



Net-Zero America - Missouri data

October 29, 2021 (updated November 17, 2023)

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

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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)		62.8	0.052	0.05	0.042	0.028	0.001
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		23.4	12.4	6.2	4.87	2.59	1.25
Premature deaths from air pollution - Mobile - On-Road (deaths)		146	136	103	59.5	27.6	11.6
Premature deaths from air pollution - Gas Stations (deaths)		11.4	10.5	7.88	4.68	2.33	1.16
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		22.2	17.8	11.6	6.23	2.82	1.1
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.545	0.448	0.315	0.193	0.096	0.045
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		4.05	3.67	2.81	1.81	0.904	0.365
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		5.84	5.59	5.32	5.02	4.72	4.41
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		16.2	13.9	10.2	6.49	3.84	2.2
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.97	1.63	1.28	0.946	0.657	0.418
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		1.38	1.15	0.937	0.728	0.531	0.348
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		2.81	1.72	1.7	1.67	1.68	1.66
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		94	88.3	80.3	62.4	46.2	28.6
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		556	0.465	0.445	0.372	0.247	0.01
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		207	110	54.9	43.2	22.9	11.1
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		1,300	1,208	916	529	246	103
Monetary damages from air pollution - Gas Stations (million \$2019)		101	92.6	69.7	41.5	20.6	10.3
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		197	158	103	55.2	25	9.74
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		4.83	3.97	2.79	1.71	0.849	0.394
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		35.9	32.5	24.9	16	8.01	3.23
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		51.7	49.5	47.1	44.5	41.8	39
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		144	123	90.6	57.5	34	19.5

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)		17.5	14.4	11.3	8.38	5.81	3.7
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		12.2	10.2	8.29	6.44	4.7	3.08
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		24.8	15.2	15	14.8	14.9	14.6
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		835	784	713	554	411	254

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		441	449	431	366	303	742
By economic sector - Construction (jobs)		14,888	16,430	24,010	31,112	25,367	25,647
By economic sector - Manufacturing (jobs)		3,126	3,542	4,437	5,025	4,625	5,280
By economic sector - Mining (jobs)		2,224	1,584	1,073	699	468	322
By economic sector - Other (jobs)		2,200	2,498	4,326	6,039	4,537	4,605
By economic sector - Pipeline (jobs)		404	504	279	221	179	217
By economic sector - Professional (jobs)		6,373	6,870	10,528	14,280	12,423	13,840
By economic sector - Trade (jobs)		4,817	4,937	7,159	9,484	7,994	8,604
By economic sector - Utilities (jobs)		8,787	10,795	15,278	21,439	21,466	22,993
By resource sector - Biomass (jobs)		1,042	1,028	963	946	1,127	3,240
By resource sector - CO2 (jobs)		14.7	1,318	91.3	194	438	1,118
By resource sector - Coal (jobs)		1,495	345	151	132	119	105
By resource sector - Grid (jobs)		12,320	17,375	28,156	40,662	42,700	45,353
By resource sector - Natural Gas (jobs)		3,513	2,388	2,008	2,340	1,045	799
By resource sector - Nuclear (jobs)		624	614	604	350	0	0
By resource sector - Oil (jobs)		5,419	4,356	3,168	2,195	1,500	1,003
By resource sector - Solar (jobs)		15,499	16,130	26,727	34,639	22,327	20,589
By resource sector - Wind (jobs)		3,334	4,056	5,651	7,206	8,109	10,043
By education level - All sectors - High school diploma or less (jobs)		18,642	20,560	29,045	37,859	32,813	34,765
By education level - All sectors - Associates degree or some college (jobs)		13,577	15,114	21,655	28,699	25,117	26,570
By education level - All sectors - Bachelors degree (jobs)		8,583	9,276	13,014	17,066	15,008	16,120
By education level - All sectors - Masters or professional degree (jobs)		2,130	2,312	3,301	4,374	3,858	4,173
By education level - All sectors - Doctoral degree (jobs)		328	347	504	665	568	621
Related work experience - All sectors - None (jobs)		6,304	6,974	9,898	13,028	11,370	12,092
Related work experience - All sectors - Up to 1 year (jobs)		8,929	9,800	13,931	18,117	15,578	16,581
Related work experience - All sectors - 1 to 4 years (jobs)		15,449	16,981	24,069	31,689	27,762	29,528
Related work experience - All sectors - 4 to 10 years (jobs)		10,013	11,029	15,637	20,605	18,056	19,160
Related work experience - All sectors - Over 10 years (jobs)		2,566	2,826	3,985	5,225	4,598	4,888
On-the-Job Training - All sectors - None (jobs)		2,429	2,633	3,743	4,883	4,176	4,434
On-the-Job Training - All sectors - Up to 1 year (jobs)		28,131	30,849	43,596	57,089	49,894	53,296

