Net-Zero America - Indiana 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:

E. Larson, C. Greig, J. Jenkins, E. Mayfield, A. Pascale, C. Zhang, J. Drossman, R. Williams, S. Pacala, R. Socolow, EJ Baik, R. Birdsey, R. Duke, R. Jones, B. Haley, E. Leslie, K. Paustian, and A. Swan, Net-Zero America: Potential Pathways, Infrastructure, and Impacts, Final Report, Princeton University, Princeton, NJ, 29 October 2021. Report available at https://net-zeroamerica.princeton.edu.

Contents

1 E+ scenario - IMPACTS - Health . . . 1
2 E+ scenario - IMPACTS - Jobs . . . 2
3 E+ scenario - IMPACTS - Fossil fuel industries . . . 3
4 E+ scenario - PILLAR 1: Efficiency/Electrification - Overview . . . 3
5 E+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand . . . 3
6 E+ scenario - PILLAR 1: Efficiency/Electrification - Transportation . . . 3
7 E+ scenario - PILLAR 1: Efficiency/Electrification - Residential . . . 4
8 E+ scenario - PILLAR 1: Efficiency/Electrification - Commercial . . . 4
9 E+ scenario - PILLAR 2: Clean Electricity - Generating capacity . . . 4
10 E+ scenario - PILLAR 2: Clean Electricity - Generation . . . 5
11 E+ scenario - PILLAR 3: Clean fuels - Bioenergy . . . 5
12 E+ scenario - PILLAR 4: CCUS - CO2 capture . . . 5
13 E+ scenario - PILLAR 4: CCUS - CO2 pipelines . . . 6
14 E+ scenario - PILLAR 4: CCUS - CO2 storage . . . 6
15 E+ scenario - PILLAR 6: Land sinks - Forests . . . 6
16 E+ scenario - PILLAR 6: Land sinks - Agriculture . . . 8
17 E- scenario - IMPACTS - Health . . . 9
18 E- scenario - IMPACTS - Jobs . . . 10
19 E- scenario - PILLAR 1: Efficiency/Electrification - Overview . . . 12
20 E- scenario - PILLAR 1: Efficiency/Electrification - Electricity demand . . . 12
21 E- scenario - PILLAR 1: Efficiency/Electrification - Transportation . . . 12
22 E- scenario - PILLAR 1: Efficiency/Electrification - Residential . . . 12
23 E- scenario - PILLAR 1: Efficiency/Electrification - Commercial . . . 12
24 E- scenario - PILLAR 2: Clean Electricity - Generating capacity . . . 13
25 E- scenario - PILLAR 6: Land sinks - Forests . . . 13
26 E- scenario - PILLAR 6: Land sinks - Agriculture . . . 15
27 E+RE+ scenario - IMPACTS - Health . . . 16
28 E+RE+ scenario - IMPACTS - Jobs . . . 17
29 E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Overview . . . 18
30 E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand . . . 18
31 E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Transportation . . . 19
32 E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Residential . . . 19
33 E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Commercial . . . 19
34 E+RE+ scenario - PILLAR 2: Clean Electricity - Generating capacity . . . 19
35 E+RE+ scenario - PILLAR 2: Clean Electricity - Generation . . . 20
36 E+RE+ scenario - PILLAR 6: Land sinks - Forests . . . 20
37 E+RE+ scenario - PILLAR 6: Land sinks - Agriculture . . . 23
38 E+RE- scenario - IMPACTS - Health . . . 23
39 E+RE- scenario - IMPACTS - Jobs . . . 25
40 E+RE- scenario - PILLAR 1: Efficiency/Electrification - Overview . . . 26
41 E+RE- scenario - PILLAR 1: Efficiency/Electrification - Electricity demand . . . 26
42 E+RE- scenario - PILLAR 1: Efficiency/Electrification - Transportation . . . 26
43 E+RE- scenario - PILLAR 1: Efficiency/Electrification - Residential . . . 26

44 E+RE- scenario - PILLAR 1: Efficiency/Electrification - Commercial 27
45 E+RE- scenario - PILLAR 2: Clean Electricity - Generating capacity 27
46 E+RE- scenario - PILLAR 2: Clean Electricity - Generation 27
47 E+RE- scenario - PILLAR 6: Land sinks - Forests 28
48 E+RE- scenario - PILLAR 6: Land sinks - Agriculture 30
49 E-B+ scenario - IMPACTS - Health 31
50 E-B+ scenario - IMPACTS - Jobs 32
51 E-B+ scenario - PILLAR 1: Efficiency/Electrification - Overview 33
52 E-B+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand . . 33
53 E-B+ scenario - PILLAR 1: Efficiency/Electrification - Transportation 33
54 E-B+ scenario - PILLAR 1: Efficiency/Electrification - Residential 34
55 E-B+ scenario - PILLAR 1: Efficiency/Electrification - Commercial 34
56 E-B+ scenario - PILLAR 2: Clean Electricity - Generating capacity 34
57 E-B+ scenario - PILLAR 2: Clean Electricity - Generation 34
58 E-B+ scenario - PILLAR 3: Clean fuels - Bioenergy 35
59 E-B+ scenario - PILLAR 4: CCUS - CO2 capture 35
60 E-B+ scenario - PILLAR 4: CCUS - CO2 pipelines 35
61 E-B+ scenario - PILLAR 4: CCUS - CO2 storage 35
62 E-B+ scenario - PILLAR 6: Land sinks - Forests 36
63 E-B+ scenario - PILLAR 6: Land sinks - Agriculture 38
64 REF scenario - IMPACTS - Health 39
65 REF scenario - IMPACTS - Jobs 40
66 REF scenario - PILLAR 1: Efficiency/Electrification - Overview 41
67 REF scenario - PILLAR 1: Efficiency/Electrification - Electricity demand . . . 42
68 REF scenario - PILLAR 1: Efficiency/Electrification - Residential 42
69 REF scenario - PILLAR 1: Efficiency/Electrification - Commercial 42
70 REF scenario - PILLAR 2: Clean Electricity - Generating capacity 42
71 REF scenario - PILLAR 2: Clean Electricity - Generation 43
72 REF scenario - PILLAR 6: Land sinks - Forests - REF only 43
73 REF scenario - PILLAR 6: Land sinks - Forests 43

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)		92.9	0.113	0.112	0.098	0.071	0.006
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		22.9	17.2	11.6	10	5.42	2.25
Premature deaths from air pollution - Mobile - On-Road (deaths)		204	190	144	83.2	38.1	15.3
Premature deaths from air pollution - Gas Stations (deaths)		18.9	17.3	13	7.7	3.75	1.78
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		33.6	28.7	20.2	11.5	5.41	1.88
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		1.92	1.56	1.08	0.633	0.281	0.106
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		5.05	4.77	3.82	2.58	1.38	0.607
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		8.06	7.7	7.3	6.88	6.45	6
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		27.1	24.5	18.9	12.1	6.74	3.27
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		3.56	2.97	2.32	1.67	1.12	0.704
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		2.46	2.05	1.66	1.29	0.94	0.614
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		2.51	0.833	0.802	0.762	0.747	0.724
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		77.7	73.4	67.3	52.2	39	24.3
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		823	1	0.992	0.867	0.63	0.056
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		203	153	103	88.6	48	19.9
Monetary damages from air pollution - Mobile - On-Road (million $2019)		1,813	1,690	1,283	740	339	136
Monetary damages from air pollution - Gas Stations (million $2019)		167	153	115	68.1	33.2	15.8
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		298	254	179	102	47.9	16.6
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		17	13.9	9.55	5.61	2.49	0.943
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		44.8	42.2	33.8	22.8	12.3	5.38
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		71.3	68.2	64.6	60.9	57.1	53.1
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		240	217	167	107	59.6	28.9

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)		31.5	26.3	20.6	14.8	9.93	6.23
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		21.7	18.2	14.7	11.4	8.32	5.44
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		22.2	7.35	7.08	6.72	6.59	6.39
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		690	651	598	463	347	216

