	0.033	0.003
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		6.77	4.84	2.81	2.2	1.21	0.446
Premature deaths from air pollution - Mobile - On-Road (deaths)		39.8	35.2	25.4	13.9	6.04	2.28
Premature deaths from air pollution - Gas Stations (deaths)		4.21	3.67	2.63	1.48	0.682	0.306
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		6.5	5.18	3.41	1.83	0.833	0.311
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		2.01	1.55	1	0.548	0.227	0.071
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		1.22	1.06	0.795	0.509	0.268	0.125
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		1.16	1.05	0.946	0.846	0.755	0.667
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		8.23	6.89	4.87	2.89	1.58	0.845
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.04	0.803	0.569	0.369	0.236	0.148
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.392	0.313	0.243	0.18	0.125	0.078
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		9.94	5.88	5.51	5.12	4.88	4.55
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		119	101	81.3	59.4	38.8	21.5
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		442	0.447	0.442	0.404	0.296	0.027
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		60	42.9	24.9	19.5	10.8	3.95
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		354	313	226	124	53.7	20.3
Monetary damages from air pollution - Gas Stations (million \$2019)		37.3	32.5	23.3	13.1	6.04	2.71
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		57.6	45.9	30.2	16.2	7.38	2.76
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		17.8	13.7	8.88	4.85	2.01	0.626
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		10.8	9.42	7.05	4.51	2.38	1.11
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		10.3	9.3	8.38	7.49	6.68	5.91
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		72.8	61	43.1	25.6	14	7.48

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)		9.17	7.11	5.04	3.26	2.09	1.31
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		3.47	2.77	2.15	1.59	1.11	0.691
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		87.7	51.9	48.6	45.2	43.1	40.1
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		1,053	896	722	527	345	191

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		0	0	0	0	0	195
By economic sector - Construction (jobs)		3,321	3,415	5,493	8,369	9,062	9,914
By economic sector - Manufacturing (jobs)		5,890	6,329	7,587	7,259	6,011	6,897
By economic sector - Mining (jobs)		9,227	6,030	4,762	3,441	2,534	1,768
By economic sector - Other (jobs)		128	158	603	1,317	1,721	1,904
By economic sector - Pipeline (jobs)		576	498	405	305	202	170
By economic sector - Professional (jobs)		2,983	2,574	3,540	4,951	5,477	6,388
By economic sector - Trade (jobs)		3,192	2,410	2,830	3,567	3,872	4,229
By economic sector - Utilities (jobs)		4,014	3,142	4,110	5,804	5,854	7,330
By resource sector - Biomass (jobs)		0	0	0	0	0	835
By resource sector - CO2 (jobs)		0	0	0	0	0	414
By resource sector - Coal (jobs)		9,540	4,431	3,660	3,187	2,872	2,545
By resource sector - Grid (jobs)		2,090	2,376	5,190	9,051	10,168	13,343
By resource sector - Natural Gas (jobs)		7,105	5,936	4,650	3,639	2,141	1,247
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		6,960	6,170	5,397	3,868	2,839	1,735
By resource sector - Solar (jobs)		901	1,155	4,256	8,169	9,900	9,995
By resource sector - Wind (jobs)		2,733	4,488	6,176	7,098	6,814	8,680
By education level - All sectors - High school diploma or less (jobs)		12,828	10,517	12,551	14,930	14,744	16,211
By education level - All sectors - Associates degree or some college (jobs)		8,713	7,375	9,002	10,986	10,974	12,284
By education level - All sectors - Bachelors degree (jobs)		6,159	5,278	6,139	7,127	7,022	7,798
By education level - All sectors - Masters or professional degree (jobs)		1,435	1,220	1,435	1,717	1,731	1,939
By education level - All sectors - Doctoral degree (jobs)		194	166	201	251	262	294
Related work experience - All sectors - None (jobs)		3,977	3,355	4,063	4,935	4,928	5,485
Related work experience - All sectors - Up to 1 year (jobs)		5,963	4,915	5,939	7,129	7,095	7,840
Related work experience - All sectors - 1 to 4 years (jobs)		10,959	9,092	10,731	12,701	12,574	13,911
Related work experience - All sectors - 4 to 10 years (jobs)		6,590	5,608	6,722	8,063	8,005	8,916
Related work experience - All sectors - Over 10 years (jobs)		1,841	1,586	1,875	2,184	2,133	2,374
On-the-Job Training - All sectors - None (jobs)		1,506	1,277	1,542	1,867	1,877	2,075
On-the-Job Training - All sectors - Up to 1 year (jobs)		20,106	16,755	19,818	23,316	23,003	25,477

Table 2: *E+ scenario - IMPACTS - Jobs (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
On-the-Job Training - All sectors - 1 to 4 years (jobs)		5,869	4,953	5,991	7,282	7,253	8,075
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,585	1,333	1,688	2,203	2,265	2,529
On-the-Job Training - All sectors - Over 10 years (jobs)		263	237	291	344	337	370
On-Site or In-Plant Training - All sectors - None (jobs)		4,450	3,827	4,648	5,611	5,600	6,240
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		18,350	15,221	17,980	21,170	20,892	23,120
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		4,639	3,902	4,704	5,687	5,653	6,280
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,686	1,426	1,769	2,257	2,298	2,557
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		204	180	228	288	291	329
Wage income - All (million \$2019)		1,522	1,287	1,532	1,832	1,831	2,056

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

Item	2020	2025	2030	2035	2040	2045	2050
Oil consumption - Annual (million bbls)		31	26.8	20.4	14.4	9.6	5.68
Oil consumption - Cumulative (million bbls)							627
Oil production - Annual (million bbls)		15.1	15.1	15.1	12	9.71	6.46
Natural gas consumption - Annual (tcf)		158	133	107	80.5	50.6	35.1
Natural gas consumption - Cumulative (tcf)							3,220
Natural gas production - Annual (tcf)		2,002	1,893	1,648	1,394	1,105	859

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	151	141	123	101	81	68.6	63.6
Final energy use - Residential (PJ)	38.4	36.1	33.5	30.6	27.6	25.7	24.7
Final energy use - Commercial (PJ)	48.6	48.7	47.1	44.5	42	41	41.4
Final energy use - Industry (PJ)	185	197	201	206	212	214	218

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion \$2018)		0.954	0.978	1.95	2.08	1.75	1.83

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	2	141	280	765	1,251	1,639	2,028
Vehicle stocks - LDV – All others (1000 units)	1,691	1,610	1,529	1,114	700	396	92
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		326	832	1,355	2,050	2,233	2,128
Public EV charging plugs - DC Fast (1000 units)	0.06		0.708		3.17		5.13
Public EV charging plugs - L2 (1000 units)	0.164		17		76.1		123

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 (%)	20.6	34.6	64.3	82.8	85.4	85.5	85.5
Sales of space heating units - Electric Resistance (%)	18.3	20.1	12	6.25	5.33	5.36	5.42
Sales of space heating units - Gas (%)	50.2	29.6	14.6	4.64	3.25	3.16	3.14
Sales of space heating units - Fossil (%)	10.8	15.7	9.07	6.34	6.05	5.96	5.93
Sales of water heating units - Electric Heat Pump (%)	0	5.29	30.4	43.3	45	45.1	45.2
Sales of water heating units - Electric Resistance (%)	45	59.7	53.2	53.1	53.2	53.3	53.2
Sales of water heating units - Gas Furnace (%)	52.2	33	14.7	1.99	0.11	0	0
Sales of water heating units - Other (%)	2.8	2.02	1.66	1.59	1.61	1.62	1.64
Sales of cooking units - Electric Resistance (%)	62.6	70.5	95	99.7	100	100	100
Sales of cooking units - Gas (%)	37.4	29.5	5.04	0.254	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		0.682	0.676				