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)		9,156	10,180	14,513	19,187	16,798	17,718
On-the-Job Training - All sectors - 4 to 10 years (jobs)		3,117	3,484	5,014	6,666	5,793	6,067
On-the-Job Training - All sectors - Over 10 years (jobs)		427	464	653	839	703	734
On-Site or In-Plant Training - All sectors - None (jobs)		7,031	7,692	10,946	14,357	12,413	13,221
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		25,609	28,114	39,745	52,067	45,519	48,552
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		7,104	7,888	11,233	14,826	12,969	13,688
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		3,140	3,491	4,988	6,606	5,748	6,033
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		377	424	608	808	713	755
Wage income - All (million \$2019)		2,345	2,610	3,732	4,970	4,424	4,767

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

Item	2020	2025	2030	2035	2040	2045	2050
Oil consumption - Annual (million bbls)		121	106	83.7	62.4	45.6	32.5
Oil consumption - Cumulative (million bbls)							2,577
Oil production - Annual (million bbls)		0.117	0.117	0.117	0.093	0.075	0.05
Natural gas consumption - Annual (tcf)		249	210	169	127	79.8	55.4
Natural gas consumption - Cumulative (tcf)							5,077
Natural gas production - Annual (tcf)		0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	669	623	550	461	380	331	311
Final energy use - Residential (PJ)	241	227	206	178	155	141	134
Final energy use - Commercial (PJ)	182	178	169	158	147	141	138
Final energy use - Industry (PJ)	241	249	271	274	290	326	330

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion \$2018)		3.82	3.92	6.23	6.6	6.19	6.47

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	30.1	479	928	2,500	4,071	5,327	6,583
Vehicle stocks - LDV – All others (1000 units)	5,489	5,226	4,964	3,618	2,271	1,285	299
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		1,055	2,704	4,381	6,637	7,223	6,887
Public EV charging plugs - DC Fast (1000 units)	0.178		1.98		8.67		14
Public EV charging plugs - L2 (1000 units)	1.67		47.5		208		337

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 (%)	7.5	22.5	72.3	86.1	87.5	87.8	87.4
Sales of space heating units - Electric Resistance (%)	19.7	22.4	10	6.61	6.36	6.55	6.72
Sales of space heating units - Gas (%)	63.5	41.4	10.2	1.69	1.08	1.04	1.02
Sales of space heating units - Fossil (%)	9.34	13.6	7.39	5.58	5.03	4.63	4.86
Sales of water heating units - Electric Heat Pump (%)	0	8.7	46.5	56.1	56.7	56.7	56.7
Sales of water heating units - Electric Resistance (%)	42.5	55.5	45.3	43.3	43.3	43.3	43.3
Sales of water heating units - Gas Furnace (%)	57.4	35.7	8.23	0.581	0.019	0	0
Sales of water heating units - Other (%)	0.034	0.035	0.036	0.035	0.035	0.036	0.036
Sales of cooking units - Electric Resistance (%)	76.5	81.5	96.8	99.8	100	100	100
Sales of cooking units - Gas (%)	23.5	18.5	3.16	0.159	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		5.85	7.79				

