Net-Zero America - Kentucky data

October 29, 2021 (updated November 17, 2023)

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

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Table 1: *E+ scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		85.9	0.275	0.273	0.256	0.195	0.019
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		18.7	14.5	8.05	6.39	2.78	0.997
Premature deaths from air pollution - Mobile - On-Road (deaths)		138	128	96.5	55.5	25.3	10.1
Premature deaths from air pollution - Gas Stations (deaths)		12.1	10.9	8.12	4.76	2.31	1.11
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		17.3	14.1	9.54	5.27	2.49	1.02
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		1.74	1.39	0.932	0.523	0.212	0.063
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		3.11	2.77	2.09	1.34	0.676	0.283
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		6.36	5.87	5.42	4.99	4.52	4.04
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		13.8	12.1	8.98	5.7	3.45	2.19
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.47	1.19	0.887	0.616	0.408	0.255
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.833	0.687	0.552	0.424	0.306	0.198
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		2.91	1.36	1.29	1.21	1.16	1.1
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		64.1	58.5	51.6	39.2	28.2	17
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		762	2.43	2.42	2.27	1.73	0.168
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		166	129	71.3	56.6	24.6	8.83
Monetary damages from air pollution - Mobile - On-Road (million $2019)		1,223	1,135	858	493	225	90.1
Monetary damages from air pollution - Gas Stations (million $2019)		107	96.7	71.9	42.2	20.5	9.87
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		153	125	84.5	46.7	22	9.02
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		15.4	12.3	8.26	4.64	1.88	0.561
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		27.6	24.5	18.5	11.8	5.99	2.51
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		56.3	51.9	48	44.2	40	35.8
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		122	107	79.5	50.5	30.6	19.4

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)		13	10.5	7.85	5.45	3.61	2.26
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		7.37	6.08	4.88	3.75	2.71	1.76
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		25.7	12	11.3	10.6	10.3	9.71
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		569	520	458	348	251	151

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		96.7	484	1,257	991	1,105	890
By economic sector - Construction (jobs)		3,515	4,044	4,539	3,999	3,579	4,061
By economic sector - Manufacturing (jobs)		3,386	3,853	4,798	4,404	3,703	4,164
By economic sector - Mining (jobs)		3,343	2,045	1,485	1,026	741	535
By economic sector - Other (jobs)		192	201	253	254	237	309
By economic sector - Pipeline (jobs)		384	485	428	317	312	353
By economic sector - Professional (jobs)		2,162	2,134	2,954	2,574	2,698	2,688
By economic sector - Trade (jobs)		2,011	1,608	1,587	1,369	1,252	1,242
By economic sector - Utilities (jobs)		5,251	5,513	6,118	5,553	4,508	4,961
By resource sector - Biomass (jobs)		295	1,304	3,542	2,961	4,033	3,812
By resource sector - CO2 (jobs)		24.2	1,338	1,452	1,106	1,664	2,392
By resource sector - Coal (jobs)		3,153	589	505	432	384	339
By resource sector - Grid (jobs)		5,655	6,702	8,551	7,326	5,968	6,504
By resource sector - Natural Gas (jobs)		4,926	4,400	3,428	3,561	2,066	1,686
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		4,580	3,754	2,855	2,011	1,414	933
By resource sector - Solar (jobs)		748	912	1,295	1,407	1,368	1,864
By resource sector - Wind (jobs)		959	1,368	1,791	1,683	1,236	1,673
By education level - All sectors - High school diploma or less (jobs)		8,618	8,748	10,291	8,973	7,988	8,415
By education level - All sectors - Associates degree or some college (jobs)		6,292	6,321	7,134	6,308	5,479	5,924
By education level - All sectors - Bachelors degree (jobs)		4,287	4,186	4,709	4,092	3,645	3,812
By education level - All sectors - Masters or professional degree (jobs)		1,012	986	1,133	981	892	923
By education level - All sectors - Doctoral degree (jobs)		131	126	153	132	129	130
Related work experience - All sectors - None (jobs)		2,907	2,965	3,440	3,013	2,674	2,828
Related work experience - All sectors - Up to 1 year (jobs)		3,973	4,029	4,817	4,205	3,809	4,017
Related work experience - All sectors - 1 to 4 years (jobs)		7,467	7,395	8,445	7,369	6,491	6,842
Related work experience - All sectors - 4 to 10 years (jobs)		4,720	4,709	5,296	4,649	4,071	4,350
Related work experience - All sectors - Over 10 years (jobs)		1,274	1,267	1,422	1,250	1,088	1,167
On-the-Job Training - All sectors - None (jobs)		1,063	1,053	1,203	1,049	946	1,001
On-the-Job Training - All sectors - Up to 1 year (jobs)		13,606	13,595	15,827	13,806	12,312	12,933

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)		4,224	4,242	4,751	4,183	3,618	3,901
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,264	1,289	1,428	1,262	1,095	1,191
On-the-Job Training - All sectors - Over 10 years (jobs)		183	187	210	186	162	177
On-Site or In-Plant Training - All sectors - None (jobs)		3,174	3,221	3,752	3,282	2,930	3,095
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		12,387	12,330	14,276	12,460	11,082	11,670
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		3,295	3,307	3,722	3,272	2,839	3,050
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,318	1,336	1,474	1,299	1,130	1,222
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		166	173	195	174	152	165
Wage income - All (million $2019)		1,061	1,065	1,223	1,080	963	1,028

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

Item	2020	2025	2030	2035	2040	2045	2050
Oil consumption - Annual (million bbls)		88.2	77.2	61.2	46.1	34.1	24.3
Oil consumption - Cumulative (million bbls)							1,887
Oil production - Annual (million bbls)		2.93	2.94	2.94	2.33	1.89	1.26
Natural gas consumption - Annual (tcf)		263	222	178	134	84.2	58.4
Natural gas consumption - Cumulative (tcf)							5,358
Natural gas production - Annual (tcf)		96.2	91	79.2	67	53.1	41.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	426	391	344	288	236	205	193
Final energy use - Residential (PJ)	184	171	156	137	121	111	106
Final energy use - Commercial (PJ)	119	118	113	105	99.3	96.6	97
Final energy use - Industry (PJ)	382	396	409	403	409	414	415

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		3.26	3.36	4.91	5.18	4.05	4.16

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	10.4	368	726	1,977	3,229	4,229	5,229
Vehicle stocks - LDV – All others (1000 units)	4,361	4,152	3,944	2,874	1,804	1,021	237
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		840	2,147	3,490	5,282	5,754	5,483
Public EV charging plugs - DC Fast (1000 units)	0.06		1.72		7.66		12.4
Public EV charging plugs - L2 (1000 units)	0.251		41.4		184		298

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 (%)	26.6	42.5	77.8	85.8	86.2	86.1	86.1
Sales of space heating units - Electric Resistance (%)	26.5	25.4	10.6	7.34	7.19	7.29	7.32
Sales of space heating units - Gas (%)	37.2	20.8	6.32	3.1	2.98	2.95	2.94
Sales of space heating units - Fossil (%)	9.65	11.3	5.2	3.78	3.67	3.61	3.61
Sales of water heating units - Electric Heat Pump (%)	0	8.47	44.9	53	53.3	53.4	53.4
Sales of water heating units - Electric Resistance (%)	62.5	70	49.2	44.5	44.3	44.3	44.3
Sales of water heating units - Gas Furnace (%)	34.2	19.2	3.59	0.151	0	0	0
Sales of water heating units - Other (%)	3.3	2.39	2.36	2.36	2.36	2.37	2.38
Sales of cooking units - Electric Resistance (%)	76.9	81.8	96.9	99.8	100	100	100
Sales of cooking units - Gas (%)	23.1	18.2	3.11	0.157	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		3.38	3.59				