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 (%)	3.31	21.4	54	79.9	84	84.2	84.2
Sales of space heating units - Electric Resistance (%)	3.22	8.3	10.8	13.4	13.9	13.9	13.9
Sales of space heating units - Gas Furnace (%)	89.4	66.3	34.4	6.61	2.15	1.91	1.9
Sales of space heating units - Fossil (%)	4.12	4.08	0.778	0.033	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.114	6.44	36.5	54	56.3	56.5	56.5
Sales of water heating units - Electric Resistance (%)	2.92	9.46	24.7	38.5	40.7	40.8	40.8
Sales of water heating units - Gas Furnace (%)	94.5	80.1	35.8	4.81	0.265	0	0
Sales of water heating units - Other (%)	2.43	4.02	2.96	2.7	2.7	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)		5,826	6,488				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	11,355	1,656	0	0	0	0	0
Installed thermal - Natural gas (MW)	1,216	1,339	1,108	1,280	537	537	537
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	10	15	19.9	26.4	34.1	42.9	53.1
Installed renewables - Solar - Base land use assumptions (MW)	0	0	0	2,219	7,427	13,921	18,879
Installed renewables - Wind - Base land use assumptions (MW)	684	740	7,019	13,807	26,216	26,977	29,033
Installed renewables - Solar - Constrained land use assumptions (MW)	0	0	278	2,315	4,976	8,272	10,798
Installed renewables - Wind - Constrained land use assumptions (MW)	740	740	19,923	47,759	47,868	47,868	47,868
Capital invested - Solar PV - Base (billion \$2018)		0	0	2.45	5.41	6.37	4.59

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Wind - Base (billion \$2018)		0	8.36	8.42	14.7	0.853	2.18
Capital invested - Solar PV - Constrained (billion \$2018)		0	0	1.91	3.94	5.57	3.3
Capital invested - Wind - Constrained (billion \$2018)		0	26.5	33.7	0.092	0	2.31
Capital invested - Biomass power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	0	0	0	3,967	13,256	24,607	33,274
Wind - Base land use assumptions (GWh)	3,100	3,100	25,019	46,938	84,242	86,377	91,821
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	0	0	507	4,116	8,819	14,584	18,996
Wind - Constrained land use assumptions (GWh)	3,100	3,100	64,947	135,343	135,594	135,594	135,594
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	0	0	0	0
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	0	0	4
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0
Conversion capital investment - Cumulative 5-yr (million \$2018)		0	0	0	0	0	2,949
Biomass purchases (million \$2018/y)		0	0	0	0	0	136

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	0	0	0	7.32
Annual - BECCS (MMT)		0	0	0	0	0	3.79
Annual - NGCC (MMT)		0	0	0	0	0	0
Annual - Cement and lime (MMT)		0	0	0	0	0	3.53
Cumulative - All (MMT)		0	0	0	0	0	7.32
Cumulative - BECCS (MMT)		0	0	0	0	0	3.79

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

Item	2020	2025	2030	2035	2040	2045	2050
Cumulative - NGCC (MMT)		0	0	0	0	0	0
Cumulative - Cement and lime (MMT)		0	0	0	0	0	3.53

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	0	0	0	0	0
Spur (km)		0	0	0	0	0	316
All (km)		0	0	0	0	0	316
Cumulative investment - Trunk (million \$2018)		0	0	0	0	0	0
Cumulative investment - Spur (million \$2018)		0	0	0	0	0	223
Cumulative investment - All (million \$2018)		0	0	0	0	0	223

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-53.9
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-121
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,454
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-30.8
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-1,480
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-69.1
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-236
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-927
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-5,372
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-80.7
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-422
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-4,421
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-45.2
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-2,961

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-133
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-1,675
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-1,839
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-11,577
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-108
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-724
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-6,389
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-60.6
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-4,441
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-197
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-3,114
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-17,784
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-2,750
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							8.8
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							92.1
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,248
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							11.2
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)							9.87
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							15.3
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							552
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,937
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							13.2

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							95.1
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							2,253
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							16.8
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							14.3
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							111
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,111
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							3,614
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							17.6
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							98.1
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							3,258
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							22.3
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)							18.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							88.5
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							912
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							4,415

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-273
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-10.5
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-284
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-518
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-21.1
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-539
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							182
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							19.2
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							201
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							345
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							38.3
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							384

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)		49.9	0.05	0.05	0.046	0.033	0.003
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		6.19	3.89	1.51	0.589	0.182	0.101
Premature deaths from air pollution - Mobile - On-Road (deaths)		40.4	38.6	35.7	30.5	23.1	15.1
Premature deaths from air pollution - Gas Stations (deaths)		4.3	4.1	3.75	3.19	2.41	1.58
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		6.54	5.64	4.75	3.76	2.71	1.72
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		2.05	1.86	1.68	1.4	0.99	0.597

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		1.23	1.18	1.11	0.979	0.753	0.518
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		1.16	1.05	0.946	0.846	0.755	0.667
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		8.27	7.63	6.88	5.8	4.46	3.13
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.04	0.889	0.752	0.605	0.473	0.359
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.392	0.335	0.284	0.238	0.196	0.159
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		9.71	5.89	5.54	5.16	4.89	4.47
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		118	94.7	69.8	52.1	40.3	27.8
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		442	0.447	0.442	0.404	0.296	0.027
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		54.9	34.5	13.4	5.22	1.61	0.892
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		359	343	317	271	205	134
Monetary damages from air pollution - Gas Stations (million \$2019)		38.1	36.3	33.2	28.2	21.3	14
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		58	50	42.1	33.3	24	15.3
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		18.1	16.5	14.9	12.4	8.77	5.29
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		10.9	10.4	9.87	8.67	6.67	4.59
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		10.3	9.3	8.38	7.49	6.68	5.91
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		73.2	67.5	60.9	51.3	39.5	27.7
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		9.21	7.87	6.66	5.35	4.19	3.18
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		3.47	2.97	2.52	2.1	1.73	1.41
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		85.7	52	48.9	45.6	43.1	39.4
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		1,049	841	619	462	358	247

Table 18: E- scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		0	0	0	0	0	195
By economic sector - Construction (jobs)		3,550	3,386	4,772	7,429	9,805	10,978
By economic sector - Manufacturing (jobs)		6,092	6,486	6,800	7,078	7,733	9,034
By economic sector - Mining (jobs)		9,236	5,970	4,692	3,690	2,928	2,033
By economic sector - Other (jobs)		145	164	514	1,151	1,871	2,006
By economic sector - Pipeline (jobs)		575	470	359	281	225	250
By economic sector - Professional (jobs)		3,142	2,649	3,269	4,644	6,014	7,147
By economic sector - Trade (jobs)		3,347	2,436	2,689	3,433	4,288	4,711
By economic sector - Utilities (jobs)		4,478	3,149	3,373	4,883	6,053	8,136
By resource sector - Biomass (jobs)		0	0	0	0	0	806
By resource sector - CO2 (jobs)		0	0	0	0	0	710
By resource sector - Coal (jobs)		9,893	4,700	3,679	3,214	2,875	2,502
By resource sector - Grid (jobs)		2,823	2,398	4,075	7,623	10,591	14,455
By resource sector - Natural Gas (jobs)		7,063	5,457	3,945	2,939	2,030	1,509
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		6,976	6,254	5,621	4,939	4,248	2,701
By resource sector - Solar (jobs)		956	1,216	3,428	6,968	10,918	10,170
By resource sector - Wind (jobs)		2,855	4,684	5,723	6,905	8,255	11,638
By education level - All sectors - High school diploma or less (jobs)		13,339	10,568	11,328	13,868	16,486	18,563
By education level - All sectors - Associates degree or some college (jobs)		9,113	7,420	8,055	10,121	12,234	14,074
By education level - All sectors - Bachelors degree (jobs)		6,416	5,323	5,593	6,742	7,960	9,029
By education level - All sectors - Masters or professional degree (jobs)		1,496	1,231	1,308	1,619	1,944	2,223
By education level - All sectors - Doctoral degree (jobs)		201	168	186	239	293	334
Related work experience - All sectors - None (jobs)		4,155	3,373	3,648	4,564	5,503	6,281
Related work experience - All sectors - Up to 1 year (jobs)		6,201	4,951	5,364	6,623	7,941	8,972
Related work experience - All sectors - 1 to 4 years (jobs)		11,409	9,147	9,715	11,865	14,095	15,967
Related work experience - All sectors - 4 to 10 years (jobs)		6,882	5,642	6,052	7,494	8,965	10,249
Related work experience - All sectors - Over 10 years (jobs)		1,917	1,597	1,690	2,043	2,412	2,754
On-the-Job Training - All sectors - None (jobs)		1,570	1,286	1,396	1,742	2,107	2,375
On-the-Job Training - All sectors - Up to 1 year (jobs)		20,926	16,876	17,950	21,814	25,882	29,326
On-the-Job Training - All sectors - 1 to 4 years (jobs)		6,129	4,974	5,367	6,717	8,075	9,244
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,666	1,333	1,496	1,995	2,470	2,847
On-the-Job Training - All sectors - Over 10 years (jobs)		274	239	261	321	383	431
On-Site or In-Plant Training - All sectors - None (jobs)		4,645	3,858	4,186	5,217	6,292	7,177
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		19,095	15,324	16,283	19,792	23,475	26,583
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		4,841	3,920	4,222	5,258	6,305	7,194
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,769	1,427	1,576	2,060	2,522	2,893
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		215	181	201	262	322	376
Wage income - All (million \$2019)		1,586	1,294	1,384	1,710	2,051	2,362