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 (%)	4.52	24.4	70.6	87.7	89.7	89.7	89.7
Sales of space heating units - Electric Resistance (%)	8.06	5.73	7.1	9.32	9.79	9.8	9.8
Sales of space heating units - Gas (%)	87.4	68.1	22	2.94	0.553	0.458	0.459
Sales of space heating units - Fossil (%)	0	1.75	0.337	0.014	0	0	0
Sales of water heating units - Electric Heat Pump (%)	1.19	10.6	53.1	64.2	65	65	65
Sales of water heating units - Electric Resistance (%)	10.1	11	28.4	33.8	34.3	34.3	34.3
Sales of water heating units - Gas (%)	87.7	77.5	17.8	1.26	0.041	0	0
Sales of water heating units - Other (%)	0.996	0.947	0.735	0.688	0.685	0.688	0.687
Sales of cooking units - Electric Resistance (%)	44.8	57.1	84	89.3	89.6	89.6	89.6
Sales of cooking units - Gas (%)	55.2	42.9	16	10.7	10.4	10.4	10.4
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		16,269	17,611				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	7,000	1,299	0	0	0	0	0
Installed thermal - Natural gas (MW)	6,692	4,262	4,288	3,916	2,586	2,383	2,172
Installed thermal - Nuclear (MW)	1,236	1,236	1,236	1,236	0	0	0
Installed renewables - Rooftop PV (MW)	153	269	400	605	898	1,277	1,767
Installed renewables - Solar - Base land use assumptions (MW)	33.6	9,863	18,696	35,534	55,733	61,382	63,727
Installed renewables - Wind - Base land use assumptions (MW)	6,593	24,947	42,054	59,780	89,561	120,496	155,043
Installed renewables - Solar - Constrained land use assumptions (MW)	1,074	7,271	17,708	32,235	48,623	52,207	53,235
Installed renewables - Wind - Constrained land use assumptions (MW)	4,745	26,146	49,853	78,238	92,807	95,002	95,116
Capital invested - Solar PV - Base (billion \$2018)		13.2	10.6	18.6	21	5.54	2.17
Capital invested - Wind - Base (billion \$2018)		28.5	22.8	22	35.2	34.7	36.6

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)		9.58	11.6	13.9	23.7	1.24	0.374
Capital invested - Wind - Constrained (billion \$2018)		31.6	32.5	34.5	16.2	1.98	80.4
Capital invested - Biomass power plant (billion \$2018)	0	0.003	0.021	0	0.003	0	0
Capital invested - Biomass w/ccu allam power plant (billion \$2018)	0	0	0	0	0	0.009	0
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	0	0	1.19	0.005	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	72.4	18,541	35,193	66,831	104,688	115,313	119,768
Wind - Base land use assumptions (GWh)	19,737	83,563	139,217	196,305	291,874	389,204	494,930
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	0	13,674	33,346	60,726	91,519	98,271	100,217
Wind - Constrained land use assumptions (GWh)	17,665	86,986	161,857	250,834	294,590	301,857	302,230
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0
Biomass power plant (GWh)	0	5.97	46.4	46.4	52.4	52.4	52.4
Biomass w/ccu power plant (GWh)	0	0	0	0	1,335	1,341	1,341
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	9.08	9.08

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

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Power (quantity)	0	1	1	1	1	1	1
Number of facilities - Power ccu (quantity)	0	0	0	0	1	2	2
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	0	1	1
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	1	4	11
Number of facilities - Diesel (quantity)	0	0	0	1	1	1	1
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	1	1
Number of facilities - Pyrolysis (quantity)	0	0	0	1	1	1	1
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	1	2	2
Number of facilities - Sng (quantity)	0	1	1	1	1	1	1
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0
Conversion capital investment - Cumulative 5-yr (million \$2018)		3.44	23	19.7	1,705	1,881	6,256
Biomass purchases (million \$2018/y)		38.3	97	98	192	298	656

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	3.24	3.35	5.37	14.7	23.1
Annual - BECCS (MMT)		0	0	0	2.05	4.46	12.5
Annual - NGCC (MMT)		0	0	0	0	0	0
Annual - Cement and lime (MMT)		0	3.24	3.35	3.32	10.3	10.6
Cumulative - All (MMT)		0	3.24	6.59	12	26.7	49.8
Cumulative - BECCS (MMT)		0	0	0	2.05	6.51	19
Cumulative - NGCC (MMT)		0	0	0	0	0	0
Cumulative - Cement and lime (MMT)		0	3.24	6.59	9.91	20.2	30.8

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	409	409	409	409	409
Spur (km)		0	10.4	180	278	550	1,148
All (km)		0	420	589	687	959	1,557
Cumulative investment - Trunk (million \$2018)		0	1,950	1,950	1,950	1,950	1,950
Cumulative investment - Spur (million \$2018)		0	11.9	160	242	387	895
Cumulative investment - All (million \$2018)		0	1,962	2,109	2,192	2,337	2,845