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 (%)	5.4	31	77.5	91	92.2	92.3	92.3
Sales of space heating units - Electric Resistance (%)	3.11	4.17	4.51	5.9	6.19	6.19	6.21
Sales of space heating units - Gas (%)	76.4	60.5	17.1	3.03	1.58	1.53	1.52
Sales of space heating units - Fossil (%)	15.1	4.35	0.819	0.034	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.117	10.6	55.7	65.7	66.2	66.2	66.2
Sales of water heating units - Electric Resistance (%)	4.29	9.87	28	32.1	32.3	32.2	32.3
Sales of water heating units - Gas (%)	94.4	77.9	14.7	0.621	0	0	0
Sales of water heating units - Other (%)	1.17	1.57	1.57	1.57	1.57	1.56	1.55
Sales of cooking units - Electric Resistance (%)	43.5	55.3	83.4	88.9	89.2	89.2	89.1
Sales of cooking units - Gas (%)	56.5	44.7	16.6	11.1	10.8	10.8	10.9
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		12,650	14,338				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	10,116	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	7,857	10,932	12,861	12,400	9,318	7,755	8,472
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	45.2	72.8	103	147	208	288	390
Installed renewables - Solar - Base land use assumptions (MW)	68.3	68.3	68.3	68.3	68.3	68.3	145
Installed renewables - Solar - Constrained land use assumptions (MW)	68.3	68.3	68.3	68.3	68.3	68.3	68.3
Installed renewables - Wind - Constrained land use assumptions (MW)	0	0	73.6	421	465	465	465
Capital invested - Solar PV - Base (billion $2018)		0	0	0	0	0	0.071
Capital invested - Solar PV - Constrained (billion $2018)		0.091	0	0	0	0.132	0.08
Capital invested - Wind - Constrained (billion $2018)		0	0.098	0.431	0.052	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Biomass power plant (billion $2018)	0	0	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	5.14	0	0	5.51	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	145	145	145	145	145	145	283
Wind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	145	145	145	145	145	145	145
Wind - Constrained land use assumptions (GWh)	0	0	217	1,055	1,146	1,146	1,146
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	5,771	5,771	5,771	11,950	11,950
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	4	4	4	9	9
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Beccs hydrogen (quantity)	0	0	0	6	6	8	8
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	1	1
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	4,717	5,838	0	6,983	0
Biomass purchases (million $2018/y)		0	227	552	552	902	902

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	5.71	20.1	22.8	35.3	34.1
Annual - BECCS (MMT)		0	5.71	13.2	13	21.4	21.4
Annual - NGCC (MMT)		0	0	6.95	6.44	10.4	9.12
Annual - Cement and lime (MMT)		0	0	0	3.32	3.42	3.53
Cumulative - All (MMT)		0	5.71	25.9	48.6	83.9	118
Cumulative - BECCS (MMT)		0	5.71	18.9	31.9	53.4	74.8
Cumulative - NGCC (MMT)		0	0	6.95	13.4	23.8	33
Cumulative - Cement and lime (MMT)		0	0	0	3.32	6.74	10.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	275	359	359	359	359
Spur (km)		0	230	1,031	1,097	2,176	2,477
All (km)		0	505	1,390	1,455	2,534	2,836
Cumulative investment - Trunk (million $2018)		0	1,440	1,954	1,954	1,954	1,954
Cumulative investment - Spur (million $2018)		0	284	929	966	1,808	2,046
Cumulative investment - All (million $2018)		0	1,724	2,883	2,920	3,762	4,000

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual (MMT)		0	1.1	1.76	3.61	5.16	6.52
Injection wells (wells)		0	1	4	7	12	15
Resource characterization, appraisal, permitting costs (million $2020)		45.8	128	165	165	165	165
Wells and facilities construction costs (million $2020)		0	30.5	119	212	354	439

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)							-48.5
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-256
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,177
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-24.5
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-1,555
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-338
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-704
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-773
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,079
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-6,956
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-72.6
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-897
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-3,923
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-35.9
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-3,110
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-651
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-1,057
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-5,490

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,139
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-17,376
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-96.7
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,537
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-5,669
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-48.1
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-4,665
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-965
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-1,409
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-10,207
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-27,796
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,200
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							7.91
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							195
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,107
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							8.86
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)							48.3
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							46.6
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							50.3
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							642
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							2,107
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							11.9
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							202
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							1,999

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 - Improve plantations (1000 hectares)							13.3
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)							70
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							69.9
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							363
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,293
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							4,022
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							15.8
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							208
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							2,891
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							17.7
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)							91.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							93.2
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							290
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,061
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							4,668

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)							-432
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-2,618
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-67.9
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-3,118

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-432
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-4,963
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-136
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-5,532
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							188
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							1,187
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							124
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,498
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							188
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							2,250
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							247
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							2,685

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)		85.9	0.275	0.273	0.256	0.195	0.019
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		16.1	9.67	3.71	1.59	0.547	0.312
Premature deaths from air pollution - Mobile - On-Road (deaths)		140	141	136	122	96.8	66.2
Premature deaths from air pollution - Gas Stations (deaths)		12.3	12.2	11.6	10.3	8.05	5.51
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		17.4	15.5	13.4	10.9	8.07	5.29
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		1.77	1.66	1.55	1.33	0.968	0.608
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		3.15	3.1	3	2.69	2.09	1.44
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		6.36	5.87	5.42	4.99	4.52	4.04
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		13.9	13.6	12.8	11.3	9.01	6.62

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.48	1.31	1.15	0.967	0.779	0.606
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.833	0.737	0.647	0.561	0.479	0.404
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		2.81	1.36	1.3	1.23	1.17	1.06
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		64	56.3	47.3	40.2	34.6	23.6
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		762	2.43	2.42	2.27	1.73	0.168
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		142	85.7	32.8	14.1	4.84	2.76
Monetary damages from air pollution - Mobile - On-Road (million $2019)		1,243	1,249	1,211	1,086	860	589
Monetary damages from air pollution - Gas Stations (million $2019)		109	108	103	90.9	71.3	48.8
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		154	137	119	96.5	71.5	46.9
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		15.7	14.7	13.7	11.8	8.58	5.38
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		27.9	27.4	26.6	23.8	18.5	12.8
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		56.3	51.9	48	44.2	40	35.8
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		123	120	114	99.8	79.8	58.6
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		13.1	11.6	10.2	8.56	6.9	5.37
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		7.37	6.52	5.73	4.96	4.24	3.58
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		24.8	12	11.5	10.8	10.3	9.38
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		568	500	420	357	307	210

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		104	1,572	2,258	1,748	1,542	890
By economic sector - Construction (jobs)		3,105	3,743	4,732	4,473	4,787	4,758
By economic sector - Manufacturing (jobs)		3,371	4,140	4,892	4,943	5,162	5,333
By economic sector - Mining (jobs)		3,395	2,086	1,629	1,268	1,021	741
By economic sector - Other (jobs)		160	158	247	268	281	301
By economic sector - Pipeline (jobs)		385	591	552	434	495	587
By economic sector - Professional (jobs)		1,981	2,974	4,262	4,323	4,045	2,708