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	151	143	129	118	110	100	89.1
Final energy use - Residential (PJ)	38.4	36.2	35	33.8	32.2	30.3	28.1
Final energy use - Commercial (PJ)	48.6	48.8	48.2	47.6	46.4	45.3	44.7
Final energy use - Industry (PJ)	185	197	202	207	214	216	219

Table 20: E- scenario - PILLAR 1: Efficiency/Electrification - Electricity demand

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion \$2018)		0.829	0.837	1.16	1.2	1.73	1.83

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	1.55	42.4	83.2	272	461	880	1,299
Vehicle stocks - LDV – All others (1000 units)	1,698	1,698	1,698	1,610	1,523	1,174	824
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		0	52.1	111	373	1,179	1,716
Public EV charging plugs - DC Fast (1000 units)	0.06		0.211		1.17		3.29
Public EV charging plugs - L2 (1000 units)	0.164		5.06		28.1		79

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 (%)	20.6	29.9	33.3	43.4	60.9	75.7	82.6
Sales of space heating units - Electric Resistance (%)	18.3	21.3	20.5	17.4	12.3	8.13	6.18
Sales of space heating units - Gas (%)	50.2	31.9	30	25.2	16.5	8.57	4.78
Sales of space heating units - Fossil (%)	10.8	16.9	16.2	14	10.4	7.61	6.49
Sales of water heating units - Electric Heat Pump (%)	0	1.02	3.88	12.4	26.6	38	43.1
Sales of water heating units - Electric Resistance (%)	45	61.1	60.3	58	54.9	53.5	53.2
Sales of water heating units - Gas Furnace (%)	52.2	35.8	33.7	27.7	16.7	6.76	2.07
Sales of water heating units - Other (%)	2.8	2.09	2.06	1.96	1.8	1.69	1.66
Sales of cooking units - Electric Resistance (%)	62.4	63.4	66.8	75.9	88.5	96.3	99
Sales of cooking units - Gas (%)	37.6	36.6	33.2	24.1	11.5	3.71	0.997
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		0.678	0.66				

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 (%)	3.31	16.5	20.2	31.4	51.9	70.8	80
Sales of space heating units - Electric Resistance (%)	3.22	7.96	8.26	9.15	10.8	12.6	13.5
Sales of space heating units - Gas Furnace (%)	89.4	70.9	67.2	56.1	35.6	16.1	6.3
Sales of space heating units - Fossil (%)	4.12	4.72	4.38	3.31	1.62	0.515	0.135
Sales of water heating units - Electric Heat Pump (%)	0.114	1.49	4.92	15.1	32.6	47.1	53.7
Sales of water heating units - Electric Resistance (%)	2.92	7.34	9.03	14.3	24.3	33.8	38.6

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Gas Furnace (%)	94.5	86.9	81.8	66.8	39.9	16.2	4.96
Sales of water heating units - Other (%)	2.43	4.23	4.21	3.78	3.24	2.87	2.74
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)		5,823	6,480				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	11,355	2,956	0	0	0	0	0
Installed thermal - Natural gas (MW)	1,216	1,224	1,224	815	7.5	7.5	15
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-53.9
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-121
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,454
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-30.8
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-1,480
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-69.1
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-236
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-927
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-5,372
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-80.7
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-422
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-4,421
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-45.2
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-2,961
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-133
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-1,675
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-1,839
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-11,577

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-108
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-724
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-6,389
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-60.6
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-4,441
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-197
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-3,114
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-17,784
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-2,750
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							8.8
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							92.1
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,248
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							11.2
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)							9.87
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							15.3
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							552
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,937
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							13.2
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							95.1
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							2,253
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							16.8

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							14.3
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							111
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,111
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							3,614
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							17.6
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							98.1
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							3,258
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							22.3
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)							18.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							88.5
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							912
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							4,415

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-273
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-10.5
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-284

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-518
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-21.1
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-539
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							182
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							19.2
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							201
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							345
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							38.3
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							384

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)		49.9	0.05	0.05	0.046	0.033	0.003
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		5.93	4.17	2.2	1.31	0.382	0.095
Premature deaths from air pollution - Mobile - On-Road (deaths)		39.8	35.2	25.4	13.9	6.04	2.28
Premature deaths from air pollution - Gas Stations (deaths)		4.21	3.67	2.63	1.48	0.682	0.306
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		6.5	5.18	3.41	1.83	0.833	0.311
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		2.01	1.55	1	0.548	0.227	0.071
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		1.22	1.06	0.795	0.509	0.268	0.125
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		1.16	1.05	0.946	0.846	0.755	0.667
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		8.23	6.89	4.87	2.89	1.58	0.845

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.04	0.803	0.569	0.369	0.236	0.148
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.392	0.313	0.243	0.18	0.125	0.078
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		10.5	5.88	5.5	5.11	4.88	4.37
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		115	98.5	73.5	48.7	24.9	1.64
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		442	0.447	0.442	0.404	0.296	0.027
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		52.6	36.9	19.5	11.6	3.39	0.845
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		354	313	226	124	53.7	20.3
Monetary damages from air pollution - Gas Stations (million \$2019)		37.3	32.5	23.3	13.1	6.04	2.71
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		57.6	45.9	30.2	16.2	7.38	2.76
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		17.8	13.7	8.88	4.85	2.01	0.626
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		10.8	9.42	7.05	4.51	2.38	1.11
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		10.3	9.3	8.38	7.49	6.68	5.91
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		72.8	61	43.1	25.6	14	7.48
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		9.17	7.11	5.04	3.26	2.09	1.31
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		3.47	2.77	2.15	1.59	1.11	0.691
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		92.8	51.9	48.6	45.1	43	38.5
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		1,025	874	653	432	221	14.6

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		0	0	0	0	0	196
By economic sector - Construction (jobs)		3,629	3,793	9,425	11,695	19,089	12,165
By economic sector - Manufacturing (jobs)		6,383	7,311	9,960	10,505	12,367	12,875
By economic sector - Mining (jobs)		9,537	5,987	4,608	3,217	2,226	1,244
By economic sector - Other (jobs)		164	216	1,426	1,894	4,086	2,032
By economic sector - Pipeline (jobs)		559	482	356	240	125	19.6
By economic sector - Professional (jobs)		3,244	2,838	5,321	6,733	10,522	8,395