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual (MMT)		0	0	0.88	1.81	3.44	3.73
Injection wells (wells)		0	1	2	4	7	9
Resource characterization, appraisal, permitting costs (million \$2020)		27.9	78.2	101	101	101	101
Wells and facilities construction costs (million \$2020)		0	18.6	72.5	129	216	268

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)							-82
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-379
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,973
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-77
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-1,071
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-787
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-5,328
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-1,597
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,244
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-13,537
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-123
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,326
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-5,357
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-113
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-2,141
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,517
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-7,992

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 tCO ₂ e/y)							-11,338
Carbon sink potential - Mid - Restore productivity (1000 tCO ₂ e/y)							-2,467
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO ₂ e/y)							-32,374
Carbon sink potential - High - Accelerate regeneration (1000 tCO ₂ e/y)							-164
Carbon sink potential - High - Avoid deforestation (1000 tCO ₂ e/y)							-2,274
Carbon sink potential - High - Extend rotation length (1000 tCO ₂ e/y)							-7,741
Carbon sink potential - High - Improve plantations (1000 tCO ₂ e/y)							-151
Carbon sink potential - High - Increase retention of HWP (1000 tCO ₂ e/y)							-3,212
Carbon sink potential - High - Increase trees outside forests (1000 tCO ₂ e/y)							-2,247
Carbon sink potential - High - Reforest cropland (1000 tCO ₂ e/y)							-10,656
Carbon sink potential - High - Reforest pasture (1000 tCO ₂ e/y)							-21,079
Carbon sink potential - High - All (not counting overlap) (1000 tCO ₂ e/y)							-51,213
Carbon sink potential - High - Restore productivity (1000 tCO ₂ e/y)							-3,690
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							13.4
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							289
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,512
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							27.9
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)							112
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							352
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							104
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							740
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,151
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							20.1
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							298

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)							2,730
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							41.9
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)							163
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							528
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							751
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,490
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							6,022
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							26.8
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							308
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							3,947
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							55.7
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							214
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							705
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							599
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,223
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							7,077

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO ₂ e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO ₂ e/y)							-7,068

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 tCO ₂ e/y)							-157
Carbon sink potential - Moderate deployment - Total (1000 tCO ₂ e/y)							-7,225
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO ₂ e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO ₂ e/y)							-13,495
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO ₂ e/y)							-313
Carbon sink potential - Aggressive deployment - Total (1000 tCO ₂ e/y)							-13,808
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							3,016
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							285
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							3,301
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							5,748
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							570
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							6,318

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)		62.8	0.052	0.05	0.042	0.028	0.001
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		22.7	10.5	4.66	2.24	0.862	0.676
Premature deaths from air pollution - Mobile - On-Road (deaths)		149	149	145	131	104	71.3
Premature deaths from air pollution - Gas Stations (deaths)		11.6	11.7	11.2	10	7.95	5.51
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		22.4	20.3	17.8	14.5	10.6	6.8
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.556	0.531	0.505	0.451	0.363	0.271
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		4.1	4.16	4.14	3.78	2.98	2.08

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)		5.84	5.59	5.32	5.02	4.72	4.41
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		16.3	15.6	14.6	12.7	10.1	7.49
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.98	1.78	1.59	1.38	1.14	0.924
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		1.38	1.24	1.1	0.962	0.831	0.708
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		2.74	1.72	1.71	1.69	1.69	1.62
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		93.8	85.1	74.1	64.9	57.4	39.9
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		556	0.465	0.445	0.372	0.247	0.01
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		201	92.7	41.3	19.8	7.64	5.99
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		1,321	1,328	1,290	1,161	924	634
Monetary damages from air pollution - Gas Stations (million \$2019)		103	103	99.3	88.7	70.4	48.8
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		199	180	157	128	93.6	60.3
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		4.93	4.7	4.47	4	3.22	2.4
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		36.3	36.9	36.7	33.5	26.4	18.4
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		51.7	49.5	47.1	44.5	41.8	39
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		144	138	129	112	89.8	66.3
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		17.5	15.7	14.1	12.2	10.1	8.18
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		12.2	11	9.72	8.52	7.36	6.27
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		24.2	15.2	15.1	14.9	14.9	14.3
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		833	756	658	576	509	355

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		442	456	434	475	411	742
By economic sector - Construction (jobs)		15,446	17,340	20,900	27,638	27,436	28,355