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Trade (jobs)		1,996	1,642	2,030	2,059	1,851	1,335
By economic sector - Utilities (jobs)		4,426	4,528	5,656	5,353	5,738	5,575
By resource sector - Biomass (jobs)		307	4,202	7,433	7,292	6,568	3,682
By resource sector - CO2 (jobs)		24.5	2,274	2,494	1,912	2,854	4,080
By resource sector - Coal (jobs)		3,473	789	513	443	385	321
By resource sector - Grid (jobs)		4,519	4,411	6,787	6,599	7,328	6,374
By resource sector - Natural Gas (jobs)		4,185	3,410	2,949	2,907	2,182	1,709
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		4,621	3,964	3,411	2,833	2,264	1,510
By resource sector - Solar (jobs)		782	950	1,083	1,245	1,518	1,907
By resource sector - Wind (jobs)		1,012	1,433	1,588	1,638	1,823	2,648
By education level - All sectors - High school diploma or less (jobs)		8,050	9,447	11,688	10,890	10,920	9,760
By education level - All sectors - Associates degree or some college (jobs)		5,794	6,305	7,640	7,291	7,434	6,909
By education level - All sectors - Bachelors degree (jobs)		4,017	4,448	5,391	5,197	5,118	4,386
By education level - All sectors - Masters or professional degree (jobs)		940	1,078	1,336	1,290	1,260	1,035
By education level - All sectors - Doctoral degree (jobs)		123	155	203	200	190	140
Related work experience - All sectors - None (jobs)		2,690	3,143	3,886	3,659	3,668	3,272
Related work experience - All sectors - Up to 1 year (jobs)		3,723	4,449	5,599	5,287	5,273	4,616
Related work experience - All sectors - 1 to 4 years (jobs)		6,956	7,766	9,434	8,905	8,900	7,917
Related work experience - All sectors - 4 to 10 years (jobs)		4,369	4,794	5,801	5,540	5,586	5,058
Related work experience - All sectors - Over 10 years (jobs)		1,185	1,281	1,538	1,479	1,496	1,367
On-the-Job Training - All sectors - None (jobs)		997	1,122	1,390	1,338	1,326	1,151
On-the-Job Training - All sectors - Up to 1 year (jobs)		12,735	14,665	18,074	17,101	17,016	14,925
On-the-Job Training - All sectors - 1 to 4 years (jobs)		3,882	4,211	5,058	4,787	4,888	4,559
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,139	1,243	1,509	1,424	1,469	1,381
On-the-Job Training - All sectors - Over 10 years (jobs)		171	190	227	218	223	213
On-Site or In-Plant Training - All sectors - None (jobs)		2,955	3,478	4,288	4,064	4,049	3,575
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		11,584	13,170	16,193	15,337	15,294	13,480
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		3,038	3,315	3,993	3,776	3,844	3,562
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,195	1,301	1,575	1,491	1,528	1,420
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		150	168	208	200	206	192
Wage income - All (million $2019)		985	1,109	1,363	1,307	1,324	1,189

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	427	394	360	333	312	287	259
Final energy use - Residential (PJ)	184	172	163	153	142	129	118
Final energy use - Commercial (PJ)	119	119	117	114	110	106	103
Final energy use - Industry (PJ)	382	396	410	408	416	420	420

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		2.71	2.75	3.26	3.36	4.25	4.44

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	8.06	113	218	706	1,193	2,271	3,349
Vehicle stocks - LDV – All others (1000 units)	4,378	4,378	4,378	4,153	3,928	3,027	2,126
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		0	135	286	962	3,037	4,422
Public EV charging plugs - DC Fast (1000 units)	0.06		0.518		2.83		7.94
Public EV charging plugs - L2 (1000 units)	0.251		12.5		68		191

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 (%)	26.6	35.6	39.7	51.4	69.2	80.7	84.7
Sales of space heating units - Electric Resistance (%)	26.5	28.2	26.4	21.5	14.1	9.46	7.83
Sales of space heating units - Gas (%)	37.2	23.6	22	17.4	10.1	5.25	3.56
Sales of space heating units - Fossil (%)	9.65	12.5	11.9	9.77	6.6	4.55	3.88
Sales of water heating units - Electric Heat Pump (%)	0	1.46	5.6	17.5	35.8	47.8	51.9
Sales of water heating units - Electric Resistance (%)	62.5	74	71.8	64.8	54.3	47.5	45.1
Sales of water heating units - Gas Furnace (%)	34.2	22.2	20.3	15.3	7.52	2.39	0.624
Sales of water heating units - Other (%)	3.3	2.39	2.37	2.38	2.39	2.38	2.38
Sales of cooking units - Electric Resistance (%)	76.8	77.4	79.5	85.1	92.9	97.7	99.4
Sales of cooking units - Gas (%)	23.2	22.6	20.5	14.9	7.09	2.29	0.616
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		3.35	3.47				

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 (%)	5.4	22.1	27.3	42.8	66.9	83.6	89.9
Sales of space heating units - Electric Resistance (%)	3.11	4.17	4.24	4.4	4.84	5.52	5.99
Sales of space heating units - Gas (%)	76.4	68.7	63.8	49.5	26.6	10.3	3.94
Sales of space heating units - Fossil (%)	15.1	5.03	4.61	3.36	1.65	0.539	0.139
Sales of water heating units - Electric Heat Pump (%)	0.117	1.95	7.08	21.8	44.5	59.3	64.4
Sales of water heating units - Electric Resistance (%)	4.29	6.36	8.3	14.3	23.5	29.4	31.5
Sales of water heating units - Gas (%)	94.4	90.1	83.1	62.2	30.5	9.74	2.54
Sales of water heating units - Other (%)	1.17	1.57	1.57	1.57	1.57	1.56	1.55
Sales of cooking units - Electric Resistance (%)	43.5	47.1	51.3	61.6	76.1	85	88
Sales of cooking units - Gas (%)	56.5	52.9	48.7	38.4	23.9	15	12
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		12,642	14,325				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	10,116	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	7,857	7,886	7,313	7,569	5,648	6,366	6,846
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)							-48.5
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-256
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,177
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-24.5
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-1,555
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-338
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-704
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-773
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,079
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-6,956
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-72.6
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-897
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-3,923
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-35.9
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-3,110
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-651
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-1,057
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-5,490
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,139
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-17,376
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-96.7
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,537
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-5,669
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-48.1
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-4,665
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-965
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-1,409

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-10,207
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-27,796
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,200
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							7.91
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							195
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,107
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							8.86
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)							48.3
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							46.6
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							50.3
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							642
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							2,107
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							11.9
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							202
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							1,999
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							13.3
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)							70
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							69.9
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							363
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,293
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							4,022

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							15.8
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							208
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							2,891
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							17.7
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)							91.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							93.2
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							290
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,061
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							4,668

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)							-432
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-2,618
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-67.9
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-3,118
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-432
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-4,963
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-136
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-5,532
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							188
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							1,187

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							124
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,498
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							188
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							2,250
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							247
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							2,685

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)		85.9	0.275	0.273	0.256	0.195	0.019
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		15.6	11.1	6.16	3.78	1.16	0.366
Premature deaths from air pollution - Mobile - On-Road (deaths)		138	128	96.5	55.5	25.3	10.1
Premature deaths from air pollution - Gas Stations (deaths)		12.1	10.9	8.12	4.76	2.31	1.11
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		17.3	14.1	9.54	5.27	2.49	1.02
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		1.74	1.39	0.932	0.523	0.212	0.063
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		3.11	2.77	2.09	1.34	0.676	0.283
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		6.36	5.87	5.42	4.99	4.52	4.04
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		13.8	12.1	8.98	5.7	3.45	2.19
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.47	1.19	0.887	0.616	0.408	0.255
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.833	0.687	0.552	0.424	0.306	0.198
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		3.15	1.36	1.28	1.2	1.16	1.02
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		63	57.6	48.2	33.8	20.1	2.86
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		762	2.43	2.42	2.27	1.73	0.168

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		138	98.7	54.6	33.5	10.3	3.25
Monetary damages from air pollution - Mobile - On-Road (million $2019)		1,223	1,135	858	493	225	90.1
Monetary damages from air pollution - Gas Stations (million $2019)		107	96.7	71.9	42.2	20.5	9.87
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		153	125	84.5	46.7	22	9.02
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		15.4	12.3	8.26	4.64	1.88	0.561
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		27.6	24.5	18.5	11.8	5.99	2.51
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		56.3	51.9	48	44.2	40	35.8
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		122	107	79.5	50.5	30.6	19.4
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		13	10.5	7.85	5.45	3.61	2.26
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		7.37	6.08	4.88	3.75	2.71	1.76
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		27.8	12	11.3	10.6	10.3	8.97
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		559	512	428	300	178	25.4