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Trade (jobs)		3,472	2,528	3,932	4,575	7,180	5,127
By economic sector - Utilities (jobs)		4,499	3,492	5,953	8,409	11,674	10,203
By resource sector - Biomass (jobs)		0	0	0	0	0	864
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Coal (jobs)		10,488	4,695	3,658	3,184	2,870	2,449
By resource sector - Grid (jobs)		2,981	2,932	9,143	14,803	22,370	19,941
By resource sector - Natural Gas (jobs)		6,851	5,700	4,091	2,824	1,256	253
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		6,960	6,158	5,253	3,536	2,182	408
By resource sector - Solar (jobs)		1,151	2,000	10,387	12,214	25,677	10,763
By resource sector - Wind (jobs)		3,056	5,163	8,450	10,706	12,913	17,579
By education level - All sectors - High school diploma or less (jobs)		13,813	11,400	17,583	20,152	28,618	21,797
By education level - All sectors - Associates degree or some college (jobs)		9,381	8,052	12,780	14,972	21,558	16,678
By education level - All sectors - Bachelors degree (jobs)		6,560	5,702	8,359	9,517	13,315	10,552
By education level - All sectors - Masters or professional degree (jobs)		1,527	1,315	1,976	2,293	3,283	2,581
By education level - All sectors - Doctoral degree (jobs)		205	179	284	333	495	380
Related work experience - All sectors - None (jobs)		4,274	3,648	5,745	6,692	9,641	7,362
Related work experience - All sectors - Up to 1 year (jobs)		6,433	5,354	8,412	9,683	13,905	10,648
Related work experience - All sectors - 1 to 4 years (jobs)		11,749	9,830	14,844	17,043	24,111	18,655
Related work experience - All sectors - 4 to 10 years (jobs)		7,062	6,089	9,397	10,892	15,492	12,042
Related work experience - All sectors - Over 10 years (jobs)		1,969	1,726	2,585	2,956	4,119	3,281
On-the-Job Training - All sectors - None (jobs)		1,614	1,387	2,189	2,523	3,678	2,770
On-the-Job Training - All sectors - Up to 1 year (jobs)		21,589	18,174	27,436	31,411	44,313	34,593
On-the-Job Training - All sectors - 1 to 4 years (jobs)		6,298	5,381	8,460	9,871	14,142	10,853
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,704	1,444	2,481	2,991	4,465	3,258
On-the-Job Training - All sectors - Over 10 years (jobs)		281	261	415	471	671	515
On-Site or In-Plant Training - All sectors - None (jobs)		4,775	4,178	6,584	7,626	10,986	8,494
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		19,704	16,495	24,888	28,500	40,217	31,309
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		4,980	4,237	6,623	7,698	11,003	8,441
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,807	1,540	2,557	3,046	4,486	3,300
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		220	197	330	396	576	445
Wage income - All (million \$2019)		1,629	1,390	2,110	2,456	3,496	2,756

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	151	141	123	101	81	68.6	63.6
Final energy use - Residential (PJ)	38.4	36.1	33.5	30.6	27.6	25.7	24.7
Final energy use - Commercial (PJ)	48.6	48.7	47.1	44.5	42	41	41.4
Final energy use - Industry (PJ)	185	197	201	206	212	214	218

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion \$2018)		0.954	0.978	1.95	2.08	1.75	1.83

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV - EV (1000 units)	2	141	280	765	1,251	1,639	2,028
Vehicle stocks - LDV - All others (1000 units)	1,691	1,610	1,529	1,114	700	396	92
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		326	832	1,355	2,050	2,233	2,128
Public EV charging plugs - DC Fast (1000 units)	0.06		0.708		3.17		5.13
Public EV charging plugs - L2 (1000 units)	0.164		17		76.1		123

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 (%)	20.6	34.6	64.3	82.8	85.4	85.5	85.5
Sales of space heating units - Electric Resistance (%)	18.3	20.1	12	6.25	5.33	5.36	5.42
Sales of space heating units - Gas (%)	50.2	29.6	14.6	4.64	3.25	3.16	3.14
Sales of space heating units - Fossil (%)	10.8	15.7	9.07	6.34	6.05	5.96	5.93
Sales of water heating units - Electric Heat Pump (%)	0	5.29	30.4	43.3	45	45.1	45.2
Sales of water heating units - Electric Resistance (%)	45	59.7	53.2	53.1	53.2	53.3	53.2
Sales of water heating units - Gas Furnace (%)	52.2	33	14.7	1.99	0.11	0	0
Sales of water heating units - Other (%)	2.8	2.02	1.66	1.59	1.61	1.62	1.64
Sales of cooking units - Electric Resistance (%)	62.6	70.5	95	99.7	100	100	100
Sales of cooking units - Gas (%)	37.4	29.5	5.04	0.254	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		0.682	0.676				

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 (%)	3.31	21.4	54	79.9	84	84.2	84.2
Sales of space heating units - Electric Resistance (%)	3.22	8.3	10.8	13.4	13.9	13.9	13.9
Sales of space heating units - Gas Furnace (%)	89.4	66.3	34.4	6.61	2.15	1.91	1.9
Sales of space heating units - Fossil (%)	4.12	4.08	0.778	0.033	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.114	6.44	36.5	54	56.3	56.5	56.5
Sales of water heating units - Electric Resistance (%)	2.92	9.46	24.7	38.5	40.7	40.8	40.8
Sales of water heating units - Gas Furnace (%)	94.5	80.1	35.8	4.81	0.265	0	0
Sales of water heating units - Other (%)	2.43	4.02	2.96	2.7	2.7	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)		5,826	6,488				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	11,355	3,640	0	0	0	0	0
Installed thermal - Natural gas (MW)	1,216	1,224	1,339	1,056	130	130	537
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	10	15	19.9	26.4	34.1	42.9	53.1
Installed renewables - Solar - Base land use assumptions (MW)	0	79.1	262	6,872	13,078	28,498	28,498
Installed renewables - Wind - Base land use assumptions (MW)	740	740	8,957	21,914	44,905	54,159	54,198
Installed renewables - Solar - Constrained land use assumptions (MW)	0	377	916	4,435	10,762	14,839	15,021
Installed renewables - Wind - Constrained land use assumptions (MW)	840	840	27,586	47,968	47,968	47,968	63,329
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion \$2018)		0.106	0.219	7.29	6.45	15.1	0
Capital invested - Wind - Base (billion \$2018)		0	10.9	16.1	27.2	10.4	0.041

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	0	145	476	12,091	22,963	49,928	49,928
Wind - Base land use assumptions (GWh)	3,100	3,100	31,342	71,772	131,323	154,153	154,241
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	0	1,379	3,378	15,726	37,677	51,985	52,648
Wind - Constrained land use assumptions (GWh)	6,201	6,201	170,493	271,188	271,188	271,188	370,654
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-53.9
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-121
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,454
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-30.8
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-1,480
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-69.1
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-236
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-927
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-5,372

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO ₂ e/y)							-80.7
Carbon sink potential - Mid - Avoid deforestation (1000 tCO ₂ e/y)							-422
Carbon sink potential - Mid - Extend rotation length (1000 tCO ₂ e/y)							-4,421
Carbon sink potential - Mid - Improve plantations (1000 tCO ₂ e/y)							-45.2
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO ₂ e/y)							-2,961
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO ₂ e/y)							-133
Carbon sink potential - Mid - Reforest cropland (1000 tCO ₂ e/y)							0
Carbon sink potential - Mid - Reforest pasture (1000 tCO ₂ e/y)							-1,675
Carbon sink potential - Mid - Restore productivity (1000 tCO ₂ e/y)							-1,839
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO ₂ e/y)							-11,577
Carbon sink potential - High - Accelerate regeneration (1000 tCO ₂ e/y)							-108
Carbon sink potential - High - Avoid deforestation (1000 tCO ₂ e/y)							-724
Carbon sink potential - High - Extend rotation length (1000 tCO ₂ e/y)							-6,389
Carbon sink potential - High - Improve plantations (1000 tCO ₂ e/y)							-60.6
Carbon sink potential - High - Increase retention of HWP (1000 tCO ₂ e/y)							-4,441
Carbon sink potential - High - Increase trees outside forests (1000 tCO ₂ e/y)							-197
Carbon sink potential - High - Reforest cropland (1000 tCO ₂ e/y)							0
Carbon sink potential - High - Reforest pasture (1000 tCO ₂ e/y)							-3,114
Carbon sink potential - High - All (not counting overlap) (1000 tCO ₂ e/y)							-17,784
Carbon sink potential - High - Restore productivity (1000 tCO ₂ e/y)							-2,750
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							8.8
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							92.1
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,248
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							11.2
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)							9.87
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							0

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							15.3
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							552
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,937
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							13.2
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							95.1
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							2,253
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							16.8
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							14.3
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							111
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,111
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							3,614
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							17.6
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							98.1
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							3,258
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							22.3
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)							18.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							88.5
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							912