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Manufacturing (jobs)		3,177	3,662	4,109	4,855	5,647	6,355
By economic sector - Mining (jobs)		2,243	1,665	1,293	984	751	515
By economic sector - Other (jobs)		2,313	2,613	3,701	5,295	4,715	4,801
By economic sector - Pipeline (jobs)		407	616	302	280	279	359
By economic sector - Professional (jobs)		6,578	7,120	9,303	13,059	13,678	15,345
By economic sector - Trade (jobs)		4,959	5,141	6,485	8,741	8,775	9,525
By economic sector - Utilities (jobs)		8,781	11,261	13,206	18,628	23,638	26,061
By resource sector - Biomass (jobs)		1,043	1,047	980	1,569	1,751	3,132
By resource sector - CO2 (jobs)		14.9	2,248	159	343	751	1,904
By resource sector - Coal (jobs)		1,495	345	151	132	119	105
By resource sector - Grid (jobs)		12,259	17,524	23,993	35,092	46,771	50,566
By resource sector - Natural Gas (jobs)		3,513	2,226	1,859	1,999	1,224	1,177
By resource sector - Nuclear (jobs)		624	614	604	350	0	0
By resource sector - Oil (jobs)		5,479	4,662	3,974	3,256	2,545	1,708
By resource sector - Solar (jobs)		16,442	16,985	22,657	30,205	22,719	20,505
By resource sector - Wind (jobs)		3,477	4,225	5,355	7,008	9,450	12,960
By education level - All sectors - High school diploma or less (jobs)		19,122	21,553	25,679	34,131	36,181	38,831
By education level - All sectors - Associates degree or some college (jobs)		13,921	15,853	19,056	25,715	27,606	29,754
By education level - All sectors - Bachelors degree (jobs)		8,784	9,697	11,612	15,525	16,648	18,108
By education level - All sectors - Masters or professional degree (jobs)		2,182	2,412	2,937	3,974	4,268	4,673
By education level - All sectors - Doctoral degree (jobs)		338	361	450	610	628	691
Related work experience - All sectors - None (jobs)		6,461	7,311	8,746	11,734	12,529	13,516
Related work experience - All sectors - Up to 1 year (jobs)		9,169	10,257	12,320	16,365	17,171	18,475
Related work experience - All sectors - 1 to 4 years (jobs)		15,829	17,787	21,313	28,591	30,635	33,075
Related work experience - All sectors - 4 to 10 years (jobs)		10,261	11,562	13,823	18,552	19,909	21,495
Related work experience - All sectors - Over 10 years (jobs)		2,627	2,958	3,531	4,714	5,086	5,496
On-the-Job Training - All sectors - None (jobs)		2,495	2,757	3,320	4,421	4,601	4,940
On-the-Job Training - All sectors - Up to 1 year (jobs)		28,823	32,282	38,670	51,651	55,159	59,650
On-the-Job Training - All sectors - 1 to 4 years (jobs)		9,387	10,685	12,776	17,187	18,464	19,862
On-the-Job Training - All sectors - 4 to 10 years (jobs)		3,201	3,665	4,390	5,939	6,331	6,782
On-the-Job Training - All sectors - Over 10 years (jobs)		440	488	577	756	774	823
On-Site or In-Plant Training - All sectors - None (jobs)		7,217	8,059	9,685	12,966	13,683	14,778
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		26,238	29,425	35,237	47,068	50,300	54,342
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		7,283	8,276	9,898	13,295	14,265	15,337
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		3,223	3,671	4,380	5,903	6,298	6,754
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		386	445	534	722	783	846
Wage income - All (million \$2019)		2,402	2,734	3,304	4,480	4,882	5,345

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	670	628	574	531	498	459	413
Final energy use - Residential (PJ)	241	228	218	206	189	170	154
Final energy use - Commercial (PJ)	182	179	174	169	162	155	149
Final energy use - Industry (PJ)	241	250	272	277	295	331	335

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)		3.2	3.23	3.9	4.01	5.79	6.1

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	23.3	155	287	899	1,510	2,863	4,216
Vehicle stocks - LDV – All others (1000 units)	5,511	5,511	5,511	5,228	4,944	3,810	2,676
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		0	171	359	1,211	3,810	5,551
Public EV charging plugs - DC Fast (1000 units)	0.178		0.611		3.21		8.98
Public EV charging plugs - L2 (1000 units)	1.67		14.7		77.3		216