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		96.9	135	1,157	913	943	893
By economic sector - Construction (jobs)		3,162	2,841	3,398	2,965	2,949	6,619
By economic sector - Manufacturing (jobs)		3,524	4,110	5,839	5,954	6,874	7,836
By economic sector - Mining (jobs)		3,413	1,976	1,349	847	499	169
By economic sector - Other (jobs)		167	151	218	220	320	1,243
By economic sector - Pipeline (jobs)		375	317	229	153	89.7	27.1
By economic sector - Professional (jobs)		1,982	1,393	2,509	2,311	2,503	4,231
By economic sector - Trade (jobs)		1,945	1,381	1,366	1,196	1,171	2,258
By economic sector - Utilities (jobs)		4,527	3,613	4,490	4,003	3,514	6,510
By resource sector - Biomass (jobs)		282	348	3,087	2,952	3,505	3,938
By resource sector - CO2 (jobs)		0	0	0	0.001	0.001	0
By resource sector - Coal (jobs)		3,336	589	504	431	383	298
By resource sector - Grid (jobs)		4,807	4,774	7,022	5,819	5,644	11,318
By resource sector - Natural Gas (jobs)		4,260	3,640	2,799	2,672	1,645	1,960
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		4,581	3,719	2,766	1,809	1,039	48.8
By resource sector - Solar (jobs)		830	1,251	1,868	2,231	3,695	8,205
By resource sector - Wind (jobs)		1,096	1,596	2,510	2,649	2,950	4,019
By education level - All sectors - High school diploma or less (jobs)		8,189	6,827	9,086	8,165	8,325	12,952

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

Item	2020	2025	2030	2035	2040	2045	2050
By education level - All sectors - Associates degree or some college (jobs)		5,889	4,914	6,184	5,642	5,722	9,362
By education level - All sectors - Bachelors degree (jobs)		4,045	3,327	4,172	3,762	3,809	5,861
By education level - All sectors - Masters or professional degree (jobs)		946	755	981	876	884	1,412
By education level - All sectors - Doctoral degree (jobs)		123	93.1	131	118	122	199
Related work experience - All sectors - None (jobs)		2,728	2,282	2,985	2,691	2,724	4,343
Related work experience - All sectors - Up to 1 year (jobs)		3,787	3,163	4,310	3,912	4,066	6,316
Related work experience - All sectors - 1 to 4 years (jobs)		7,048	5,780	7,398	6,643	6,699	10,565
Related work experience - All sectors - 4 to 10 years (jobs)		4,425	3,671	4,591	4,155	4,187	6,727
Related work experience - All sectors - Over 10 years (jobs)		1,203	1,020	1,271	1,160	1,185	1,835
On-the-Job Training - All sectors - None (jobs)		1,006	834	1,060	961	990	1,592
On-the-Job Training - All sectors - Up to 1 year (jobs)		12,910	10,722	14,102	12,747	13,039	20,050
On-the-Job Training - All sectors - 1 to 4 years (jobs)		3,946	3,272	4,066	3,669	3,671	6,057
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,156	934	1,135	1,007	974	1,796
On-the-Job Training - All sectors - Over 10 years (jobs)		174	154	192	178	187	290
On-Site or In-Plant Training - All sectors - None (jobs)		2,992	2,516	3,325	3,018	3,101	4,876
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		11,748	9,724	12,674	11,450	11,687	18,087
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		3,088	2,565	3,208	2,893	2,905	4,744
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,211	982	1,184	1,052	1,019	1,826
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		153	130	164	150	150	253
Wage income - All (million $2019)		997	828	1,060	961	972	1,556

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	426	391	344	288	236	205	193
Final energy use - Residential (PJ)	184	171	156	137	121	111	106
Final energy use - Commercial (PJ)	119	118	113	105	99.3	96.6	97
Final energy use - Industry (PJ)	382	396	409	403	409	414	415

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		3.26	3.36	4.91	5.18	4.05	4.16

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	10.4	368	726	1,977	3,229	4,229	5,229
Vehicle stocks - LDV – All others (1000 units)	4,361	4,152	3,944	2,874	1,804	1,021	237

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		840	2,147	3,490	5,282	5,754	5,483
Public EV charging plugs - DC Fast (1000 units)	0.06		1.72		7.66		12.4
Public EV charging plugs - L2 (1000 units)	0.251		41.4		184		298

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 (%)	26.6	42.5	77.8	85.8	86.2	86.1	86.1
Sales of space heating units - Electric Resistance (%)	26.5	25.4	10.6	7.34	7.19	7.29	7.32
Sales of space heating units - Gas (%)	37.2	20.8	6.32	3.1	2.98	2.95	2.94
Sales of space heating units - Fossil (%)	9.65	11.3	5.2	3.78	3.67	3.61	3.61
Sales of water heating units - Electric Heat Pump (%)	0	8.47	44.9	53	53.3	53.4	53.4
Sales of water heating units - Electric Resistance (%)	62.5	70	49.2	44.5	44.3	44.3	44.3
Sales of water heating units - Gas Furnace (%)	34.2	19.2	3.59	0.151	0	0	0
Sales of water heating units - Other (%)	3.3	2.39	2.36	2.36	2.36	2.37	2.38
Sales of cooking units - Electric Resistance (%)	76.9	81.8	96.9	99.8	100	100	100
Sales of cooking units - Gas (%)	23.1	18.2	3.11	0.157	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		3.38	3.59				

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 (%)	5.4	31	77.5	91	92.2	92.3	92.3
Sales of space heating units - Electric Resistance (%)	3.11	4.17	4.51	5.9	6.19	6.19	6.21
Sales of space heating units - Gas (%)	76.4	60.5	17.1	3.03	1.58	1.53	1.52
Sales of space heating units - Fossil (%)	15.1	4.35	0.819	0.034	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.117	10.6	55.7	65.7	66.2	66.2	66.2
Sales of water heating units - Electric Resistance (%)	4.29	9.87	28	32.1	32.3	32.2	32.3
Sales of water heating units - Gas (%)	94.4	77.9	14.7	0.621	0	0	0
Sales of water heating units - Other (%)	1.17	1.57	1.57	1.57	1.57	1.56	1.55
Sales of cooking units - Electric Resistance (%)	43.5	55.3	83.4	88.9	89.2	89.2	89.1
Sales of cooking units - Gas (%)	56.5	44.7	16.6	11.1	10.8	10.8	10.9
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		12,650	14,338				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	10,116	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	7,898	8,899	8,582	8,821	5,442	6,089	11,096
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	45.2	72.8	103	147	208	288	390
Installed renewables - Solar - Base land use assumptions (MW)	68.3	68.3	68.3	68.3	68.3	597	6,284
Installed renewables - Wind - Base land use assumptions (MW)	0	0	0	0	256	359	524

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed renewables - Solar - Constrained land use assumptions (MW)	68.4	68.4	68.4	68.4	68.4	799	6,559
Installed renewables - Wind - Constrained land use assumptions (MW)	0	0	73.6	465	465	465	465
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion $2018)		0	0	0	0	0.519	5.27
Capital invested - Wind - Base (billion $2018)		0	0	0	0.302	0.116	0.175

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	145	145	145	145	145	1,075	11,440
Wind - Base land use assumptions (GWh)	0	0	0	0	623	860	1,310
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	289	289	289	289	289	2,876	23,756
Wind - Constrained land use assumptions (GWh)	0	0	433	2,292	2,292	2,292	2,292
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)							-48.5
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-256
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,177
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-24.5
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-1,555
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-338
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-704
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-773
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,079
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-6,956
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-72.6
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-897
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-3,923
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-35.9
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-3,110
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-651