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							4,415

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 tCO ₂ e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO ₂ e/y)							-273
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO ₂ e/y)							-10.5
Carbon sink potential - Moderate deployment - Total (1000 tCO ₂ e/y)							-284
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO ₂ e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO ₂ e/y)							-518
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO ₂ e/y)							-21.1
Carbon sink potential - Aggressive deployment - Total (1000 tCO ₂ e/y)							-539
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							182
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							19.2
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							201
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							345
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							38.3
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							384

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)		49.9	0.05	0.05	0.046	0.033	0.003

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		6.99	4.83	6.84	4.94	1.73	0.506
Premature deaths from air pollution - Mobile - On-Road (deaths)		39.8	35.2	25.4	13.9	6.04	2.28
Premature deaths from air pollution - Gas Stations (deaths)		4.21	3.67	2.63	1.48	0.682	0.306
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		6.5	5.18	3.41	1.83	0.833	0.311
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		2.01	1.55	1	0.548	0.227	0.071
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		1.22	1.06	0.795	0.509	0.268	0.125
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		1.16	1.05	0.946	0.846	0.755	0.667
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		8.23	6.89	4.87	2.89	1.58	0.845
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.04	0.803	0.569	0.369	0.236	0.148
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.392	0.313	0.243	0.18	0.125	0.078
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		9.36	5.88	5.51	5.12	4.88	4.37
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		121	108	98.8	82.4	65.6	46.7
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		442	0.447	0.442	0.404	0.296	0.027
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		61.9	42.7	60.6	43.8	15.3	4.49
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		354	313	226	124	53.7	20.3
Monetary damages from air pollution - Gas Stations (million \$2019)		37.3	32.5	23.3	13.1	6.04	2.71
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		57.6	45.9	30.2	16.2	7.38	2.76
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		17.8	13.7	8.88	4.85	2.01	0.626
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		10.8	9.42	7.05	4.51	2.38	1.11
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		10.3	9.3	8.38	7.49	6.68	5.91
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		72.8	61	43.1	25.6	14	7.48
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		9.17	7.11	5.04	3.26	2.09	1.31

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		3.47	2.77	2.15	1.59	1.11	0.691
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		82.6	51.9	48.6	45.1	43.1	38.5
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		1,073	958	878	732	582	415

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		0	0	0	0	0	195
By economic sector - Construction (jobs)		3,371	3,100	3,266	3,696	4,340	5,968
By economic sector - Manufacturing (jobs)		5,307	4,481	4,058	4,277	4,058	4,000
By economic sector - Mining (jobs)		8,988	6,138	4,992	3,706	2,821	2,006
By economic sector - Other (jobs)		127	120	142	189	250	354
By economic sector - Pipeline (jobs)		592	536	502	439	361	372
By economic sector - Professional (jobs)		2,934	2,284	2,272	3,030	4,054	5,747
By economic sector - Trade (jobs)		3,082	2,291	2,116	2,158	2,391	2,877
By economic sector - Utilities (jobs)		4,097	2,980	3,284	7,693	13,655	22,732
By resource sector - Biomass (jobs)		0	0	0	0	0	809
By resource sector - CO2 (jobs)		0	0	0	0	0	802
By resource sector - Coal (jobs)		8,937	4,337	3,659	3,185	2,873	2,449
By resource sector - Grid (jobs)		2,094	1,699	2,791	3,998	6,024	9,905
By resource sector - Natural Gas (jobs)		7,455	6,662	6,065	5,326	4,335	3,310
By resource sector - Nuclear (jobs)		0	0	0	5,290	12,239	21,613
By resource sector - Oil (jobs)		6,959	6,170	5,397	3,868	2,910	1,983
By resource sector - Solar (jobs)		731	664	564	548	495	462
By resource sector - Wind (jobs)		2,321	2,397	2,157	2,974	3,055	2,917
By education level - All sectors - High school diploma or less (jobs)		12,400	9,385	8,809	8,884	9,291	11,064
By education level - All sectors - Associates degree or some college (jobs)		8,477	6,543	6,221	6,503	7,028	8,670
By education level - All sectors - Bachelors degree (jobs)		6,017	4,741	4,420	4,547	4,912	6,000
By education level - All sectors - Masters or professional degree (jobs)		1,411	1,109	1,040	1,097	1,227	1,549
By education level - All sectors - Doctoral degree (jobs)		192	152	143	160	190	249
Related work experience - All sectors - None (jobs)		3,873	2,999	2,844	2,929	3,132	3,829
Related work experience - All sectors - Up to 1 year (jobs)		5,748	4,333	4,047	4,158	4,425	5,333
Related work experience - All sectors - 1 to 4 years (jobs)		10,656	8,177	7,679	7,834	8,345	10,101
Related work experience - All sectors - 4 to 10 years (jobs)		6,431	5,020	4,748	4,922	5,312	6,534
Related work experience - All sectors - Over 10 years (jobs)		1,789	1,401	1,313	1,348	1,434	1,734
On-the-Job Training - All sectors - None (jobs)		1,465	1,139	1,062	1,094	1,178	1,440
On-the-Job Training - All sectors - Up to 1 year (jobs)		19,475	14,910	13,950	14,258	15,154	18,247
On-the-Job Training - All sectors - 1 to 4 years (jobs)		5,732	4,445	4,225	4,367	4,694	5,779
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,571	1,233	1,204	1,276	1,416	1,819

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

Item	2020	2025	2030	2035	2040	2045	2050
On-the-Job Training - All sectors - Over 10 years (jobs)		255	204	191	197	207	246
On-Site or In-Plant Training - All sectors - None (jobs)		4,326	3,377	3,174	3,320	3,599	4,428
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		17,779	13,577	12,705	12,952	13,743	16,534
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		4,522	3,498	3,318	3,412	3,649	4,465
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,669	1,318	1,280	1,339	1,471	1,867
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		201	160	157	168	186	237
Wage income - All (million \$2019)		1,485	1,162	1,108	1,146	1,241	1,530

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	151	141	123	101	81	68.6	63.6
Final energy use - Residential (PJ)	38.4	36.1	33.5	30.6	27.6	25.7	24.7
Final energy use - Commercial (PJ)	48.6	48.7	47.1	44.5	42	41	41.4
Final energy use - Industry (PJ)	185	197	201	206	212	214	218

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion \$2018)		0.954	0.978	1.95	2.08	1.75	1.83

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	2	141	280	765	1,251	1,639	2,028
Vehicle stocks - LDV – All others (1000 units)	1,691	1,610	1,529	1,114	700	396	92
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		326	832	1,355	2,050	2,233	2,128
Public EV charging plugs - DC Fast (1000 units)	0.06		0.708		3.17		5.13
Public EV charging plugs - L2 (1000 units)	0.164		17		76.1		123

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 (%)	20.6	34.6	64.3	82.8	85.4	85.5	85.5
Sales of space heating units - Electric Resistance (%)	18.3	20.1	12	6.25	5.33	5.36	5.42
Sales of space heating units - Gas (%)	50.2	29.6	14.6	4.64	3.25	3.16	3.14
Sales of space heating units - Fossil (%)	10.8	15.7	9.07	6.34	6.05	5.96	5.93
Sales of water heating units - Electric Heat Pump (%)	0	5.29	30.4	43.3	45	45.1	45.2
Sales of water heating units - Electric Resistance (%)	45	59.7	53.2	53.1	53.2	53.3	53.2
Sales of water heating units - Gas Furnace (%)	52.2	33	14.7	1.99	0.11	0	0
Sales of water heating units - Other (%)	2.8	2.02	1.66	1.59	1.61	1.62	1.64
Sales of cooking units - Electric Resistance (%)	62.6	70.5	95	99.7	100	100	100
Sales of cooking units - Gas (%)	37.4	29.5	5.04	0.254	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		0.682	0.676				