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		2,024	2,048	1,949	1,975	3,890	2,868
By economic sector - Construction (jobs)		8,873	19,891	28,086	26,019	24,844	26,722
By economic sector - Manufacturing (jobs)		5,112	5,696	7,074	6,867	7,228	7,614
By economic sector - Mining (jobs)		3,873	2,301	1,595	1,045	704	486
By economic sector - Other (jobs)		635	2,680	4,473	3,907	3,473	4,004
By economic sector - Pipeline (jobs)		751	905	535	409	381	291
By economic sector - Professional (jobs)		5,239	9,129	13,410	14,462	18,461	19,968
By economic sector - Trade (jobs)		4,585	6,357	8,816	8,538	9,151	10,371
By economic sector - Utilities (jobs)		10,335	13,780	19,845	21,812	22,350	24,031
By resource sector - Biomass (jobs)		4,782	4,683	4,346	5,238	14,281	12,573
By resource sector - CO2 (jobs)		26.8	2,275	376	439	1,369	1,311
By resource sector - Coal (jobs)		4,776	1,153	227	191	168	148
By resource sector - Grid (jobs)		11,579	19,179	34,267	38,527	39,993	44,374
By resource sector - Natural Gas (jobs)		7,694	6,136	5,869	5,252	3,344	2,282
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		6,069	4,885	3,582	2,434	1,622	998
By resource sector - Solar (jobs)		1,943	15,977	25,297	18,231	12,827	13,783
By resource sector - Wind (jobs)		4,555	8,498	11,819	14,723	16,876	20,886
By education level - All sectors - High school diploma or less (jobs)		18,273	27,549	37,223	36,305	38,391	40,275
By education level - All sectors - Associates degree or some college (jobs)		12,482	19,599	27,180	27,032	28,045	30,231
By education level - All sectors - Bachelors degree (jobs)		8,354	12,146	16,540	16,731	18,394	19,766
By education level - All sectors - Masters or professional degree (jobs)		2,034	3,038	4,202	4,311	4,863	5,236
By education level - All sectors - Doctoral degree (jobs)		283	455	636	656	788	847
Related work experience - All sectors - None (jobs)		6,135	9,300	12,654	12,495	13,271	14,058
Related work experience - All sectors - Up to 1 year (jobs)		8,789	13,304	17,992	17,470	18,709	19,681
Related work experience - All sectors - 1 to 4 years (jobs)		14,712	22,154	30,377	30,351	32,433	34,583
Related work experience - All sectors - 4 to 10 years (jobs)		9,337	14,343	19,708	19,679	20,764	22,319
Related work experience - All sectors - Over 10 years (jobs)		2,453	3,687	5,052	5,041	5,304	5,714
On-the-Job Training - All sectors - None (jobs)		2,237	3,447	4,700	4,589	4,901	5,240
On-the-Job Training - All sectors - Up to 1 year (jobs)		27,862	41,136	55,887	55,471	59,906	63,481

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

Item	2020	2025	2030	2035	2040	2045	2050
On-the-Job Training - All sectors - 1 to 4 years (jobs)		8,316	13,141	18,168	18,058	18,642	20,055
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,642	4,460	6,211	6,137	6,244	6,735
On-the-Job Training - All sectors - Over 10 years (jobs)		368	603	815	778	787	843
On-Site or In-Plant Training - All sectors - None (jobs)		6,527	10,108	13,837	13,739	14,816	15,761
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		25,290	37,407	50,867	50,412	54,119	57,442
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		6,518	10,211	14,087	13,971	14,465	15,524
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,735	4,498	6,214	6,141	6,286	6,771
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		355	564	778	772	795	857
Wage income - All (million $2019)		2,210	3,334	4,600	4,658	5,042	5,445

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

Item	2020	2025	2030	2035	2040	2045	2050
Oil consumption - Annual (million bbls)		125	109	84.3	61.1	42.8	28
Oil consumption - Cumulative (million bbls)							2,596
Oil production - Annual (million bbls)		2.18	2.19	2.19	1.73	1.41	0.937
Natural gas consumption - Annual (tcf)		661	557	447	336	212	147
Natural gas consumption - Cumulative (tcf)							13,461
Natural gas production - Annual (tcf)		6.17	5.83	5.08	4.3	3.41	2.65

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	652	610	534	441	358	306	285
Final energy use - Residential (PJ)	311	288	267	232	196	169	152
Final energy use - Commercial (PJ)	190	187	179	166	151	140	135
Final energy use - Industry (PJ)	680	692	706	721	751	767	776

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)		4.81	4.97	8.01	8.51	7.33	7.63

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	24.8	531	1,037	2,808	4,580	5,996	7,411
Vehicle stocks - LDV – All others (1000 units)	6,180	5,884	5,589	4,073	2,557	1,447	336
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		1,189	3,044	4,939	7,479	8,143	7,762
Public EV charging plugs - DC Fast (1000 units)	0.168		2.17		9.57		15.5
Public EV charging plugs - L2 (1000 units)	0.43		52.1		230		372

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 (%)	7.14	16.5	45.4	84.9	91.7	92.1	91.9
Sales of space heating units - Electric Resistance (%)	18.1	24.2	17.6	8.04	6.29	6.24	6.46
Sales of space heating units - Gas (%)	68.7	49.9	30.9	4.83	0.406	0.132	0.133
Sales of space heating units - Fossil (%)	6.08	9.3	6.1	2.21	1.58	1.53	1.49
Sales of water heating units - Electric Heat Pump (%)	0	2.32	17.1	34.9	37.8	38	38.1
Sales of water heating units - Electric Resistance (%)	39.3	55.4	55.8	60.8	61.7	61.8	61.7
Sales of water heating units - Gas Furnace (%)	60.6	42.1	26.8	4.14	0.241	0	0
Sales of water heating units - Other (%)	0.101	0.202	0.203	0.203	0.201	0.202	0.203
Sales of cooking units - Electric Resistance (%)	67.6	74.5	95.6	99.8	100	100	100
Sales of cooking units - Gas (%)	32.4	25.5	4.36	0.22	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		5.74	7.82				

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	2.05	9.66	38.6	81.8	89.2	89.7	89.7
Sales of space heating units - Electric Resistance (%)	6.04	3.52	5.22	9.16	9.92	9.96	9.94
Sales of space heating units - Gas (%)	88.9	84.5	55.7	9.03	0.86	0.359	0.36
Sales of space heating units - Fossil (%)	3.02	2.32	0.438	0.019	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.622	3.21	22.6	47.9	52.2	52.5	52.5
Sales of water heating units - Electric Resistance (%)	5.71	4.94	19	42.9	47.1	47.4	47.4
Sales of water heating units - Gas (%)	93.3	91.7	58.2	8.97	0.524	0	0
Sales of water heating units - Other (%)	0.34	0.189	0.189	0.191	0.19	0.19	0.19
Sales of cooking units - Electric Resistance (%)	41	54.2	82.9	88.6	88.9	88.9	88.9
Sales of cooking units - Gas (%)	59	45.8	17.1	11.4	11.1	11.1	11.1
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		19,994	21,829				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	14,827	6,680	0	0	0	0	0
Installed thermal - Natural gas (MW)	8,452	7,917	9,037	14,467	14,459	9,685	9,573
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	98.1	147	195	258	334	421	520
Installed renewables - Solar - Base land use assumptions (MW)	128	839	11,858	29,639	37,430	39,496	42,109
Installed renewables - Wind - Base land use assumptions (MW)	2,516	3,368	24,947	40,707	51,343	51,428	51,428
Installed renewables - Solar - Constrained land use assumptions (MW)	73	1,898	19,259	36,169	43,384	45,305	46,218
Installed renewables - Wind - Constrained land use assumptions (MW)	3,368	3,368	10,841	10,841	10,841	10,841	10,841
Capital invested - Solar PV - Base (billion $2018)		0.952	13.2	19.6	8.1	2.03	2.42
Capital invested - Wind - Base (billion $2018)		0	28.7	19.6	12.6	0.095	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Solar PV - Constrained (billion $2018)		1.79	15.2	20	8.27	4.43	1.1
Capital invested - Wind - Constrained (billion $2018)		0	9.95	0	0	0	7.78
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	0.006	0.021	0
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	0	0	0	0.909	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	245	1,525	21,352	53,256	67,126	70,803	75,356
Wind - Base land use assumptions (GWh)	12,511	12,511	82,281	129,936	160,359	160,578	160,578
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	36.1	3,293	34,491	64,799	77,634	81,001	82,579
Wind - Constrained land use assumptions (GWh)	12,511	12,511	34,458	34,458	34,458	34,458	34,458
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0
Biomass power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu power plant (GWh)	0	0	0	0	0	1,020	1,020
Biomass w/ccu allam power plant (GWh)	0	0	0	0	6.38	27.4	27.4

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

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu (quantity)	0	0	0	0	0	1	1
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	1	2	2
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	9	46	47
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	1	2	2
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	1	2	2
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0
Conversion capital investment - Cumulative 5-yr (million $2018)		0	0	0	7,842	34,786	704
Biomass purchases (million $2018/y)		0	0	0	531	2,880	2,928

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	1.08	11.5	59.5	60.5
Annual - BECCS (MMT)		0	0	0	10.1	54.7	55.6
Annual - NGCC (MMT)		0	0	1.08	1.43	1.45	1.36
Annual - Cement and lime (MMT)		0	0	0	0	3.42	3.53
Cumulative - All (MMT)		0	0	1.08	12.6	72.1	133
Cumulative - BECCS (MMT)		0	0	0	10.1	64.7	120
Cumulative - NGCC (MMT)		0	0	1.08	2.51	3.96	5.32
Cumulative - Cement and lime (MMT)		0	0	0	0	3.42	6.95