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-1,057
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-5,490
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,139
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-17,376
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-96.7
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,537
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-5,669
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-48.1
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-4,665
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-965
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-1,409
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-10,207
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-27,796
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,200
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							7.91
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							195
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,107
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							8.86
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)							48.3
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							46.6
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							50.3
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							642
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							2,107
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							11.9

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 - Mid - Avoid deforestation (over 30 years) (1000 hectares)							202
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							1,999
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							13.3
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)							70
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							69.9
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							363
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,293
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							4,022
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							15.8
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							208
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							2,891
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							17.7
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)							91.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							93.2
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							290
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,061
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							4,668

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-432

Table 37: *E+RE+ 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)							-2,618
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-67.9
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-3,118
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-432
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-4,963
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-136
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-5,532
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							188
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							1,187
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							124
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,498
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							188
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							2,250
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							247
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							2,685

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)		85.9	0.275	0.273	0.256	0.195	0.019
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		15.7	10.3	13.2	9.81	3.29	1.01
Premature deaths from air pollution - Mobile - On-Road (deaths)		138	128	96.5	55.5	25.3	10.1
Premature deaths from air pollution - Gas Stations (deaths)		12.1	10.9	8.12	4.76	2.31	1.11
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		17.3	14.1	9.54	5.27	2.49	1.02
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		1.74	1.39	0.932	0.523	0.212	0.063

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		3.11	2.77	2.09	1.34	0.676	0.283
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		6.36	5.87	5.42	4.99	4.52	4.04
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		13.8	12.1	8.98	5.7	3.45	2.19
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.47	1.19	0.887	0.616	0.408	0.255
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.833	0.687	0.552	0.424	0.306	0.198
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		2.67	1.36	1.28	1.21	1.16	1.02
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		64.9	61.1	58.2	48	39	28.2
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		762	2.43	2.42	2.27	1.73	0.168
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		140	91.6	117	86.9	29.1	8.96
Monetary damages from air pollution - Mobile - On-Road (million $2019)		1,223	1,135	858	493	225	90.1
Monetary damages from air pollution - Gas Stations (million $2019)		107	96.7	71.9	42.2	20.5	9.87
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		153	125	84.5	46.7	22	9.02
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		15.4	12.3	8.26	4.64	1.88	0.561
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		27.6	24.5	18.5	11.8	5.99	2.51
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		56.3	51.9	48	44.2	40	35.8
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		122	107	79.5	50.5	30.6	19.4
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		13	10.5	7.85	5.45	3.61	2.26
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		7.37	6.08	4.88	3.75	2.71	1.76
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		23.5	12	11.3	10.6	10.3	8.97
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		577	542	516	426	346	250

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		102	1,689	2,290	1,413	1,242	888
By economic sector - Construction (jobs)		2,998	4,094	5,638	5,064	6,446	8,052
By economic sector - Manufacturing (jobs)		2,900	3,003	3,408	3,171	3,306	3,315
By economic sector - Mining (jobs)		3,260	2,120	1,649	1,214	962	740
By economic sector - Other (jobs)		150	171	292	290	366	459
By economic sector - Pipeline (jobs)		393	648	628	493	554	673
By economic sector - Professional (jobs)		1,855	3,054	4,648	3,726	4,977	6,078
By economic sector - Trade (jobs)		1,840	1,636	2,142	1,817	2,189	2,592
By economic sector - Utilities (jobs)		4,177	5,138	7,133	6,822	15,045	25,315
By resource sector - Biomass (jobs)		285	4,312	7,778	5,236	4,866	3,702
By resource sector - CO2 (jobs)		24.7	2,581	2,829	2,151	3,211	4,604
By resource sector - Coal (jobs)		2,973	587	504	431	384	298
By resource sector - Grid (jobs)		4,109	4,765	9,052	8,592	11,051	13,183
By resource sector - Natural Gas (jobs)		4,322	4,377	3,782	4,239	4,209	3,598
By resource sector - Nuclear (jobs)		0	0	0	0	8,633	20,291
By resource sector - Oil (jobs)		4,579	3,754	2,855	2,011	1,458	1,080
By resource sector - Solar (jobs)		642	616	624	698	744	982
By resource sector - Wind (jobs)		738	562	403	653	530	377
By education level - All sectors - High school diploma or less (jobs)		7,492	9,506	12,309	10,463	12,101	13,536
By education level - All sectors - Associates degree or some college (jobs)		5,409	6,369	8,205	7,290	8,851	10,339
By education level - All sectors - Bachelors degree (jobs)		3,769	4,427	5,662	4,863	5,863	6,773
By education level - All sectors - Masters or professional degree (jobs)		887	1,093	1,435	1,217	1,498	1,751
By education level - All sectors - Doctoral degree (jobs)		117	158	218	178	225	268
Related work experience - All sectors - None (jobs)		2,518	3,188	4,147	3,566	4,199	4,761
Related work experience - All sectors - Up to 1 year (jobs)		3,454	4,432	5,840	4,934	5,745	6,447
Related work experience - All sectors - 1 to 4 years (jobs)		6,501	7,827	10,019	8,638	10,280	11,784
Related work experience - All sectors - 4 to 10 years (jobs)		4,093	4,840	6,212	5,451	6,602	7,691
Related work experience - All sectors - Over 10 years (jobs)		1,107	1,266	1,611	1,422	1,712	1,986
On-the-Job Training - All sectors - None (jobs)		933	1,119	1,463	1,253	1,488	1,704
On-the-Job Training - All sectors - Up to 1 year (jobs)		11,860	14,629	18,916	16,136	18,966	21,454
On-the-Job Training - All sectors - 1 to 4 years (jobs)		3,641	4,294	5,487	4,868	5,913	6,924
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,081	1,326	1,732	1,551	1,926	2,301
On-the-Job Training - All sectors - Over 10 years (jobs)		160	185	231	204	245	286
On-Site or In-Plant Training - All sectors - None (jobs)		2,761	3,479	4,503	3,849	4,592	5,271
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		10,793	13,157	17,003	14,563	17,145	19,433
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		2,845	3,367	4,306	3,800	4,583	5,333
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,134	1,376	1,787	1,593	1,965	2,334
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		141	174	229	206	253	298
Wage income - All (million $2019)		924	1,124	1,460	1,280	1,548	1,800

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	426	391	344	288	236	205	193
Final energy use - Residential (PJ)	184	171	156	137	121	111	106
Final energy use - Commercial (PJ)	119	118	113	105	99.3	96.6	97
Final energy use - Industry (PJ)	382	396	409	403	409	414	415

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		3.26	3.36	4.91	5.18	4.05	4.16

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	10.4	368	726	1,977	3,229	4,229	5,229
Vehicle stocks - LDV – All others (1000 units)	4,361	4,152	3,944	2,874	1,804	1,021	237
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		840	2,147	3,490	5,282	5,754	5,483
Public EV charging plugs - DC Fast (1000 units)	0.06		1.72		7.66		12.4
Public EV charging plugs - L2 (1000 units)	0.251		41.4		184		298

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 (%)	26.6	42.5	77.8	85.8	86.2	86.1	86.1
Sales of space heating units - Electric Resistance (%)	26.5	25.4	10.6	7.34	7.19	7.29	7.32
Sales of space heating units - Gas (%)	37.2	20.8	6.32	3.1	2.98	2.95	2.94
Sales of space heating units - Fossil (%)	9.65	11.3	5.2	3.78	3.67	3.61	3.61
Sales of water heating units - Electric Heat Pump (%)	0	8.47	44.9	53	53.3	53.4	53.4
Sales of water heating units - Electric Resistance (%)	62.5	70	49.2	44.5	44.3	44.3	44.3
Sales of water heating units - Gas Furnace (%)	34.2	19.2	3.59	0.151	0	0	0
Sales of water heating units - Other (%)	3.3	2.39	2.36	2.36	2.36	2.37	2.38
Sales of cooking units - Electric Resistance (%)	76.9	81.8	96.9	99.8	100	100	100
Sales of cooking units - Gas (%)	23.1	18.2	3.11	0.157	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		3.38	3.59				