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 (%)	3.31	21.4	54	79.9	84	84.2	84.2
Sales of space heating units - Electric Resistance (%)	3.22	8.3	10.8	13.4	13.9	13.9	13.9
Sales of space heating units - Gas Furnace (%)	89.4	66.3	34.4	6.61	2.15	1.91	1.9
Sales of space heating units - Fossil (%)	4.12	4.08	0.778	0.033	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.114	6.44	36.5	54	56.3	56.5	56.5
Sales of water heating units - Electric Resistance (%)	2.92	9.46	24.7	38.5	40.7	40.8	40.8
Sales of water heating units - Gas Furnace (%)	94.5	80.1	35.8	4.81	0.265	0	0
Sales of water heating units - Other (%)	2.43	4.02	2.96	2.7	2.7	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)		5,826	6,488				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	11,355	972	0	0	0	0	0
Installed thermal - Natural gas (MW)	1,216	2,013	1,141	2,178	1,949	2,301	2,301
Installed thermal - Nuclear (MW)	0	0	0	0	2,257	7,099	15,156
Installed renewables - Rooftop PV (MW)	10	15	19.9	26.4	34.1	42.9	53.1
Installed renewables - Wind - Base land use assumptions (MW)	740	1,496	4,313	4,313	4,815	4,855	4,979
Installed renewables - Solar - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - Wind - Constrained land use assumptions (MW)	740	2,348	8,454	8,454	9,820	10,260	10,930
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Capital invested - Wind - Base (billion \$2018)		1.11	3.75	0	0.593	0.045	0.132
Capital invested - Wind - Constrained (billion \$2018)		2.36	8.13	0	1.61	0.493	0.71

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Wind - Base land use assumptions (GWh)	3,100	5,923	15,857	15,857	17,577	17,724	18,139
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0
Wind - Constrained land use assumptions (GWh)	3,100	8,876	29,562	29,562	33,982	35,386	37,512
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)							-53.9
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-121
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,454
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-30.8
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-1,480
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-69.1
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-236
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-927
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-5,372
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-80.7
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-422
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-4,421
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-45.2
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-2,961
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-133
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-1,675
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-1,839
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-11,577
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-108
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-724
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-6,389
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-60.6
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-4,441
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-197
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-3,114
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-17,784

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-2,750
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							8.8
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							92.1
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,248
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							11.2
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)							9.87
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							15.3
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							552
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,937
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							13.2
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							95.1
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							2,253
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							16.8
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							14.3
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							111
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,111
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							3,614
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							17.6

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 - Avoid deforestation (over 30 years) (1000 hectares)							98.1
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							3,258
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							22.3
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)							18.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							88.5
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							912
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							4,415

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-273
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-10.5
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-284
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-518
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-21.1
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-539
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							182
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							19.2

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							201
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							345
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							38.3
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							384

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)		49.9	0.05	0.05	0.046	0.033	0.003
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		6.4	3.67	1.9	1.15	0.561	0.178
Premature deaths from air pollution - Mobile - On-Road (deaths)		40.4	38.6	35.7	30.5	23.1	15.1
Premature deaths from air pollution - Gas Stations (deaths)		4.3	4.1	3.75	3.19	2.41	1.58
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		6.54	5.64	4.75	3.76	2.71	1.72
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		2.05	1.86	1.68	1.4	0.99	0.597
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		1.23	1.18	1.11	0.979	0.753	0.518
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		1.16	1.05	0.946	0.846	0.755	0.667
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		8.27	7.63	6.88	5.8	4.46	3.13
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.04	0.889	0.752	0.605	0.473	0.359
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.392	0.335	0.284	0.238	0.196	0.159
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		9.91	5.89	5.54	5.17	4.93	4.57
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		118	94.7	69.8	52.1	40.3	27.8
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		442	0.447	0.442	0.404	0.296	0.027
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		56.7	32.5	16.8	10.2	4.97	1.57
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		359	343	317	271	205	134

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Gas Stations (million \$2019)		38.1	36.3	33.2	28.2	21.3	14
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		58	50	42.1	33.3	24	15.3
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		18.1	16.5	14.9	12.4	8.77	5.29
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		10.9	10.4	9.87	8.67	6.67	4.59
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		10.3	9.3	8.38	7.49	6.68	5.91
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		73.2	67.5	60.9	51.3	39.5	27.7
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		9.21	7.87	6.66	5.35	4.19	3.18
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		3.47	2.97	2.52	2.1	1.73	1.41
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		87.4	52	48.9	45.6	43.5	40.3
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		1,049	841	619	462	358	247

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		0	0	0	0	0	0
By economic sector - Construction (jobs)		3,455	3,406	4,522	5,859	7,199	8,815
By economic sector - Manufacturing (jobs)		6,130	6,550	6,217	5,145	5,614	7,034
By economic sector - Mining (jobs)		9,267	5,964	4,709	3,718	2,947	2,022
By economic sector - Other (jobs)		139	166	462	841	1,275	1,670
By economic sector - Pipeline (jobs)		569	468	366	292	225	244
By economic sector - Professional (jobs)		3,097	2,650	3,138	3,801	4,578	5,440
By economic sector - Trade (jobs)		3,309	2,440	2,613	2,928	3,365	3,816
By economic sector - Utilities (jobs)		4,276	3,115	3,265	3,960	4,676	6,307
By resource sector - Biomass (jobs)		0	0	0	0	0	0
By resource sector - CO2 (jobs)		0	0	0	0	0	728
By resource sector - Coal (jobs)		9,859	4,608	3,679	3,216	2,897	2,557
By resource sector - Grid (jobs)		2,535	2,436	3,815	5,757	7,929	10,919
By resource sector - Natural Gas (jobs)		6,984	5,431	4,037	3,055	2,030	1,426
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		6,976	6,254	5,621	4,973	4,269	2,598
By resource sector - Solar (jobs)		941	1,200	2,914	4,851	7,111	9,101
By resource sector - Wind (jobs)		2,947	4,830	5,227	4,692	5,643	8,018
By education level - All sectors - High school diploma or less (jobs)		13,221	10,596	10,817	11,290	12,670	14,960
By education level - All sectors - Associates degree or some college (jobs)		9,002	7,433	7,678	8,168	9,310	11,227
By education level - All sectors - Bachelors degree (jobs)		6,344	5,330	5,361	5,548	6,167	7,153
By education level - All sectors - Masters or professional degree (jobs)		1,477	1,231	1,258	1,339	1,505	1,749

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

Item	2020	2025	2030	2035	2040	2045	2050
By education level - All sectors - Doctoral degree (jobs)		199	168	179	199	227	260
Related work experience - All sectors - None (jobs)		4,105	3,379	3,483	3,703	4,206	5,026
Related work experience - All sectors - Up to 1 year (jobs)		6,150	4,966	5,108	5,352	6,058	7,200
Related work experience - All sectors - 1 to 4 years (jobs)		11,291	9,162	9,303	9,727	10,886	12,774
Related work experience - All sectors - 4 to 10 years (jobs)		6,798	5,651	5,786	6,104	6,878	8,160
Related work experience - All sectors - Over 10 years (jobs)		1,898	1,600	1,612	1,657	1,851	2,189
On-the-Job Training - All sectors - None (jobs)		1,553	1,289	1,332	1,414	1,607	1,898
On-the-Job Training - All sectors - Up to 1 year (jobs)		20,728	16,914	17,148	17,789	19,925	23,448
On-the-Job Training - All sectors - 1 to 4 years (jobs)		6,054	4,982	5,129	5,458	6,177	7,385
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,637	1,333	1,436	1,627	1,882	2,275
On-the-Job Training - All sectors - Over 10 years (jobs)		271	240	247	255	288	344
On-Site or In-Plant Training - All sectors - None (jobs)		4,593	3,867	3,988	4,210	4,784	5,709
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		18,914	15,358	15,563	16,159	18,088	21,275
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		4,784	3,927	4,035	4,276	4,831	5,755
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,740	1,427	1,515	1,688	1,932	2,311
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		212	181	192	211	244	299
Wage income - All (million \$2019)		1,568	1,295	1,327	1,405	1,587	1,884

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	151	143	129	118	110	100	89.1
Final energy use - Residential (PJ)	38.4	36.2	35	33.8	32.2	30.3	28.1
Final energy use - Commercial (PJ)	48.6	48.8	48.2	47.6	46.4	45.3	44.7
Final energy use - Industry (PJ)	185	197	202	207	214	216	219