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	465	467	467	467	467
Spur (km)		0	34.3	292	321	1,930	2,245
All (km)		0	499	758	788	2,397	2,712
Cumulative investment - Trunk (million $2018)		0	2,355	2,368	2,368	2,368	2,368
Cumulative investment - Spur (million $2018)		0	57.6	249	302	1,997	2,228
Cumulative investment - All (million $2018)		0	2,413	2,617	2,670	4,365	4,596

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	6.02	7.46
Injection wells (wells)		0	1	4	8	13	16
Resource characterization, appraisal, permitting costs (million $2020)		50.6	142	182	182	182	182
Wells and facilities construction costs (million $2020)		0	33.7	131	234	391	485

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)							-38.8
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-325
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-829
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-85.6
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-611
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-702
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-632
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-290
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-433
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-3,947
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-58.2
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,138
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-1,493
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-125
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-1,223
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,354
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-948

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,056
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-858
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-9,255
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-77.5
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,952
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-2,158
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-168
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-1,834
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-2,006
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-1,264
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-3,822
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-14,566
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-1,284
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							6.34
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							248
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							422
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							31
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)							100
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							41.8
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							18.8
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							258
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,125
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							9.51
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							256

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 - Extend rotation length (1000 hectares)							761
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							46.6
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)							145
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							62.7
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							136
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							519
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,936
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							12.7
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							264
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							1,100
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							62
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)							191
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							83.6
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							109
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							426
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							2,248

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)							-1,845
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-3,936

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-117
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-5,898
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-1,845
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-7,474
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-234
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-9,552
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							808
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							2,104
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							213
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							3,124
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							808
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							3,995
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							425
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							5,228

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)		92.9	0.113	0.112	0.098	0.071	0.006
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		24.1	15.6	6.61	3.05	1.03	0.695
Premature deaths from air pollution - Mobile - On-Road (deaths)		207	209	203	183	145	99.7
Premature deaths from air pollution - Gas Stations (deaths)		19.3	19.4	18.6	16.6	13.2	9.1
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		33.7	30.6	27.2	22.9	17.5	11.7
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		1.95	1.87	1.77	1.54	1.17	0.78
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		5.09	5.17	5.17	4.82	3.91	2.81

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		8.06	7.7	7.3	6.88	6.45	6
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		27.2	26.4	25.2	22.6	18.5	13.7
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		3.57	3.3	3.03	2.63	2.14	1.68
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		2.46	2.2	1.95	1.71	1.47	1.25
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		2.4	0.837	0.817	0.787	0.75	0.676
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		77.5	71.1	63	55.8	49.7	34.3
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		823	1	0.992	0.867	0.63	0.056
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		213	138	58.6	27	9.17	6.15
Monetary damages from air pollution - Mobile - On-Road (million $2019)		1,843	1,859	1,807	1,625	1,292	887
Monetary damages from air pollution - Gas Stations (million $2019)		171	172	165	147	117	80.6
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		299	271	241	203	155	104
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		17.3	16.5	15.7	13.7	10.3	6.91
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		45.1	45.8	45.8	42.7	34.6	24.9
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		71.3	68.2	64.6	60.9	57.1	53.1
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		241	234	223	200	164	121
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		31.6	29.2	26.8	23.2	19	14.9
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		21.7	19.5	17.3	15.1	13	11.1
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		21.2	7.38	7.21	6.94	6.62	5.97
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		688	632	559	496	441	305

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		2,029	2,037	1,945	2,717	5,400	2,866
By economic sector - Construction (jobs)		9,012	20,916	23,910	23,765	27,669	29,083

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Manufacturing (jobs)		5,211	5,800	6,350	7,151	9,780	8,846
By economic sector - Mining (jobs)		3,904	2,366	1,819	1,395	1,093	762
By economic sector - Other (jobs)		651	2,793	3,763	3,500	3,668	4,232
By economic sector - Pipeline (jobs)		753	1,079	555	484	585	475
By economic sector - Professional (jobs)		5,333	9,364	11,654	15,065	23,308	21,833
By economic sector - Trade (jobs)		4,666	6,556	7,878	8,592	11,095	11,510
By economic sector - Utilities (jobs)		10,455	14,259	15,852	18,780	24,769	25,691
By resource sector - Biomass (jobs)		4,789	4,651	4,341	9,472	22,997	12,156
By resource sector - CO2 (jobs)		27.1	3,880	649	771	2,348	2,224
By resource sector - Coal (jobs)		4,904	1,244	232	199	169	136
By resource sector - Grid (jobs)		11,728	18,764	27,361	32,970	43,998	46,688
By resource sector - Natural Gas (jobs)		7,687	5,723	4,308	4,118	3,231	2,496
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		6,132	5,208	4,437	3,629	2,830	1,823
By resource sector - Solar (jobs)		2,043	16,857	21,089	15,974	12,948	13,782
By resource sector - Wind (jobs)		4,704	8,844	11,310	14,318	18,846	25,993
By education level - All sectors - High school diploma or less (jobs)		18,519	28,586	32,088	34,831	45,551	43,830
By education level - All sectors - Associates degree or some college (jobs)		12,665	20,394	23,147	25,356	32,675	33,084
By education level - All sectors - Bachelors degree (jobs)		8,479	12,580	14,306	16,352	22,255	21,715
By education level - All sectors - Masters or professional degree (jobs)		2,064	3,139	3,631	4,239	5,902	5,738
By education level - All sectors - Doctoral degree (jobs)		287	470	556	672	984	930
Related work experience - All sectors - None (jobs)		6,218	9,656	10,867	11,954	15,732	15,324
Related work experience - All sectors - Up to 1 year (jobs)		8,907	13,776	15,579	16,972	22,476	21,410
Related work experience - All sectors - 1 to 4 years (jobs)		14,925	22,998	26,079	29,037	38,408	37,827
Related work experience - All sectors - 4 to 10 years (jobs)		9,474	14,913	16,869	18,689	24,470	24,463
Related work experience - All sectors - Over 10 years (jobs)		2,489	3,826	4,334	4,798	6,280	6,275
On-the-Job Training - All sectors - None (jobs)		2,270	3,575	4,068	4,463	5,895	5,725
On-the-Job Training - All sectors - Up to 1 year (jobs)		28,255	42,615	48,230	53,714	71,812	69,334
On-the-Job Training - All sectors - 1 to 4 years (jobs)		8,436	13,688	15,467	16,872	21,605	21,955
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,679	4,662	5,259	5,662	7,129	7,354
On-the-Job Training - All sectors - Over 10 years (jobs)		374	630	703	740	925	929
On-Site or In-Plant Training - All sectors - None (jobs)		6,623	10,495	11,910	13,259	17,670	17,240
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		25,646	38,762	43,861	48,661	64,711	62,735
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		6,612	10,628	12,015	13,103	16,826	16,984
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,773	4,698	5,280	5,706	7,236	7,402
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		360	587	661	720	924	936
Wage income - All (million $2019)		2,241	3,460	3,952	4,458	5,979	5,957

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	653	615	559	514	480	439	392
Final energy use - Residential (PJ)	311	289	273	257	238	214	188
Final energy use - Commercial (PJ)	190	187	183	179	172	164	155
Final energy use - Industry (PJ)	680	693	708	728	762	777	784

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)		4.04	4.11	5.15	5.33	7.04	7.41

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	19.2	168	317	1,006	1,695	3,221	4,747
Vehicle stocks - LDV – All others (1000 units)	6,205	6,205	6,205	5,886	5,566	4,290	3,013
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		0	192	404	1,364	4,297	6,258
Public EV charging plugs - DC Fast (1000 units)	0.168		0.662		3.54		9.92
Public EV charging plugs - L2 (1000 units)	0.43		15.9		85.2		238

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 (%)	7.14	13.6	16.9	27.4	49.2	73	86
Sales of space heating units - Electric Resistance (%)	18.1	24.8	24	21.6	16.2	10.6	7.72
Sales of space heating units - Gas (%)	68.7	51.9	49.7	42.9	28.7	12.9	4.2
Sales of space heating units - Fossil (%)	6.08	9.67	9.33	8.18	5.9	3.46	2.13
Sales of water heating units - Electric Heat Pump (%)	0	0.608	2.31	7.59	18.2	29.3	35.3
Sales of water heating units - Electric Resistance (%)	39.3	55.7	55.6	55.8	57.2	59.4	61
Sales of water heating units - Gas Furnace (%)	60.6	43.5	41.9	36.4	24.4	11	3.54
Sales of water heating units - Other (%)	0.101	0.202	0.203	0.204	0.204	0.204	0.204
Sales of cooking units - Electric Resistance (%)	67.5	68.3	71.3	79.1	90.1	96.8	99.1
Sales of cooking units - Gas (%)	32.5	31.7	28.7	20.9	9.94	3.21	0.863
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		5.71	7.71				