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 (%)	5.4	31	77.5	91	92.2	92.3	92.3
Sales of space heating units - Electric Resistance (%)	3.11	4.17	4.51	5.9	6.19	6.19	6.21
Sales of space heating units - Gas (%)	76.4	60.5	17.1	3.03	1.58	1.53	1.52
Sales of space heating units - Fossil (%)	15.1	4.35	0.819	0.034	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.117	10.6	55.7	65.7	66.2	66.2	66.2
Sales of water heating units - Electric Resistance (%)	4.29	9.87	28	32.1	32.3	32.2	32.3
Sales of water heating units - Gas (%)	94.4	77.9	14.7	0.621	0	0	0
Sales of water heating units - Other (%)	1.17	1.57	1.57	1.57	1.57	1.56	1.55

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of cooking units - Electric Resistance (%)	43.5	55.3	83.4	88.9	89.2	89.2	89.1
Sales of cooking units - Gas (%)	56.5	44.7	16.6	11.1	10.8	10.8	10.9
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		12,650	14,338				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	10,116	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	7,857	7,420	7,288	9,318	10,224	15,250	13,296
Installed thermal - Nuclear (MW)	0	0	0	0	0	3,742	11,906
Installed renewables - Rooftop PV (MW)	45.2	72.8	103	147	208	288	390
Installed renewables - Solar - Base land use assumptions (MW)	68.3	68.3	68.3	68.3	68.3	68.3	68.3
Installed renewables - Solar - Constrained land use assumptions (MW)	68.4	68.4	68.4	68.4	68.4	68.4	68.4
Installed renewables - Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion $2018)		0	0	0	0	0	0
Capital invested - Solar PV - Constrained (billion $2018)		0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	145	145	145	145	145	145	145
Wind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	145	145	145	145	145	145	145
Wind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-48.5
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-256
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,177
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-24.5
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-1,555
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-338
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-704
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-773

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,079
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-6,956
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-72.6
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-897
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-3,923
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-35.9
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-3,110
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-651
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-1,057
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-5,490
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,139
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-17,376
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-96.7
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,537
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-5,669
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-48.1
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-4,665
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-965
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-1,409
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-10,207
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-27,796
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,200
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							7.91
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							195
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,107
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							8.86
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							48.3
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							46.6
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							50.3
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							642
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							2,107
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							11.9
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							202
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							1,999
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							13.3
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)							70
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							69.9
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							363
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,293
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							4,022
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							15.8
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							208
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							2,891
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							17.7
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)							91.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							93.2

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							290
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,061
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							4,668

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)							-432
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-2,618
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-67.9
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-3,118
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-432
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-4,963
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-136
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-5,532
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							188
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							1,187
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							124
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,498
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							188
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							2,250
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							247
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							2,685

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)		85.9	0.275	0.273	0.256	0.195	0.019
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		16.3	9.35	5.14	3.22	1.62	0.626
Premature deaths from air pollution - Mobile - On-Road (deaths)		140	141	136	122	96.8	66.2
Premature deaths from air pollution - Gas Stations (deaths)		12.3	12.2	11.6	10.3	8.05	5.51
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		17.4	15.5	13.4	10.9	8.07	5.29
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		1.77	1.66	1.55	1.33	0.968	0.608
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		3.15	3.1	3	2.69	2.09	1.44
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		6.36	5.87	5.42	4.99	4.52	4.04
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		13.9	13.6	12.8	11.3	9.01	6.62
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.48	1.31	1.15	0.967	0.779	0.606
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.833	0.737	0.647	0.561	0.479	0.404
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		2.9	1.36	1.3	1.23	1.18	1.11
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		64	56.3	47.3	40.2	34.6	23.6
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		762	2.43	2.42	2.27	1.73	0.168
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		144	82.8	45.5	28.5	14.3	5.55
Monetary damages from air pollution - Mobile - On-Road (million $2019)		1,243	1,249	1,211	1,086	860	589
Monetary damages from air pollution - Gas Stations (million $2019)		109	108	103	90.9	71.3	48.8
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		154	137	119	96.5	71.5	46.9
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		15.7	14.7	13.7	11.8	8.58	5.38
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		27.9	27.4	26.6	23.8	18.5	12.8
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		56.3	51.9	48	44.2	40	35.8
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		123	120	114	99.8	79.8	58.6

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		13.1	11.6	10.2	8.56	6.9	5.37
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		7.37	6.52	5.73	4.96	4.24	3.58
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		25.6	12	11.5	10.8	10.4	9.81
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		568	500	420	357	307	210

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		101	3,497	1,665	1,532	1,762	1,634
By economic sector - Construction (jobs)		3,021	4,194	4,528	4,164	4,721	5,241
By economic sector - Manufacturing (jobs)		3,375	4,882	4,289	3,726	4,228	5,028
By economic sector - Mining (jobs)		3,341	2,082	1,638	1,311	1,040	720
By economic sector - Other (jobs)		155	194	227	243	279	340
By economic sector - Pipeline (jobs)		382	597	563	446	500	592
By economic sector - Professional (jobs)		1,908	5,170	3,496	3,915	4,695	4,457
By economic sector - Trade (jobs)		1,894	1,992	1,861	1,964	2,067	1,844
By economic sector - Utilities (jobs)		4,249	5,062	5,434	4,964	5,442	5,909
By resource sector - Biomass (jobs)		300	9,385	5,565	6,370	8,152	7,717
By resource sector - CO2 (jobs)		24.4	2,328	2,559	1,980	2,943	4,155
By resource sector - Coal (jobs)		3,144	591	513	444	395	344
By resource sector - Grid (jobs)		4,216	5,380	6,452	5,810	6,944	7,143
By resource sector - Natural Gas (jobs)		4,293	3,601	2,869	2,933	1,842	1,365
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		4,622	3,964	3,411	2,926	2,277	1,445
By resource sector - Solar (jobs)		773	940	956	950	1,111	1,856
By resource sector - Wind (jobs)		1,053	1,481	1,375	852	1,073	1,739
By education level - All sectors - High school diploma or less (jobs)		7,837	12,453	10,485	9,722	10,798	11,288
By education level - All sectors - Associates degree or some college (jobs)		5,641	7,725	7,010	6,522	7,227	7,699
By education level - All sectors - Bachelors degree (jobs)		3,914	5,780	4,846	4,671	5,187	5,264
By education level - All sectors - Masters or professional degree (jobs)		915	1,475	1,185	1,168	1,312	1,311
By education level - All sectors - Doctoral degree (jobs)		120	236	174	182	211	203
Related work experience - All sectors - None (jobs)		2,620	4,096	3,501	3,285	3,649	3,803
Related work experience - All sectors - Up to 1 year (jobs)		3,625	6,011	4,972	4,697	5,290	5,509
Related work experience - All sectors - 1 to 4 years (jobs)		6,770	10,009	8,527	7,992	8,826	9,145
Related work experience - All sectors - 4 to 10 years (jobs)		4,254	5,981	5,295	4,978	5,513	5,772
Related work experience - All sectors - Over 10 years (jobs)		1,157	1,573	1,405	1,315	1,458	1,536
On-the-Job Training - All sectors - None (jobs)		970	1,457	1,249	1,202	1,345	1,382
On-the-Job Training - All sectors - Up to 1 year (jobs)		12,399	19,368	16,172	15,256	16,983	17,556