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 (%)	7.5	13	18.7	35.2	61.1	79	85.2
Sales of space heating units - Electric Resistance (%)	19.7	24.8	23.3	19.2	12.8	8.51	7.04
Sales of space heating units - Gas (%)	63.5	47.3	43.7	33.5	17.6	6.67	2.55
Sales of space heating units - Fossil (%)	9.34	14.9	14.4	12.2	8.46	5.78	5.24
Sales of water heating units - Electric Heat Pump (%)	0	1.51	5.81	18.2	37.5	50.4	55
Sales of water heating units - Electric Resistance (%)	42.5	57.5	56.3	52.9	47.8	44.7	43.6
Sales of water heating units - Gas Furnace (%)	57.4	40.9	37.8	28.9	14.7	4.93	1.34
Sales of water heating units - Other (%)	0.034	0.035	0.036	0.036	0.036	0.036	0.036
Sales of cooking units - Electric Resistance (%)	76.4	77	79.2	84.9	92.8	97.7	99.4
Sales of cooking units - Gas (%)	23.6	23	20.8	15.1	7.21	2.33	0.626
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		5.81	7.68				

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 (%)	4.52	15.9	21.2	36.6	61.3	79.5	86.8
Sales of space heating units - Electric Resistance (%)	8.06	5.57	5.72	6.25	7.38	8.69	9.45
Sales of space heating units - Gas (%)	87.4	76.5	71.1	55.7	30.6	11.6	3.64
Sales of space heating units - Fossil (%)	0	2.02	1.9	1.42	0.689	0.224	0.059
Sales of water heating units - Electric Heat Pump (%)	1.19	2.53	7.36	21.3	43.1	57.7	63
Sales of water heating units - Electric Resistance (%)	10.1	7.76	9.75	15.5	24.6	31	33.4
Sales of water heating units - Gas (%)	87.7	88.7	81.9	62.3	31.6	10.6	2.88
Sales of water heating units - Other (%)	0.996	0.987	0.962	0.892	0.786	0.72	0.695

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of cooking units - Electric Resistance (%)	44.8	49.3	53.1	63	76.9	85.5	88.5
Sales of cooking units - Gas (%)	55.2	50.7	46.9	37	23.1	14.5	11.5
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		16,266	17,675				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	7,000	1,299	0	0	0	0	0
Installed thermal - Natural gas (MW)	6,692	4,262	4,134	3,511	647	2,254	3,204
Installed thermal - Nuclear (MW)	1,236	1,236	1,236	1,236	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)							-82
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-379
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,973
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-77
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-1,071
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-787
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-5,328
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-1,597
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,244
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-13,537
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-123
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,326
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-5,357
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-113
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-2,141
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,517
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-7,992
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-11,338
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,467
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-32,374
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-164
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-2,274

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)							-7,741
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-151
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-3,212
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-2,247
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-10,656
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-21,079
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-51,213
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,690
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							13.4
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							289
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,512
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							27.9
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)							112
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							352
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							104
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							740
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,151
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							20.1
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							298
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							2,730
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							41.9
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)							163

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)							528
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							751
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,490
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							6,022
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							26.8
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							308
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							3,947
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							55.7
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							214
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							705
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							599
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,223
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							7,077

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-7,068
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-157
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-7,225
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-13,495

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 tCO ₂ e/y)							-313
Carbon sink potential - Aggressive deployment - Total (1000 tCO ₂ e/y)							-13,808
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							3,016
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							285
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							3,301
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							5,748
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							570
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							6,318

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)		62.8	0.052	0.05	0.042	0.028	0.001
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		21.6	11.3	4.17	2.81	1.05	0.61
Premature deaths from air pollution - Mobile - On-Road (deaths)		146	136	103	59.5	27.6	11.6
Premature deaths from air pollution - Gas Stations (deaths)		11.4	10.5	7.88	4.68	2.33	1.16
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		22.2	17.8	11.6	6.23	2.82	1.1
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.545	0.448	0.315	0.193	0.096	0.045
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		4.05	3.67	2.81	1.81	0.904	0.365
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		5.84	5.59	5.32	5.02	4.72	4.41
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		16.2	13.9	10.2	6.49	3.84	2.2
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.97	1.63	1.28	0.946	0.657	0.418
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		1.38	1.15	0.937	0.728	0.531	0.348