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	2.05	6.96	10.3	20.9	43.5	68.9	83
Sales of space heating units - Electric Resistance (%)	6.04	3.45	3.62	4.3	5.98	8.09	9.31
Sales of space heating units - Gas (%)	88.9	86.9	83.6	72.9	49.6	22.7	7.57
Sales of space heating units - Fossil (%)	3.02	2.68	2.47	1.87	0.951	0.308	0.081
Sales of water heating units - Electric Heat Pump (%)	0.622	1.14	3.37	10.3	24.6	40.1	48.5
Sales of water heating units - Electric Resistance (%)	5.71	3.86	5.44	10.7	22.3	35.9	43.7
Sales of water heating units - Gas (%)	93.3	94.8	91	78.8	52.9	23.8	7.64
Sales of water heating units - Other (%)	0.34	0.189	0.189	0.191	0.19	0.19	0.19

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of cooking units - Electric Resistance (%)	41	45.8	49.8	60.5	75.4	84.5	87.7
Sales of cooking units - Gas (%)	59	54.2	50.2	39.5	24.6	15.5	12.3
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		19,992	21,841				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	14,827	6,680	0	0	0	0	0
Installed thermal - Natural gas (MW)	8,452	8,848	8,101	8,101	6,400	4,663	6,374
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)							-38.8
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-325
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-829
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-85.6
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-611
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-702
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-632
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-290
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-433
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-3,947
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-58.2
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,138
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-1,493
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-125
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-1,223
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,354
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-948
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,056
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-858
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-9,255
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-77.5
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,952

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-2,158
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-168
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-1,834
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-2,006
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-1,264
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-3,822
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-14,566
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-1,284
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							6.34
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							248
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							422
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							31
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)							100
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							41.8
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							18.8
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							258
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,125
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							9.51
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							256
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							761
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							46.6
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)							145

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							62.7
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							136
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							519
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,936
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							12.7
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							264
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							1,100
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							62
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)							191
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							83.6
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							109
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							426
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							2,248

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)							-1,845
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-3,936
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-117
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-5,898
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-1,845
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-7,474

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-234
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-9,552
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							808
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							2,104
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							213
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							3,124
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							808
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							3,995
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							425
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							5,228

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)		92.9	0.113	0.112	0.098	0.071	0.006
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		23.7	16.1	9.39	6.45	2.23	0.578
Premature deaths from air pollution - Mobile - On-Road (deaths)		204	190	144	83.2	38.1	15.3
Premature deaths from air pollution - Gas Stations (deaths)		18.9	17.3	13	7.7	3.75	1.78
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		33.6	28.7	20.2	11.5	5.41	1.88
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		1.92	1.56	1.08	0.633	0.281	0.106
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		5.05	4.77	3.82	2.58	1.38	0.607
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		8.06	7.7	7.3	6.88	6.45	6
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		27.1	24.5	18.9	12.1	6.74	3.27
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		3.56	2.97	2.32	1.67	1.12	0.704
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		2.46	2.05	1.66	1.29	0.94	0.614

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		2.79	0.833	0.8	0.759	0.745	0.617
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		76.6	72.5	63.5	45.6	28.4	4.61
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		823	1	0.992	0.867	0.63	0.056
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		210	143	83.1	57.1	19.8	5.12
Monetary damages from air pollution - Mobile - On-Road (million $2019)		1,813	1,690	1,283	740	339	136
Monetary damages from air pollution - Gas Stations (million $2019)		167	153	115	68.1	33.2	15.8
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		298	254	179	102	47.9	16.6
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		17	13.9	9.55	5.61	2.49	0.943
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		44.8	42.2	33.8	22.8	12.3	5.38
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		71.3	68.2	64.6	60.9	57.1	53.1
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		240	217	167	107	59.6	28.9
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		31.5	26.3	20.6	14.8	9.93	6.23
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		21.7	18.2	14.7	11.4	8.32	5.44
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		24.6	7.35	7.06	6.7	6.57	5.44
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		680	644	564	405	252	40.9

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		2,024	2,049	1,949	1,900	3,338	2,878
By economic sector - Construction (jobs)		13,384	25,758	28,771	25,771	32,712	65,447
By economic sector - Manufacturing (jobs)		5,545	6,586	8,260	8,281	10,440	13,402
By economic sector - Mining (jobs)		3,992	2,208	1,412	812	412	109
By economic sector - Other (jobs)		1,470	3,968	4,441	3,608	4,956	14,020
By economic sector - Pipeline (jobs)		730	608	426	275	154	66.8
By economic sector - Professional (jobs)		6,961	11,894	14,339	15,604	23,679	41,927
By economic sector - Trade (jobs)		5,758	8,045	9,168	8,861	12,269	25,149
By economic sector - Utilities (jobs)		12,053	15,960	20,666	21,794	27,331	45,568
By resource sector - Biomass (jobs)		4,773	4,689	4,343	5,231	12,484	12,993
By resource sector - CO2 (jobs)		0	0	0	0.001	0.001	0
By resource sector - Coal (jobs)		5,389	1,405	226	191	168	121
By resource sector - Grid (jobs)		14,674	25,479	37,249	39,196	50,861	87,481

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

Item	2020	2025	2030	2035	2040	2045	2050
By resource sector - Natural Gas (jobs)		7,634	5,912	4,441	4,081	2,730	2,369
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		6,071	4,833	3,459	2,153	1,093	36.3
By resource sector - Solar (jobs)		8,399	25,112	24,351	15,249	19,688	65,847
By resource sector - Wind (jobs)		4,976	9,646	15,361	20,807	28,267	39,718
By education level - All sectors - High school diploma or less (jobs)		22,888	33,698	38,657	36,762	48,270	86,926
By education level - All sectors - Associates degree or some college (jobs)		15,868	24,175	28,331	27,602	36,252	66,754
By education level - All sectors - Bachelors degree (jobs)		10,276	14,874	17,357	17,361	23,550	41,975
By education level - All sectors - Masters or professional degree (jobs)		2,520	3,752	4,415	4,488	6,211	11,103
By education level - All sectors - Doctoral degree (jobs)		363	577	670	694	1,007	1,807
Related work experience - All sectors - None (jobs)		7,661	11,365	13,144	12,685	16,770	30,448
Related work experience - All sectors - Up to 1 year (jobs)		11,021	16,350	18,733	17,806	23,610	42,591
Related work experience - All sectors - 1 to 4 years (jobs)		18,428	27,220	31,689	31,041	41,355	74,773
Related work experience - All sectors - 4 to 10 years (jobs)		11,750	17,622	20,570	20,177	26,703	48,456
Related work experience - All sectors - Over 10 years (jobs)		3,054	4,519	5,295	5,199	6,853	12,297
On-the-Job Training - All sectors - None (jobs)		2,831	4,271	4,890	4,688	6,271	11,602
On-the-Job Training - All sectors - Up to 1 year (jobs)		34,564	50,352	58,363	56,837	75,899	135,827
On-the-Job Training - All sectors - 1 to 4 years (jobs)		10,589	16,182	18,910	18,395	24,046	44,132
On-the-Job Training - All sectors - 4 to 10 years (jobs)		3,455	5,523	6,417	6,187	8,042	15,098
On-the-Job Training - All sectors - Over 10 years (jobs)		476	748	850	799	1,033	1,907
On-Site or In-Plant Training - All sectors - None (jobs)		8,246	12,481	14,446	14,103	18,941	34,329
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		31,409	45,793	53,087	51,589	68,646	123,238
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		8,278	12,570	14,663	14,225	18,610	34,104
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		3,534	5,542	6,425	6,204	8,073	15,027
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		449	689	809	786	1,021	1,867
Wage income - All (million $2019)		2,747	4,073	4,795	4,761	6,401	11,633

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	652	610	534	441	358	306	285
Final energy use - Residential (PJ)	311	288	267	232	196	169	152
Final energy use - Commercial (PJ)	190	187	179	166	151	140	135
Final energy use - Industry (PJ)	680	692	706	721	751	767	776

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)		4.81	4.97	8.01	8.51	7.33	7.63

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	24.8	531	1,037	2,808	4,580	5,996	7,411
Vehicle stocks - LDV – All others (1000 units)	6,180	5,884	5,589	4,073	2,557	1,447	336
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		1,189	3,044	4,939	7,479	8,143	7,762
Public EV charging plugs - DC Fast (1000 units)	0.168		2.17		9.57		15.5
Public EV charging plugs - L2 (1000 units)	0.43		52.1		230		372