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

Item	2020	2025	2030	2035	2040	2045	2050
On-the-Job Training - All sectors - 1 to 4 years (jobs)		3,782	5,127	4,661	4,306	4,746	5,049
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,107	1,489	1,409	1,310	1,448	1,546
On-the-Job Training - All sectors - Over 10 years (jobs)		168	228	208	192	213	231
On-Site or In-Plant Training - All sectors - None (jobs)		2,880	4,601	3,835	3,623	4,039	4,197
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		11,277	17,227	14,539	13,700	15,239	15,782
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		2,959	4,074	3,668	3,392	3,740	3,966
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,162	1,563	1,466	1,371	1,514	1,603
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		146	204	192	180	202	217
Wage income - All (million $2019)		959	1,419	1,235	1,178	1,320	1,382

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	427	394	360	333	312	287	259
Final energy use - Residential (PJ)	184	172	163	153	142	129	118
Final energy use - Commercial (PJ)	119	119	117	114	110	106	103
Final energy use - Industry (PJ)	382	396	410	408	416	420	420

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		2.71	2.75	3.26	3.36	4.25	4.44

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	8.06	113	218	706	1,193	2,271	3,349
Vehicle stocks - LDV – All others (1000 units)	4,378	4,378	4,378	4,153	3,928	3,027	2,126
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		0	135	286	962	3,037	4,422
Public EV charging plugs - DC Fast (1000 units)	0.06		0.518		2.83		7.94
Public EV charging plugs - L2 (1000 units)	0.251		12.5		68		191

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 (%)	26.6	35.6	39.7	51.4	69.2	80.7	84.7
Sales of space heating units - Electric Resistance (%)	26.5	28.2	26.4	21.5	14.1	9.46	7.83
Sales of space heating units - Gas (%)	37.2	23.6	22	17.4	10.1	5.25	3.56
Sales of space heating units - Fossil (%)	9.65	12.5	11.9	9.77	6.6	4.55	3.88
Sales of water heating units - Electric Heat Pump (%)	0	1.46	5.6	17.5	35.8	47.8	51.9
Sales of water heating units - Electric Resistance (%)	62.5	74	71.8	64.8	54.3	47.5	45.1
Sales of water heating units - Gas Furnace (%)	34.2	22.2	20.3	15.3	7.52	2.39	0.624
Sales of water heating units - Other (%)	3.3	2.39	2.37	2.38	2.39	2.38	2.38

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of cooking units - Electric Resistance (%)	76.8	77.4	79.5	85.1	92.9	97.7	99.4
Sales of cooking units - Gas (%)	23.2	22.6	20.5	14.9	7.09	2.29	0.616
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		3.35	3.47				

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 (%)	5.4	22.1	27.3	42.8	66.9	83.6	89.9
Sales of space heating units - Electric Resistance (%)	3.11	4.17	4.24	4.4	4.84	5.52	5.99
Sales of space heating units - Gas (%)	76.4	68.7	63.8	49.5	26.6	10.3	3.94
Sales of space heating units - Fossil (%)	15.1	5.03	4.61	3.36	1.65	0.539	0.139
Sales of water heating units - Electric Heat Pump (%)	0.117	1.95	7.08	21.8	44.5	59.3	64.4
Sales of water heating units - Electric Resistance (%)	4.29	6.36	8.3	14.3	23.5	29.4	31.5
Sales of water heating units - Gas (%)	94.4	90.1	83.1	62.2	30.5	9.74	2.54
Sales of water heating units - Other (%)	1.17	1.57	1.57	1.57	1.57	1.56	1.55
Sales of cooking units - Electric Resistance (%)	43.5	47.1	51.3	61.6	76.1	85	88
Sales of cooking units - Gas (%)	56.5	52.9	48.7	38.4	23.9	15	12
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		12,642	14,325				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	10,116	1,493	0	0	0	0	0
Installed thermal - Natural gas (MW)	7,895	8,691	7,445	8,410	5,666	4,674	4,549
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	0.018	0
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	31.9	0	7.92	5.72	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	35,757	35,757	44,647	51,069	51,069
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	18	18

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	29	29	36	40	40
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	0	1	1
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	0	5	6
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	1	1
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
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	29,223	0	7,265	9,733	1,101
Biomass purchases (million $2018/y)		0	2,298	2,298	2,870	3,689	3,789

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	35.4	35.4	47.5	59.7	61.2
Annual - BECCS (MMT)		0	35.4	35.4	44.2	56.3	57.5
Annual - NGCC (MMT)		0	0	0	0	0	0.14
Annual - Cement and lime (MMT)		0	0	0	3.32	3.42	3.53
Cumulative - All (MMT)		0	35.4	70.8	118	178	239
Cumulative - BECCS (MMT)		0	35.4	70.8	115	171	229
Cumulative - NGCC (MMT)		0	0	0	0	0	0.14
Cumulative - Cement and lime (MMT)		0	0	0	3.32	6.74	10.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	275	359	442	442	442
Spur (km)		0	1,225	1,225	1,195	2,322	2,931
All (km)		0	1,500	1,584	1,637	2,764	3,373
Cumulative investment - Trunk (million $2018)		0	1,525	2,123	2,827	2,827	2,827
Cumulative investment - Spur (million $2018)		0	1,678	1,677	1,686	2,774	3,438
Cumulative investment - All (million $2018)		0	3,203	3,800	4,513	5,600	6,265

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual (MMT)		0	1.85	6.42	13.1	17.7	18.4
Injection wells (wells)		0	3	12	21	35	44
Resource characterization, appraisal, permitting costs (million $2020)		45.8	201	311	311	311	311
Wells and facilities construction costs (million $2020)		0	91.4	356	635	1,062	1,318

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-48.5
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-256
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,177
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-24.5
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-1,555
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-338
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-704

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-773
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,079
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-6,956
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-72.6
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-897
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-3,923
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-35.9
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-3,110
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-651
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-1,057
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-5,490
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,139
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-17,376
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-96.7
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,537
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-5,669
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-48.1
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-4,665
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-965
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-1,409
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-10,207
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-27,796
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,200
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							7.91
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							195
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,107
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							8.86
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							48.3
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							46.6
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							50.3
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							642
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							2,107
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							11.9
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							202
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							1,999
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							13.3
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)							70
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							69.9
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							363
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,293
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							4,022
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							15.8
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							208
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							2,891
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							17.7
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)							91.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							93.2

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							290
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,061
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							4,668

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)							-971
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-2,418
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-62.1
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)							-3,451
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-971
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-4,584
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-124
Carbon sink potential - Aggressive deployment - Cropland to woody energy crops (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Pasture to energy crops (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-5,680
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							395
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							1,086
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							113
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)							92.2
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)							432

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							2,118
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							395
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							5,086
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							226
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)							92.2
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)							432
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							6,231

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)		222	159	134	121	116	113
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		15.2	19.9	21.8	28.2	22.5	19.5
Premature deaths from air pollution - Mobile - On-Road (deaths)		140	142	145	149	152	155
Premature deaths from air pollution - Gas Stations (deaths)		12.3	12.3	12.4	12.5	12.5	12.5
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		17.1	15.3	13.7	12.6	12	11.5
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		1.71	1.41	0.987	0.608	0.324	0.174
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		2.97	2.84	2.76	2.71	2.64	2.54
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		6.64	6.42	6.22	6.03	5.76	5.45
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		14	13.5	12.2	10.7	9.79	9.65
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.52	1.45	1.34	1.22	1.13	1.07
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.87	0.874	0.88	0.883	0.886	0.892
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		5.69	3.92	3.12	2.86	2.66	2.41
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		64.3	66.1	65.9	61.4	59.4	54.2

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		1,971	1,411	1,189	1,069	1,026	1,006
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		134	177	193	250	199	173
Monetary damages from air pollution - Mobile - On-Road (million $2019)		1,243	1,267	1,291	1,321	1,351	1,382
Monetary damages from air pollution - Gas Stations (million $2019)		109	109	109	110	111	111
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		152	136	121	112	106	102
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		15.1	12.5	8.75	5.39	2.87	1.54
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		26.3	25.2	24.4	24	23.4	22.5
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		58.8	56.8	55.1	53.3	51	48.2
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		124	120	108	94.7	86.6	85.4
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		13.5	12.9	11.9	10.8	9.97	9.47
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		7.7	7.74	7.79	7.82	7.85	7.89
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		50.2	34.6	27.6	25.2	23.5	21.3
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		571	587	585	546	528	481