Table 52: E-B+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion \$2018)		0.829	0.837	1.16	1.2	1.73	1.83

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	1.55	42.4	83.2	272	461	880	1,299
Vehicle stocks - LDV – All others (1000 units)	1,698	1,698	1,698	1,610	1,523	1,174	824
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		0	52.1	111	373	1,179	1,716
Public EV charging plugs - DC Fast (1000 units)	0.06		0.211		1.17		3.29
Public EV charging plugs - L2 (1000 units)	0.164		5.06		28.1		79

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 (%)	20.6	29.9	33.3	43.4	60.9	75.7	82.6
Sales of space heating units - Electric Resistance (%)	18.3	21.3	20.5	17.4	12.3	8.13	6.18
Sales of space heating units - Gas (%)	50.2	31.9	30	25.2	16.5	8.57	4.78
Sales of space heating units - Fossil (%)	10.8	16.9	16.2	14	10.4	7.61	6.49
Sales of water heating units - Electric Heat Pump (%)	0	1.02	3.88	12.4	26.6	38	43.1
Sales of water heating units - Electric Resistance (%)	45	61.1	60.3	58	54.9	53.5	53.2
Sales of water heating units - Gas Furnace (%)	52.2	35.8	33.7	27.7	16.7	6.76	2.07
Sales of water heating units - Other (%)	2.8	2.09	2.06	1.96	1.8	1.69	1.66
Sales of cooking units - Electric Resistance (%)	62.4	63.4	66.8	75.9	88.5	96.3	99
Sales of cooking units - Gas (%)	37.6	36.6	33.2	24.1	11.5	3.71	0.997
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		0.678	0.66				

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 (%)	3.31	16.5	20.2	31.4	51.9	70.8	80
Sales of space heating units - Electric Resistance (%)	3.22	7.96	8.26	9.15	10.8	12.6	13.5
Sales of space heating units - Gas Furnace (%)	89.4	70.9	67.2	56.1	35.6	16.1	6.3
Sales of space heating units - Fossil (%)	4.12	4.72	4.38	3.31	1.62	0.515	0.135
Sales of water heating units - Electric Heat Pump (%)	0.114	1.49	4.92	15.1	32.6	47.1	53.7
Sales of water heating units - Electric Resistance (%)	2.92	7.34	9.03	14.3	24.3	33.8	38.6
Sales of water heating units - Gas Furnace (%)	94.5	86.9	81.8	66.8	39.9	16.2	4.96
Sales of water heating units - Other (%)	2.43	4.23	4.21	3.78	3.24	2.87	2.74
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)		5,823	6,480				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	11,355	3,640	0	0	0	0	0
Installed thermal - Natural gas (MW)	1,216	1,224	1,224	815	15	15	15
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Capital invested - Biomass power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	0	0	0	0	0

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

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

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

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

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	0	0	0	0	0
Spur (km)		0	0	0	0	0	30.7
All (km)		0	0	0	0	0	30.7
Cumulative investment - Trunk (million \$2018)		0	0	0	0	0	0
Cumulative investment - Spur (million \$2018)		0	0	0	0	0	36
Cumulative investment - All (million \$2018)		0	0	0	0	0	36

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO ₂ e/y)							-53.9
Carbon sink potential - Low - Avoid deforestation (1000 tCO ₂ e/y)							-121
Carbon sink potential - Low - Extend rotation length (1000 tCO ₂ e/y)							-2,454
Carbon sink potential - Low - Improve plantations (1000 tCO ₂ e/y)							-30.8
Carbon sink potential - Low - Increase retention of HWP (1000 tCO ₂ e/y)							-1,480
Carbon sink potential - Low - Increase trees outside forests (1000 tCO ₂ e/y)							-69.1
Carbon sink potential - Low - Reforest cropland (1000 tCO ₂ e/y)							0
Carbon sink potential - Low - Reforest pasture (1000 tCO ₂ e/y)							-236
Carbon sink potential - Low - Restore productivity (1000 tCO ₂ e/y)							-927
Carbon sink potential - Low - All (not counting overlap) (1000 tCO ₂ e/y)							-5,372
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO ₂ e/y)							-80.7
Carbon sink potential - Mid - Avoid deforestation (1000 tCO ₂ e/y)							-422
Carbon sink potential - Mid - Extend rotation length (1000 tCO ₂ e/y)							-4,421
Carbon sink potential - Mid - Improve plantations (1000 tCO ₂ e/y)							-45.2
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO ₂ e/y)							-2,961
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO ₂ e/y)							-133
Carbon sink potential - Mid - Reforest cropland (1000 tCO ₂ e/y)							0
Carbon sink potential - Mid - Reforest pasture (1000 tCO ₂ e/y)							-1,675
Carbon sink potential - Mid - Restore productivity (1000 tCO ₂ e/y)							-1,839
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO ₂ e/y)							-11,577
Carbon sink potential - High - Accelerate regeneration (1000 tCO ₂ e/y)							-108
Carbon sink potential - High - Avoid deforestation (1000 tCO ₂ e/y)							-724
Carbon sink potential - High - Extend rotation length (1000 tCO ₂ e/y)							-6,389
Carbon sink potential - High - Improve plantations (1000 tCO ₂ e/y)							-60.6
Carbon sink potential - High - Increase retention of HWP (1000 tCO ₂ e/y)							-4,441
Carbon sink potential - High - Increase trees outside forests (1000 tCO ₂ e/y)							-197
Carbon sink potential - High - Reforest cropland (1000 tCO ₂ e/y)							0
Carbon sink potential - High - Reforest pasture (1000 tCO ₂ e/y)							-3,114
Carbon sink potential - High - All (not counting overlap) (1000 tCO ₂ e/y)							-17,784

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-2,750
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							8.8
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							92.1
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,248
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							11.2
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)							9.87
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							15.3
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							552
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,937
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							13.2
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							95.1
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							2,253
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							16.8
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							14.3
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							111
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,111
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							3,614
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							17.6

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 - Avoid deforestation (over 30 years) (1000 hectares)							98.1
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							3,258
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							22.3
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)							18.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							88.5
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							912
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							4,415

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)							-17
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-268
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-10.4
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)							-296
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-17
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-509
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-20.7
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

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-546
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							6.53
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							179
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							18.8
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)							0.058
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)							110
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							314
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							6.53
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							838
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							37.7
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)							0.058
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)							110
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							993

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)		135	82.3	74.7	71	68.8	63.8
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		5.33	6.23	6.87	6.6	6.8	6.09
Premature deaths from air pollution - Mobile - On-Road (deaths)		40.4	39.1	38	37	36.1	35.2
Premature deaths from air pollution - Gas Stations (deaths)		4.29	4.14	3.99	3.86	3.74	3.61
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		6.47	5.65	5	4.55	4.24	3.95
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		1.97	1.58	1.08	0.664	0.375	0.221
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		1.18	1.11	1.07	1.03	0.983	0.932
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		1.22	1.15	1.09	1.02	0.962	0.899

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)		8.33	7.73	6.81	5.88	5.35	5.21
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.06	0.958	0.838	0.707	0.619	0.561
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.41	0.398	0.387	0.374	0.362	0.351
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		16.6	11.9	9.74	8.84	8.18	7.37
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		119	122	120	108	103	94.2
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		1,200	729	662	630	609	565
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		47.2	55.2	60.9	58.5	60.2	53.9
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		359	348	338	329	321	313
Monetary damages from air pollution - Gas Stations (million \$2019)		37.9	36.6	35.3	34.2	33.1	31.9
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		57.3	50	44.3	40.3	37.6	35
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		17.5	14	9.56	5.88	3.32	1.96
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		10.5	9.85	9.45	9.13	8.71	8.26
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		10.8	10.2	9.62	9.05	8.51	7.96
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		73.7	68.4	60.2	52	47.3	46.1
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		9.42	8.48	7.42	6.26	5.48	4.97
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		3.63	3.52	3.42	3.31	3.21	3.11
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		147	105	86	78	72.2	65.1
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		1,058	1,082	1,063	957	912	837