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 (%)	7.14	16.5	45.4	84.9	91.7	92.1	91.9
Sales of space heating units - Electric Resistance (%)	18.1	24.2	17.6	8.04	6.29	6.24	6.46
Sales of space heating units - Gas (%)	68.7	49.9	30.9	4.83	0.406	0.132	0.133
Sales of space heating units - Fossil (%)	6.08	9.3	6.1	2.21	1.58	1.53	1.49
Sales of water heating units - Electric Heat Pump (%)	0	2.32	17.1	34.9	37.8	38	38.1
Sales of water heating units - Electric Resistance (%)	39.3	55.4	55.8	60.8	61.7	61.8	61.7
Sales of water heating units - Gas Furnace (%)	60.6	42.1	26.8	4.14	0.241	0	0
Sales of water heating units - Other (%)	0.101	0.202	0.203	0.203	0.201	0.202	0.203
Sales of cooking units - Electric Resistance (%)	67.6	74.5	95.6	99.8	100	100	100
Sales of cooking units - Gas (%)	32.4	25.5	4.36	0.22	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		5.74	7.82				

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	2.05	9.66	38.6	81.8	89.2	89.7	89.7
Sales of space heating units - Electric Resistance (%)	6.04	3.52	5.22	9.16	9.92	9.96	9.94
Sales of space heating units - Gas (%)	88.9	84.5	55.7	9.03	0.86	0.359	0.36
Sales of space heating units - Fossil (%)	3.02	2.32	0.438	0.019	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.622	3.21	22.6	47.9	52.2	52.5	52.5
Sales of water heating units - Electric Resistance (%)	5.71	4.94	19	42.9	47.1	47.4	47.4
Sales of water heating units - Gas (%)	93.3	91.7	58.2	8.97	0.524	0	0
Sales of water heating units - Other (%)	0.34	0.189	0.189	0.191	0.19	0.19	0.19
Sales of cooking units - Electric Resistance (%)	41	54.2	82.9	88.6	88.9	88.9	88.9
Sales of cooking units - Gas (%)	59	45.8	17.1	11.4	11.1	11.1	11.1
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		19,994	21,829				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	14,827	8,572	0	0	0	0	0
Installed thermal - Natural gas (MW)	8,452	8,954	9,535	11,025	11,641	9,904	13,087

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	98.1	147	195	258	334	421	520
Installed renewables - Solar - Base land use assumptions (MW)	128	5,277	21,597	35,586	38,324	43,997	103,295
Installed renewables - Wind - Base land use assumptions (MW)	3,368	3,368	31,037	50,472	51,428	51,428	51,428
Installed renewables - Solar - Constrained land use assumptions (MW)	128	6,637	15,580	22,301	25,214	27,387	105,672
Installed renewables - Wind - Constrained land use assumptions (MW)	3,734	3,734	11,206	11,206	11,206	11,206	57,578
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion $2018)		6.9	19.5	15.4	2.85	5.57	54.9
Capital invested - Wind - Base (billion $2018)		0	36.8	24.1	1.13	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	245	9,523	38,883	63,943	68,733	78,425	184,855
Wind - Base land use assumptions (GWh)	12,511	12,511	100,983	158,008	160,578	160,578	160,578
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	491	23,929	56,058	79,805	89,783	97,144	378,054
Wind - Constrained land use assumptions (GWh)	25,021	25,021	68,916	68,916	68,916	68,916	355,481
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)							-38.8
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-325
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-829
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-85.6
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-611
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-702
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-632
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-290
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-433
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-3,947
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-58.2
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,138
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-1,493

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-125
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-1,223
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,354
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-948
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,056
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-858
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-9,255
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-77.5
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,952
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-2,158
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-168
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-1,834
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-2,006
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-1,264
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-3,822
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-14,566
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-1,284
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							6.34
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							248
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							422
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							31
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)							100
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							41.8
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							18.8
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							258

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,125
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							9.51
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							256
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							761
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							46.6
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)							145
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							62.7
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							136
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							519
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,936
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							12.7
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							264
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							1,100
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							62
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)							191
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							83.6
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							109
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							426
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							2,248

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)							-1,845
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-3,936
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-117
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-5,898
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-1,845
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-7,474
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-234
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-9,552
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							808
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							2,104
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							213
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							3,124
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							808
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							3,995
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							425
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							5,228

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)		92.9	0.113	0.112	0.098	0.071	0.006
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		21.2	13.3	15.8	11.6	3.99	1.26
Premature deaths from air pollution - Mobile - On-Road (deaths)		204	190	144	83.2	38.1	15.3
Premature deaths from air pollution - Gas Stations (deaths)		18.9	17.3	13	7.7	3.75	1.78

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		33.6	28.7	20.2	11.5	5.41	1.88
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		1.92	1.56	1.08	0.633	0.281	0.106
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		5.05	4.77	3.82	2.58	1.38	0.607
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		8.06	7.7	7.3	6.88	6.45	6
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		27.1	24.5	18.9	12.1	6.74	3.27
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		3.56	2.97	2.32	1.67	1.12	0.704
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		2.46	2.05	1.66	1.29	0.94	0.614
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		2.24	0.83	0.801	0.76	0.748	0.616
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		78.5	75.9	74	61.4	50.7	37.3
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		823	1	0.992	0.867	0.63	0.056
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		188	118	140	103	35.4	11.2
Monetary damages from air pollution - Mobile - On-Road (million $2019)		1,813	1,690	1,283	740	339	136
Monetary damages from air pollution - Gas Stations (million $2019)		167	153	115	68.1	33.2	15.8
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		298	254	179	102	47.9	16.6
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		17	13.9	9.55	5.61	2.49	0.943
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		44.8	42.2	33.8	22.8	12.3	5.38
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		71.3	68.2	64.6	60.9	57.1	53.1
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		240	217	167	107	59.6	28.9
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		31.5	26.3	20.6	14.8	9.93	6.23
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		21.7	18.2	14.7	11.4	8.32	5.44
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		19.8	7.33	7.07	6.71	6.6	5.44

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		697	674	657	545	450	331

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		2,027	2,039	1,944	2,389	4,363	2,858
By economic sector - Construction (jobs)		7,616	10,498	12,365	13,709	17,382	18,218
By economic sector - Manufacturing (jobs)		4,649	4,128	4,183	4,616	6,352	6,127
By economic sector - Mining (jobs)		3,725	2,401	1,804	1,285	977	745
By economic sector - Other (jobs)		453	785	1,435	1,548	1,822	1,801
By economic sector - Pipeline (jobs)		772	1,198	672	595	686	584
By economic sector - Professional (jobs)		4,585	4,722	6,322	8,678	15,872	16,353
By economic sector - Trade (jobs)		4,106	3,726	4,395	4,822	6,836	7,138
By economic sector - Utilities (jobs)		9,147	9,900	12,940	14,002	27,925	42,746
By resource sector - Biomass (jobs)		4,775	4,651	4,338	7,463	17,140	12,208
By resource sector - CO2 (jobs)		27.4	4,397	747	861	2,638	2,506
By resource sector - Coal (jobs)		4,091	921	310	271	244	151
By resource sector - Grid (jobs)		9,505	9,708	15,861	21,182	28,673	32,411
By resource sector - Natural Gas (jobs)		7,721	6,475	6,514	6,351	5,588	4,972
By resource sector - Nuclear (jobs)		0	0	2,762	558	13,237	30,897
By resource sector - Oil (jobs)		6,068	4,885	3,582	2,433	1,683	1,206
By resource sector - Solar (jobs)		803	3,086	6,640	5,678	5,284	4,218
By resource sector - Wind (jobs)		4,089	5,275	5,305	6,848	7,727	8,004
By education level - All sectors - High school diploma or less (jobs)		16,401	17,528	19,349	22,177	30,624	30,193
By education level - All sectors - Associates degree or some college (jobs)		11,081	12,075	13,580	15,836	21,828	22,618
By education level - All sectors - Bachelors degree (jobs)		7,517	7,660	8,578	10,190	15,047	15,433
By education level - All sectors - Masters or professional degree (jobs)		1,828	1,873	2,159	2,621	4,008	4,126
By education level - All sectors - Doctoral degree (jobs)		253	260	315	398	667	682
Related work experience - All sectors - None (jobs)		5,509	5,916	6,550	7,594	10,605	10,609
Related work experience - All sectors - Up to 1 year (jobs)		7,899	8,375	9,355	10,690	15,056	14,814
Related work experience - All sectors - 1 to 4 years (jobs)		13,145	13,852	15,500	18,232	25,861	26,291
Related work experience - All sectors - 4 to 10 years (jobs)		8,332	8,938	9,990	11,697	16,442	16,976
Related work experience - All sectors - Over 10 years (jobs)		2,195	2,316	2,586	3,009	4,211	4,361
On-the-Job Training - All sectors - None (jobs)		2,007	2,114	2,381	2,745	3,913	3,936
On-the-Job Training - All sectors - Up to 1 year (jobs)		25,020	26,081	29,056	33,916	48,423	48,475
On-the-Job Training - All sectors - 1 to 4 years (jobs)		7,390	8,127	9,093	10,577	14,467	15,027
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,335	2,708	3,047	3,533	4,765	4,993
On-the-Job Training - All sectors - Over 10 years (jobs)		328	366	404	451	606	622
On-Site or In-Plant Training - All sectors - None (jobs)		5,838	6,230	7,000	8,239	11,867	11,975
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		22,697	23,708	26,411	30,728	43,575	43,744