Table 65: *REF scenario - IMPACTS - Jobs*

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		98.7	94.9	94.5	88.3	88.3	90.5
By economic sector - Construction (jobs)		3,584	4,374	4,614	4,936	4,324	4,702
By economic sector - Manufacturing (jobs)		2,321	2,564	2,596	2,809	2,424	2,417
By economic sector - Mining (jobs)		4,857	3,444	2,650	2,007	1,672	1,365
By economic sector - Other (jobs)		176	244	262	302	260	324
By economic sector - Pipeline (jobs)		393	407	412	393	398	398
By economic sector - Professional (jobs)		2,502	2,467	2,370	2,378	1,859	1,930
By economic sector - Trade (jobs)		2,665	2,361	2,130	1,905	1,612	1,619
By economic sector - Utilities (jobs)		5,629	6,609	6,791	7,391	5,688	6,026
By resource sector - Biomass (jobs)		288	275	261	245	244	244
By resource sector - CO2 (jobs)		0	0.036	0.046	0.049	0.054	0.058
By resource sector - Coal (jobs)		6,345	3,901	3,134	1,903	1,165	974
By resource sector - Grid (jobs)		6,492	8,342	9,069	9,045	7,706	8,376
By resource sector - Natural Gas (jobs)		4,396	5,424	5,082	6,597	5,074	5,042
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		4,670	4,078	3,650	3,388	3,220	3,058
By resource sector - Solar (jobs)			339	470	516	595	957
By resource sector - Wind (jobs)		34.6	205	252	513	322	221

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

Item	2020	2025	2030	2035	2040	2045	2050
By education level - All sectors - High school diploma or less (jobs)		9,678	9,694	9,391	9,453	7,911	8,158
By education level - All sectors - Associates degree or some college (jobs)		6,769	7,036	6,901	7,098	5,807	6,017
By education level - All sectors - Bachelors degree (jobs)		4,550	4,596	4,434	4,456	3,638	3,706
By education level - All sectors - Masters or professional degree (jobs)		1,085	1,097	1,059	1,066	862	881
By education level - All sectors - Doctoral degree (jobs)		143	141	135	134	108	110
Related work experience - All sectors - None (jobs)		3,140	3,243	3,175	3,245	2,679	2,772
Related work experience - All sectors - Up to 1 year (jobs)		4,444	4,422	4,267	4,277	3,571	3,678
Related work experience - All sectors - 1 to 4 years (jobs)		8,243	8,299	8,030	8,102	6,677	6,859
Related work experience - All sectors - 4 to 10 years (jobs)		5,058	5,222	5,102	5,213	4,272	4,405
Related work experience - All sectors - Over 10 years (jobs)		1,340	1,378	1,344	1,370	1,127	1,157
On-the-Job Training - All sectors - None (jobs)		1,146	1,159	1,120	1,125	931	957
On-the-Job Training - All sectors - Up to 1 year (jobs)		14,961	14,989	14,479	14,555	12,041	12,353
On-the-Job Training - All sectors - 1 to 4 years (jobs)		4,557	4,743	4,655	4,791	3,930	4,071
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,378	1,482	1,476	1,541	1,261	1,323
On-the-Job Training - All sectors - Over 10 years (jobs)		182	192	189	195	163	168
On-Site or In-Plant Training - All sectors - None (jobs)		3,363	3,456	3,367	3,428	2,816	2,902
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		13,684	13,696	13,227	13,295	11,002	11,290
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		3,575	3,696	3,620	3,710	3,053	3,159
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,429	1,526	1,515	1,575	1,291	1,349
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		173	189	190	199	163	171
Wage income - All (million $2019)		1,159	1,192	1,172	1,203	1,002	1,044

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	426	395	363	345	346	357	372
Final energy use - Residential (PJ)	184	172	165	159	157	156	157
Final energy use - Commercial (PJ)	119	120	121	120	120	122	127
Final energy use - Industry (PJ)	382	406	427	438	455	470	488

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		3.28	3.39	4.37	4.58	4.26	4.41

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 (%)	24.6	48.5	49.4	50.7	51.9	53.4	55.7
Sales of space heating units - Electric Resistance (%)	27.3	23.3	22.9	22.2	21.3	19.9	17.6
Sales of space heating units - Gas (%)	38.3	19	19.9	20	19.9	19.9	19.8
Sales of space heating units - Fossil (%)	9.89	9.17	7.81	7.09	6.94	6.85	6.89
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	62.5	74.8	75	74.8	74.6	74.6	74.6
Sales of water heating units - Gas Furnace (%)	34.2	22.8	22.6	22.8	23	23	23
Sales of water heating units - Other (%)	3.3	2.39	2.37	2.39	2.4	2.4	2.41
Sales of cooking units - Electric Resistance (%)	76.6	76.6	76.6	76.6	76.6	76.6	76.6
Sales of cooking units - Gas (%)	23.4	23.4	23.4	23.4	23.4	23.4	23.4
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		3.33	3.22				

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 (%)	5.4	26.5	53.4	75.5	79.2	79.6	79.6
Sales of space heating units - Electric Resistance (%)	3.11	5.03	9.13	15	18.3	18.8	18.9
Sales of space heating units - Gas (%)	76.4	63.9	35.2	9.15	2.46	1.58	1.52
Sales of space heating units - Fossil (%)	15.1	4.63	2.27	0.341	0.034	0	0
Sales of water heating units - Electric Heat Pump (%)	0.117	0.149	0.144	0.146	0.145	0.143	0.145
Sales of water heating units - Electric Resistance (%)	4.29	5.63	5.49	5.57	5.54	5.49	5.54
Sales of water heating units - Gas (%)	94.4	92.6	92.8	92.7	92.7	92.8	92.8
Sales of water heating units - Other (%)	1.17	1.57	1.57	1.57	1.57	1.56	1.55
Sales of cooking units - Electric Resistance (%)	43.5	45.6	45.9	45.7	46	45.9	45.7
Sales of cooking units - Gas (%)	56.5	54.4	54.1	54.3	54	54.1	54.3
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		12,419	12,935				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	10,116	4,225	4,225	4,225	0	0	0
Installed thermal - Natural gas (MW)	7,883	8,576	12,921	13,159	17,399	15,481	17,162
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	45.2	72.8	103	147	208	288	390
Installed renewables - Solar - Base land use assumptions (MW)	68.3	68.3	68.3	68.3	68.3	68.3	68.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	145	145	145	145	145	145	145
Wind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0

Table 72: *REF scenario - PILLAR 6: Land sinks - Forests - REF only*

Item	2020	2025	2030	2035	2040	2045	2050
Business-as-usual carbon sink - Natural uptake (Mt CO2e/y)	-13.6		-9.57				-7.76
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-1.27		-2.12				-2.23
Business-as-usual carbon sink - Total (Mt CO2e/y)	-14.9		-11.7				-9.99

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)							-48.5
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-256
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,177
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-24.5
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-1,555
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-338
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-704
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-773
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,079
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-6,956
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-72.6
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-897
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-3,923
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-35.9
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-3,110
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-651
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-1,057
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-5,490
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,139
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-17,376
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-96.7
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,537
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-5,669
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-48.1
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-4,665

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-965
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-1,409
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-10,207
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-27,796
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,200
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							7.91
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							195
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,107
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							8.86
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)							48.3
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							46.6
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							50.3
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							642
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							2,107
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							11.9
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							202
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							1,999
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							13.3
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)							70
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							69.9
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							363

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,293
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							4,022
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							15.8
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							208
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							2,891
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							17.7
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)							91.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							93.2
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							290
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,061
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							4,668