Table 65: REF scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		0	0	0	0	0	0
By economic sector - Construction (jobs)		3,794	3,544	3,564	3,645	3,851	3,559
By economic sector - Manufacturing (jobs)		4,346	4,251	4,227	4,466	4,107	3,727
By economic sector - Mining (jobs)		12,528	8,894	6,945	5,597	4,637	3,604

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Other (jobs)		155	129	125	147	163	158
By economic sector - Pipeline (jobs)		589	625	640	602	606	593
By economic sector - Professional (jobs)		3,780	3,025	2,703	2,710	2,699	2,403
By economic sector - Trade (jobs)		4,540	3,335	2,850	2,632	2,475	2,087
By economic sector - Utilities (jobs)		5,450	4,365	4,151	4,158	4,381	3,687
By resource sector - Biomass (jobs)		0	0	0	0	0	0
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Coal (jobs)		15,988	10,167	7,615	6,605	5,881	4,489
By resource sector - Grid (jobs)		4,304	2,815	2,749	2,885	3,448	2,467
By resource sector - Natural Gas (jobs)		7,247	7,523	7,588	7,071	6,866	6,690
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		6,985	6,279	5,685	5,119	4,668	3,958
By resource sector - Solar (jobs)			213	313	248	250	424
By resource sector - Wind (jobs)		658	1,170	1,253	2,029	1,805	1,789
By education level - All sectors - High school diploma or less (jobs)		15,899	12,438	11,004	10,374	9,870	8,507
By education level - All sectors - Associates degree or some college (jobs)		10,361	8,373	7,566	7,264	7,012	6,098
By education level - All sectors - Bachelors degree (jobs)		7,036	5,804	5,239	4,991	4,763	4,111
By education level - All sectors - Masters or professional degree (jobs)		1,662	1,366	1,227	1,168	1,120	967
By education level - All sectors - Doctoral degree (jobs)		225	187	167	160	155	136
Related work experience - All sectors - None (jobs)		4,746	3,834	3,461	3,310	3,191	2,771
Related work experience - All sectors - Up to 1 year (jobs)		7,341	5,721	5,038	4,755	4,505	3,876
Related work experience - All sectors - 1 to 4 years (jobs)		13,259	10,570	9,425	8,924	8,520	7,350
Related work experience - All sectors - 4 to 10 years (jobs)		7,734	6,314	5,716	5,473	5,273	4,580
Related work experience - All sectors - Over 10 years (jobs)		2,103	1,728	1,564	1,495	1,429	1,240
On-the-Job Training - All sectors - None (jobs)		1,768	1,429	1,280	1,215	1,159	1,000
On-the-Job Training - All sectors - Up to 1 year (jobs)		24,193	19,235	17,120	16,221	15,431	13,298
On-the-Job Training - All sectors - 1 to 4 years (jobs)		6,992	5,668	5,121	4,896	4,729	4,112
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,947	1,596	1,462	1,410	1,395	1,226
On-the-Job Training - All sectors - Over 10 years (jobs)		282	240	221	214	205	181
On-Site or In-Plant Training - All sectors - None (jobs)		5,142	4,202	3,796	3,642	3,492	3,035
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		22,210	17,604	15,641	14,795	14,071	12,117
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		5,553	4,480	4,036	3,850	3,709	3,219
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,041	1,684	1,545	1,487	1,466	1,287
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		237	199	186	183	181	160
Wage income - All (million \$2019)		1,821	1,484	1,348	1,295	1,257	1,100

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	151	143	130	122	122	126	130

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Residential (PJ)	38.4	36.3	35.7	35.7	36	36.8	37.6
Final energy use - Commercial (PJ)	48.6	49.4	49.9	50.1	50.6	52.1	55
Final energy use - Industry (PJ)	186	200	210	215	221	226	233

Table 67: REF scenario - PILLAR 1: Efficiency/Electrification - Electricity demand

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion \$2018)		0.92	0.94	1.05	1.08	1.2	1.24

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 (%)	19.1	38.2	38.9	39.9	40.6	41.6	42.9
Sales of space heating units - Electric Resistance (%)	18.7	19	18.9	18.2	17.3	16.5	15
Sales of space heating units - Gas (%)	51.1	28.6	30.6	31.9	32.2	32.1	32
Sales of space heating units - Fossil (%)	11	14.2	11.6	10.1	9.89	9.86	9.99
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	45	61.3	61.3	61	60.7	60.7	60.4
Sales of water heating units - Gas Furnace (%)	52.2	36.6	36.6	36.8	37.1	37.2	37.3
Sales of water heating units - Other (%)	2.8	2.1	2.11	2.14	2.17	2.19	2.21
Sales of cooking units - Electric Resistance (%)	62.1	62.1	62.1	62.1	62.1	62.1	62.1
Sales of cooking units - Gas (%)	37.9	37.9	37.9	37.9	37.9	37.9	37.9
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		0.676	0.631				

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 (%)	3.31	21.2	47.1	68.4	72	72.3	72.3
Sales of space heating units - Electric Resistance (%)	3.22	8.68	12.7	19.9	24.9	25.7	25.8
Sales of space heating units - Gas Furnace (%)	89.4	65.6	36.9	10.2	2.94	1.96	1.9
Sales of space heating units - Fossil (%)	4.12	4.58	3.35	1.41	0.205	0.017	0
Sales of water heating units - Electric Heat Pump (%)	0.114	0.273	0.269	0.271	0.272	0.271	0.272
Sales of water heating units - Electric Resistance (%)	2.92	6.72	6.66	6.66	6.69	6.67	6.68
Sales of water heating units - Gas Furnace (%)	94.5	88.7	88.7	88.7	88.7	88.7	88.7
Sales of water heating units - Other (%)	2.43	4.27	4.39	4.32	4.36	4.39	4.37
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)		5,743	5,973				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	11,355	7,514	3,640	3,640	3,640	3,640	0
Installed thermal - Natural gas (MW)	1,216	1,224	1,224	1,049	537	1,753	2,679

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	10	15	19.9	26.4	34.1	42.9	53.1
Installed renewables - Wind - Base land use assumptions (MW)	740	740	2,587	3,052	4,815	4,896	5,013

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Wind - Base land use assumptions (GWh)	3,100	3,100	9,717	11,384	17,577	17,853	18,248
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)	-5.21		-10.5				-9.4
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-1.21		-2.17				-2.26
Business-as-usual carbon sink - Total (Mt CO2e/y)	-6.42		-12.7				-11.7

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)							-53.9
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-121
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,454
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-30.8
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-1,480
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-69.1
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-236
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-927
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-5,372
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-80.7
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-422
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-4,421
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-45.2
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-2,961
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-133
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							0

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)							-1,675
Carbon sink potential - Mid - Restore productivity (1000 tCO ₂ e/y)							-1,839
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO ₂ e/y)							-11,577
Carbon sink potential - High - Accelerate regeneration (1000 tCO ₂ e/y)							-108
Carbon sink potential - High - Avoid deforestation (1000 tCO ₂ e/y)							-724
Carbon sink potential - High - Extend rotation length (1000 tCO ₂ e/y)							-6,389
Carbon sink potential - High - Improve plantations (1000 tCO ₂ e/y)							-60.6
Carbon sink potential - High - Increase retention of HWP (1000 tCO ₂ e/y)							-4,441
Carbon sink potential - High - Increase trees outside forests (1000 tCO ₂ e/y)							-197
Carbon sink potential - High - Reforest cropland (1000 tCO ₂ e/y)							0
Carbon sink potential - High - Reforest pasture (1000 tCO ₂ e/y)							-3,114
Carbon sink potential - High - All (not counting overlap) (1000 tCO ₂ e/y)							-17,784
Carbon sink potential - High - Restore productivity (1000 tCO ₂ e/y)							-2,750
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							8.8
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							92.1
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,248
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							11.2
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)							9.87
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							15.3
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							552
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,937
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							13.2
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							95.1

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)							2,253
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							16.8
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							14.3
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							111
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,111
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							3,614
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							17.6
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							98.1
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							3,258
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							22.3
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)							18.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							88.5
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							912
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							4,415