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

Item	2020	2025	2030	2035	2040	2045	2050
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		5,799	6,331	7,080	8,221	11,260	11,624
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,430	2,772	3,093	3,578	4,851	5,063
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		317	356	397	457	622	646
Wage income - All (million $2019)		1,982	2,117	2,384	2,826	4,048	4,178

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	652	610	534	441	358	306	285
Final energy use - Residential (PJ)	311	288	267	232	196	169	152
Final energy use - Commercial (PJ)	190	187	179	166	151	140	135
Final energy use - Industry (PJ)	680	692	706	721	751	767	776

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)		4.81	4.97	8.01	8.51	7.33	7.63

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	24.8	531	1,037	2,808	4,580	5,996	7,411
Vehicle stocks - LDV – All others (1000 units)	6,180	5,884	5,589	4,073	2,557	1,447	336
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		1,189	3,044	4,939	7,479	8,143	7,762
Public EV charging plugs - DC Fast (1000 units)	0.168		2.17		9.57		15.5
Public EV charging plugs - L2 (1000 units)	0.43		52.1		230		372

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 (%)	7.14	16.5	45.4	84.9	91.7	92.1	91.9
Sales of space heating units - Electric Resistance (%)	18.1	24.2	17.6	8.04	6.29	6.24	6.46
Sales of space heating units - Gas (%)	68.7	49.9	30.9	4.83	0.406	0.132	0.133
Sales of space heating units - Fossil (%)	6.08	9.3	6.1	2.21	1.58	1.53	1.49
Sales of water heating units - Electric Heat Pump (%)	0	2.32	17.1	34.9	37.8	38	38.1
Sales of water heating units - Electric Resistance (%)	39.3	55.4	55.8	60.8	61.7	61.8	61.7
Sales of water heating units - Gas Furnace (%)	60.6	42.1	26.8	4.14	0.241	0	0
Sales of water heating units - Other (%)	0.101	0.202	0.203	0.203	0.201	0.202	0.203
Sales of cooking units - Electric Resistance (%)	67.6	74.5	95.6	99.8	100	100	100
Sales of cooking units - Gas (%)	32.4	25.5	4.36	0.22	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		5.74	7.82				

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	2.05	9.66	38.6	81.8	89.2	89.7	89.7
Sales of space heating units - Electric Resistance (%)	6.04	3.52	5.22	9.16	9.92	9.96	9.94
Sales of space heating units - Gas (%)	88.9	84.5	55.7	9.03	0.86	0.359	0.36
Sales of space heating units - Fossil (%)	3.02	2.32	0.438	0.019	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.622	3.21	22.6	47.9	52.2	52.5	52.5
Sales of water heating units - Electric Resistance (%)	5.71	4.94	19	42.9	47.1	47.4	47.4
Sales of water heating units - Gas (%)	93.3	91.7	58.2	8.97	0.524	0	0
Sales of water heating units - Other (%)	0.34	0.189	0.189	0.191	0.19	0.19	0.19
Sales of cooking units - Electric Resistance (%)	41	54.2	82.9	88.6	88.9	88.9	88.9
Sales of cooking units - Gas (%)	59	45.8	17.1	11.4	11.1	11.1	11.1
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		19,994	21,829				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	14,827	4,508	236	236	236	236	0
Installed thermal - Natural gas (MW)	8,452	6,799	6,148	10,723	12,408	12,594	12,092
Installed thermal - Nuclear (MW)	0	0	0	1,160	1,160	6,660	18,894
Installed renewables - Rooftop PV (MW)	98.1	147	195	258	334	421	520
Installed renewables - Solar - Base land use assumptions (MW)	128	128	2,241	7,093	10,994	13,886	14,376
Installed renewables - Wind - Base land use assumptions (MW)	3,368	4,017	11,659	11,659	13,251	13,826	14,585
Installed renewables - Solar - Constrained land use assumptions (MW)	128	128	2,830	7,676	11,022	15,676	15,762
Installed renewables - Wind - Constrained land use assumptions (MW)	3,368	3,368	5,233	5,233	6,705	7,018	7,390
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion $2018)		0	2.53	5.35	4.05	2.84	0.454
Capital invested - Wind - Base (billion $2018)		0.955	10.4	0	2.02	0.645	0.849
Capital invested - Solar PV - Constrained (billion $2018)		0	3.23	5.34	3.48	4.56	0.08
Capital invested - Wind - Constrained (billion $2018)		0	2.48	0	1.74	0.35	0.394

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	245	245	4,015	12,746	19,768	24,951	25,821
Wind - Base land use assumptions (GWh)	12,511	14,691	40,509	40,509	46,016	47,863	50,422
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	245	245	5,081	13,773	19,781	28,134	28,289
Wind - Constrained land use assumptions (GWh)	12,511	12,511	18,200	18,200	22,602	23,538	24,627
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)							-38.8
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-325
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-829
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-85.6
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-611
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-702
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-632
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-290
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-433
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-3,947
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-58.2
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,138
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-1,493
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-125
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-1,223
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,354
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-948
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,056
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-858
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-9,255
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-77.5
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,952
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-2,158
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-168
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-1,834
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-2,006
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-1,264
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-3,822
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-14,566
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-1,284

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 - Accelerate regeneration (1000 hectares)							6.34
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							248
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							422
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							31
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)							100
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							41.8
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							18.8
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							258
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,125
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							9.51
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							256
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							761
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							46.6
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)							145
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							62.7
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							136
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							519
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,936
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							12.7
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							264

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 - Extend rotation length (1000 hectares)							1,100
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							62
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)							191
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							83.6
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							109
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							426
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							2,248

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)							-1,845
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-3,936
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-117
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-5,898
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-1,845
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-7,474
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-234
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-9,552
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							808
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							2,104
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							213
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							3,124

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							808
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							3,995
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							425
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							5,228

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)		92.9	0.113	0.112	0.098	0.071	0.006
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		25.1	14.4	8.31	5.84	3.01	0.985
Premature deaths from air pollution - Mobile - On-Road (deaths)		207	209	203	183	145	99.7
Premature deaths from air pollution - Gas Stations (deaths)		19.3	19.4	18.6	16.6	13.2	9.1
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		33.7	30.6	27.2	22.9	17.5	11.7
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		1.95	1.87	1.77	1.54	1.17	0.78
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		5.09	5.17	5.17	4.82	3.91	2.81
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		8.06	7.7	7.3	6.88	6.45	6
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		27.2	26.4	25.2	22.6	18.5	13.7
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		3.57	3.3	3.03	2.63	2.14	1.68
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		2.46	2.2	1.95	1.71	1.47	1.25
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		2.5	0.836	0.817	0.789	0.773	0.739
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		77.5	71.1	63	55.8	49.7	34.3
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		823	1	0.992	0.867	0.63	0.056
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		222	127	73.6	51.7	26.7	8.73
Monetary damages from air pollution - Mobile - On-Road (million $2019)		1,843	1,859	1,807	1,625	1,292	887
Monetary damages from air pollution - Gas Stations (million $2019)		171	172	165	147	117	80.6

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		299	271	241	203	155	104
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		17.3	16.5	15.7	13.7	10.3	6.91
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		45.1	45.8	45.8	42.7	34.6	24.9
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		71.3	68.2	64.6	60.9	57.1	53.1
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		241	234	223	200	164	121
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		31.6	29.2	26.8	23.2	19	14.9
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		21.7	19.5	17.3	15.1	13	11.1
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		22	7.38	7.21	6.96	6.82	6.52
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		688	632	559	496	441	305

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		2,027	2,037	3,841	5,010	6,837	5,949
By economic sector - Construction (jobs)		8,977	20,980	23,136	21,810	24,461	27,167
By economic sector - Manufacturing (jobs)		5,225	5,849	6,973	7,638	9,926	10,469
By economic sector - Mining (jobs)		3,877	2,362	1,831	1,449	1,107	729
By economic sector - Other (jobs)		650	2,776	3,443	2,944	2,991	3,685
By economic sector - Pipeline (jobs)		745	1,090	564	497	583	467
By economic sector - Professional (jobs)		5,330	9,397	13,530	17,410	24,480	25,552
By economic sector - Trade (jobs)		4,637	6,566	8,074	8,804	10,807	11,661
By economic sector - Utilities (jobs)		10,382	14,382	16,401	18,793	23,209	25,319
By resource sector - Biomass (jobs)		4,785	4,651	10,760	19,081	31,573	28,384
By resource sector - CO2 (jobs)		27.1	3,976	666	811	2,425	2,247
By resource sector - Coal (jobs)		4,770	1,155	232	199	175	151
By resource sector - Grid (jobs)		11,522	19,086	28,204	32,484	40,666	45,974
By resource sector - Natural Gas (jobs)		7,781	5,640	4,451	4,609	3,433	2,393
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		6,133	5,208	4,437	3,768	2,847	1,734
By resource sector - Solar (jobs)		2,016	16,623	18,339	12,256	9,549	11,780
By resource sector - Wind (jobs)		4,817	9,101	10,706	11,148	13,731	18,335
By education level - All sectors - High school diploma or less (jobs)		18,441	28,700	34,154	36,434	44,500	46,881
By education level - All sectors - Associates degree or some college (jobs)		12,616	20,483	23,813	25,364	30,950	33,505
By education level - All sectors - Bachelors degree (jobs)		8,449	12,633	15,275	17,263	22,038	23,315
By education level - All sectors - Masters or professional degree (jobs)		2,058	3,152	3,931	4,544	5,898	6,239
By education level - All sectors - Doctoral degree (jobs)		287	471	621	751	1,014	1,059

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

Item	2020	2025	2030	2035	2040	2045	2050
Related work experience - All sectors - None (jobs)		6,194	9,695	11,518	12,455	15,346	16,249
Related work experience - All sectors - Up to 1 year (jobs)		8,874	13,827	16,701	17,997	22,274	23,408
Related work experience - All sectors - 1 to 4 years (jobs)		14,864	23,095	27,524	30,019	37,236	39,633
Related work experience - All sectors - 4 to 10 years (jobs)		9,438	14,978	17,548	19,008	23,504	25,218
Related work experience - All sectors - Over 10 years (jobs)		2,480	3,844	4,503	4,877	6,041	6,491
On-the-Job Training - All sectors - None (jobs)		2,262	3,587	4,288	4,660	5,807	6,144
On-the-Job Training - All sectors - Up to 1 year (jobs)		28,145	42,790	51,614	56,663	70,777	74,663
On-the-Job Training - All sectors - 1 to 4 years (jobs)		8,403	13,748	15,861	16,775	20,332	22,032
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,668	4,682	5,316	5,529	6,611	7,218
On-the-Job Training - All sectors - Over 10 years (jobs)		373	632	714	729	871	941
On-Site or In-Plant Training - All sectors - None (jobs)		6,601	10,535	12,653	13,834	17,265	18,306
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		25,544	38,923	46,721	51,062	63,566	67,200
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		6,585	10,674	12,376	13,113	15,917	17,186
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,762	4,718	5,366	5,627	6,774	7,355
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		359	589	678	721	878	951
Wage income - All (million $2019)		2,232	3,475	4,175	4,622	5,815	6,263

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	653	615	559	514	480	439	392
Final energy use - Residential (PJ)	311	289	273	257	238	214	188
Final energy use - Commercial (PJ)	190	187	183	179	172	164	155
Final energy use - Industry (PJ)	680	693	708	728	762	777	784

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)		4.04	4.11	5.15	5.33	7.04	7.41

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	19.2	168	317	1,006	1,695	3,221	4,747
Vehicle stocks - LDV – All others (1000 units)	6,205	6,205	6,205	5,886	5,566	4,290	3,013
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		0	192	404	1,364	4,297	6,258
Public EV charging plugs - DC Fast (1000 units)	0.168		0.662		3.54		9.92
Public EV charging plugs - L2 (1000 units)	0.43		15.9		85.2		238

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 (%)	7.14	13.6	16.9	27.4	49.2	73	86
Sales of space heating units - Electric Resistance (%)	18.1	24.8	24	21.6	16.2	10.6	7.72
Sales of space heating units - Gas (%)	68.7	51.9	49.7	42.9	28.7	12.9	4.2
Sales of space heating units - Fossil (%)	6.08	9.67	9.33	8.18	5.9	3.46	2.13
Sales of water heating units - Electric Heat Pump (%)	0	0.608	2.31	7.59	18.2	29.3	35.3
Sales of water heating units - Electric Resistance (%)	39.3	55.7	55.6	55.8	57.2	59.4	61
Sales of water heating units - Gas Furnace (%)	60.6	43.5	41.9	36.4	24.4	11	3.54
Sales of water heating units - Other (%)	0.101	0.202	0.203	0.204	0.204	0.204	0.204
Sales of cooking units - Electric Resistance (%)	67.5	68.3	71.3	79.1	90.1	96.8	99.1
Sales of cooking units - Gas (%)	32.5	31.7	28.7	20.9	9.94	3.21	0.863
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		5.71	7.71				

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	2.05	6.96	10.3	20.9	43.5	68.9	83
Sales of space heating units - Electric Resistance (%)	6.04	3.45	3.62	4.3	5.98	8.09	9.31
Sales of space heating units - Gas (%)	88.9	86.9	83.6	72.9	49.6	22.7	7.57
Sales of space heating units - Fossil (%)	3.02	2.68	2.47	1.87	0.951	0.308	0.081
Sales of water heating units - Electric Heat Pump (%)	0.622	1.14	3.37	10.3	24.6	40.1	48.5
Sales of water heating units - Electric Resistance (%)	5.71	3.86	5.44	10.7	22.3	35.9	43.7
Sales of water heating units - Gas (%)	93.3	94.8	91	78.8	52.9	23.8	7.64
Sales of water heating units - Other (%)	0.34	0.189	0.189	0.191	0.19	0.19	0.19
Sales of cooking units - Electric Resistance (%)	41	45.8	49.8	60.5	75.4	84.5	87.7
Sales of cooking units - Gas (%)	59	54.2	50.2	39.5	24.6	15.5	12.3
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		19,992	21,841				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	14,827	7,348	0	0	0	0	0
Installed thermal - Natural gas (MW)	8,452	8,954	8,627	8,627	9,016	7,279	7,276
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	0.009	0	0
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	0	0	0.001	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu power plant (GWh)	0	0	0	0	0.958	0.958	0.958
Biomass w/ccu allam power plant (GWh)	0	0	0	0	9.16	9.16	9.16

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

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu (quantity)	0	0	0	0	1	1	1
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	1	1	1
Number of facilities - Beccs hydrogen (quantity)	0	0	0	19	52	105	105
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	1	1	1
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	1	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	0	16,160	28,771	45,905	0
Biomass purchases (million $2018/y)		0	0	1,634	4,541	9,183	9,183

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	20.8	57.7	120	120
Annual - BECCS (MMT)		0	0	20.8	57.7	117	117
Annual - NGCC (MMT)		0	0	0	0	0	0
Annual - Cement and lime (MMT)		0	0	0	0	3.42	3.53
Cumulative - All (MMT)		0	0	20.8	78.5	199	319
Cumulative - BECCS (MMT)		0	0	20.8	78.5	195	312
Cumulative - NGCC (MMT)		0	0	0	0	0	0
Cumulative - Cement and lime (MMT)		0	0	0	0	3.42	6.95

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	465	467	471	471	471
Spur (km)		0	34.3	51.8	1,171	3,524	4,188
All (km)		0	499	518	1,642	3,995	4,659
Cumulative investment - Trunk (million $2018)		0	2,358	2,372	2,502	2,726	2,726
Cumulative investment - Spur (million $2018)		0	130	265	1,323	4,317	4,777
Cumulative investment - All (million $2018)		0	2,487	2,637	3,825	7,043	7,503

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual (MMT)		0	1.85	7.49	14.3	19.7	20.1
Injection wells (wells)		0	3	13	23	39	49
Resource characterization, appraisal, permitting costs (million $2020)		50.6	222	344	344	344	344
Wells and facilities construction costs (million $2020)		0	101	394	701	1,173	1,456

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)							-38.8
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-325
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-829
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-85.6
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-611
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-702
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-632
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-290
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-433
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-3,947
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-58.2
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,138
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-1,493
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-125
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-1,223
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,354
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-948
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,056
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-858
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-9,255
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-77.5
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,952
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-2,158
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-168
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-1,834
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-2,006
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-1,264
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-3,822
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-14,566
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-1,284

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							6.34
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							248
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							422
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							31
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)							100
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							41.8
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							18.8
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							258
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,125
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							9.51
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							256
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							761
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							46.6
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)							145
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							62.7
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							136
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							519
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,936
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							12.7
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							264

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							1,100
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							62
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)							191
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							83.6
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							109
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							426
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							2,248

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)							-2,302
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-3,578
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-105
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)							-5,986
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-2,302
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-6,796
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-211
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)							-9,309

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							1,204
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							1,906
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							192
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)							400
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)							67.8
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							3,769
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							1,204
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							8,939
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							383
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)							400
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)							67.8
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							10,994

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)		301	199	154	131	123	120
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		22.8	26.3	32.3	34.5	29.9	26.5
Premature deaths from air pollution - Mobile - On-Road (deaths)		207	212	217	222	228	234
Premature deaths from air pollution - Gas Stations (deaths)		19.2	19.5	19.8	20.2	20.5	20.7
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		33.4	30.5	28	26.3	25.2	24.3
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		1.9	1.62	1.18	0.77	0.448	0.272
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		4.89	4.91	5	5.08	5.02	4.9
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		8.42	8.42	8.38	8.31	8.22	8.09

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		27.4	26.7	24.2	21.2	19.3	18.8
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		3.7	3.7	3.57	3.35	3.16	3.06
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		2.57	2.61	2.65	2.69	2.72	2.76
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		5.67	3.82	3	2.78	2.63	2.41
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		77.9	80.9	81.9	78	76.6	70.4
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		2,670	1,765	1,362	1,161	1,091	1,065
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		202	233	287	306	265	235
Monetary damages from air pollution - Mobile - On-Road (million $2019)		1,842	1,885	1,926	1,975	2,025	2,076
Monetary damages from air pollution - Gas Stations (million $2019)		170	173	175	178	181	184
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		296	270	248	233	224	216
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		16.9	14.4	10.5	6.82	3.97	2.41
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		43.3	43.5	44.3	45	44.5	43.4
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		74.6	74.6	74.2	73.5	72.7	71.6
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		242	236	215	188	171	166
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		32.7	32.7	31.6	29.6	27.9	27.1
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		22.7	23.1	23.5	23.8	24.1	24.4
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		50	33.7	26.5	24.5	23.2	21.2
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		692	719	727	693	680	625

Table 65: *REF scenario - IMPACTS - Jobs*

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		2,026	2,023	2,023	2,019	2,019	2,020
By economic sector - Construction (jobs)		7,885	8,044	8,270	10,279	9,937	9,539
By economic sector - Manufacturing (jobs)		4,263	4,169	4,181	4,718	4,394	4,084
By economic sector - Mining (jobs)		4,970	3,575	2,832	2,293	1,908	1,419

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Other (jobs)		431	469	496	684	679	742
By economic sector - Pipeline (jobs)		769	806	820	772	781	774
By economic sector - Professional (jobs)		4,941	4,555	4,394	5,469	5,264	4,973
By economic sector - Trade (jobs)		4,945	4,129	3,797	4,176	3,943	3,574
By economic sector - Utilities (jobs)		11,389	10,397	10,468	13,457	12,431	10,736
By resource sector - Biomass (jobs)		4,778	4,642	4,519	4,405	4,312	4,227
By resource sector - CO2 (jobs)		0	0.04	0.051	0.054	0.06	0.064
By resource sector - Coal (jobs)		7,526	4,897	3,767	3,462	3,111	1,468
By resource sector - Grid (jobs)		13,102	12,194	12,569	17,520	16,135	14,237
By resource sector - Natural Gas (jobs)		7,983	7,833	8,180	9,080	8,407	7,742
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		6,185	5,340	4,740	4,397	4,185	4,006
By resource sector - Solar (jobs)			497	633	655	688	1,216
By resource sector - Wind (jobs)		2,045	2,765	2,872	4,349	4,520	4,964
By education level - All sectors - High school diploma or less (jobs)		18,530	17,013	16,649	19,342	18,284	16,813
By education level - All sectors - Associates degree or some college (jobs)		12,478	11,502	11,311	13,567	12,771	11,652
By education level - All sectors - Bachelors degree (jobs)		8,325	7,563	7,302	8,566	8,042	7,318
By education level - All sectors - Masters or professional degree (jobs)		2,016	1,842	1,781	2,112	1,991	1,825
By education level - All sectors - Doctoral degree (jobs)		270	248	238	282	269	251
Related work experience - All sectors - None (jobs)		6,155	5,685	5,577	6,555	6,190	5,683
Related work experience - All sectors - Up to 1 year (jobs)		8,823	8,120	7,933	9,173	8,692	8,039
Related work experience - All sectors - 1 to 4 years (jobs)		14,887	13,554	13,196	15,561	14,639	13,340
Related work experience - All sectors - 4 to 10 years (jobs)		9,319	8,569	8,384	9,982	9,395	8,570
Related work experience - All sectors - Over 10 years (jobs)		2,434	2,240	2,190	2,597	2,441	2,228
On-the-Job Training - All sectors - None (jobs)		2,214	2,030	1,969	2,290	2,160	1,987
On-the-Job Training - All sectors - Up to 1 year (jobs)		28,116	25,659	24,971	29,128	27,456	25,131
On-the-Job Training - All sectors - 1 to 4 years (jobs)		8,312	7,684	7,564	9,082	8,553	7,811
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,628	2,466	2,452	2,986	2,827	2,595
On-the-Job Training - All sectors - Over 10 years (jobs)		348	329	324	381	361	335
On-Site or In-Plant Training - All sectors - None (jobs)		6,429	5,930	5,790	6,827	6,438	5,913
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		25,580	23,331	22,711	26,513	24,987	22,861
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		6,534	6,026	5,923	7,077	6,666	6,089
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,723	2,548	2,525	3,052	2,887	2,649
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		352	332	331	399	378	348
Wage income - All (million $2019)		2,232	2,067	2,042	2,438	2,327	2,153

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	653	615	563	533	532	548	569

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Residential (PJ)	311	289	277	269	264	262	259
Final energy use - Commercial (PJ)	190	190	188	184	179	179	183
Final energy use - Industry (PJ)	681	703	718	717	727	733	738

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)		4.26	4.35	4.69	4.81	5.72	5.94

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 (%)	5.73	19.2	19.7	20.7	21.5	22.5	23.7
Sales of space heating units - Electric Resistance (%)	18.5	23.4	23.1	22.7	21.9	20.9	19.8
Sales of space heating units - Gas (%)	69.5	49	48.9	48.6	48.6	48.6	48.5
Sales of space heating units - Fossil (%)	6.24	8.46	8.19	7.99	8.01	8.01	8.02
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	39.3	55.6	55.5	55.3	55.3	55.2	55.1
Sales of water heating units - Gas Furnace (%)	60.6	44.2	44.3	44.5	44.5	44.6	44.7
Sales of water heating units - Other (%)	0.101	0.202	0.203	0.204	0.204	0.205	0.206
Sales of cooking units - Electric Resistance (%)	67.2	67.2	67.2	67.2	67.2	67.2	67.2
Sales of cooking units - Gas (%)	32.8	32.8	32.8	32.8	32.8	32.8	32.8
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		5.46	5.93				

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	2.05	13.1	45	71.1	75.4	75.9	75.9
Sales of space heating units - Electric Resistance (%)	6.04	4.34	8.93	17.2	22.8	23.7	23.7
Sales of space heating units - Gas (%)	88.9	80.1	44.8	11.5	1.77	0.439	0.36
Sales of space heating units - Fossil (%)	3.02	2.48	1.25	0.221	0.025	0.001	0
Sales of water heating units - Electric Heat Pump (%)	0.622	0.346	0.35	0.35	0.344	0.346	0.347
Sales of water heating units - Electric Resistance (%)	5.71	3.27	3.23	3.24	3.22	3.2	3.2
Sales of water heating units - Gas (%)	93.3	96.2	96.2	96.2	96.3	96.3	96.3
Sales of water heating units - Other (%)	0.34	0.189	0.189	0.191	0.19	0.19	0.19
Sales of cooking units - Electric Resistance (%)	41	44.2	44.3	44.3	44.3	44.4	44.5
Sales of cooking units - Gas (%)	59	55.8	55.7	55.7	55.7	55.6	55.5
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		19,774	20,475				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	14,827	11,985	7,904	7,904	7,904	7,348	0
Installed thermal - Natural gas (MW)	8,452	9,589	8,842	11,474	16,572	15,873	16,694
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	98.1	147	195	258	334	421	520

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed renewables - Solar - Base land use assumptions (MW)	128	128	128	128	128	128	128
Installed renewables - Wind - Base land use assumptions (MW)	3,368	3,368	7,216	7,910	13,607	14,106	14,768

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	245	245	245	245	245	245	245
Wind - Base land use assumptions (GWh)	12,511	12,511	25,343	27,647	47,158	48,758	51,005
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)	-6.5		-4.24				-3.79
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-0.499		-0.898				-0.933
Business-as-usual carbon sink - Total (Mt CO2e/y)	-7		-5.14				-4.73

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)							-38.8
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-325
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-829
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-85.6
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-611
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-702
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-632
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-290
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-433
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-3,947
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-58.2
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,138
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-1,493
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-125
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-1,223
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,354
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-948

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,056
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-858
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-9,255
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-77.5
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,952
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-2,158
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-168
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-1,834
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-2,006
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-1,264
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-3,822
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-14,566
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-1,284
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							6.34
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							248
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							422
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							31
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)							100
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							41.8
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							18.8
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							258
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,125
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							9.51
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							256

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							761
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							46.6
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)							145
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							62.7
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							136
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							519
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,936
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							12.7
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							264
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							1,100
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							62
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)							191
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							83.6
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							109
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							426
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							2,248