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)		2.98	1.72	1.7	1.67	1.68	1.58
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		92.5	87	75.2	54	33.1	5.02
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		556	0.465	0.445	0.372	0.247	0.01
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		192	100	36.9	24.9	9.27	5.4
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		1,300	1,208	916	529	246	103
Monetary damages from air pollution - Gas Stations (million \$2019)		101	92.6	69.7	41.5	20.6	10.3
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		197	158	103	55.2	25	9.74
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		4.83	3.97	2.79	1.71	0.849	0.394
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		35.9	32.5	24.9	16	8.01	3.23
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		51.7	49.5	47.1	44.5	41.8	39
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		144	123	90.6	57.5	34	19.5
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		17.5	14.4	11.3	8.38	5.81	3.7
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		12.2	10.2	8.29	6.44	4.7	3.08
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		26.3	15.2	15	14.7	14.8	14
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		821	773	668	480	294	44.6

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		441	446	430	355	264	745
By economic sector - Construction (jobs)		13,828	18,696	28,091	33,430	58,740	52,620
By economic sector - Manufacturing (jobs)		3,195	3,904	5,511	6,401	8,744	9,497
By economic sector - Mining (jobs)		2,202	1,533	978	566	288	44.1
By economic sector - Other (jobs)		1,997	3,091	4,987	6,102	12,901	11,224
By economic sector - Pipeline (jobs)		396	335	243	162	94.2	25
By economic sector - Professional (jobs)		6,024	7,936	12,504	15,809	28,121	27,643
By economic sector - Trade (jobs)		4,586	5,627	8,283	10,157	18,886	18,018
By economic sector - Utilities (jobs)		8,494	10,886	18,461	25,291	39,654	41,537
By resource sector - Biomass (jobs)		1,040	1,021	960	945	997	3,349
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Coal (jobs)		1,495	345	151	132	119	104
By resource sector - Grid (jobs)		11,811	18,790	34,856	48,618	78,648	83,166

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

Item	2020	2025	2030	2035	2040	2045	2050
By resource sector - Natural Gas (jobs)		3,426	2,258	1,689	1,907	1,442	1,520
By resource sector - Nuclear (jobs)		624	614	604	595	345	0
By resource sector - Oil (jobs)		5,420	4,307	3,062	1,951	1,060	1.61
By resource sector - Solar (jobs)		13,899	20,652	30,438	33,691	71,377	55,179
By resource sector - Wind (jobs)		3,448	4,468	7,728	10,436	13,702	18,032
By education level - All sectors - High school diploma or less (jobs)		17,713	22,675	34,120	41,804	71,179	68,063
By education level - All sectors - Associates degree or some college (jobs)		12,897	16,638	25,562	31,843	54,574	52,441
By education level - All sectors - Bachelors degree (jobs)		8,209	10,195	15,321	19,021	32,300	31,440
By education level - All sectors - Masters or professional degree (jobs)		2,033	2,555	3,892	4,873	8,355	8,171
By education level - All sectors - Doctoral degree (jobs)		311	393	593	732	1,283	1,238
Related work experience - All sectors - None (jobs)		5,995	7,666	11,641	14,408	24,655	23,722
Related work experience - All sectors - Up to 1 year (jobs)		8,482	10,887	16,363	19,976	34,213	32,683
Related work experience - All sectors - 1 to 4 years (jobs)		14,710	18,683	28,343	35,158	59,991	57,851
Related work experience - All sectors - 4 to 10 years (jobs)		9,529	12,119	18,436	22,896	38,976	37,556
Related work experience - All sectors - Over 10 years (jobs)		2,448	3,102	4,704	5,836	9,856	9,539
On-the-Job Training - All sectors - None (jobs)		2,308	2,930	4,388	5,365	9,288	8,831
On-the-Job Training - All sectors - Up to 1 year (jobs)		26,817	33,993	51,305	63,349	107,868	104,208
On-the-Job Training - All sectors - 1 to 4 years (jobs)		8,693	11,182	17,122	21,292	36,320	34,837
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,942	3,833	5,907	7,345	12,640	12,007
On-the-Job Training - All sectors - Over 10 years (jobs)		405	517	767	922	1,575	1,469
On-Site or In-Plant Training - All sectors - None (jobs)		6,684	8,522	12,881	15,874	27,252	26,120
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		24,406	30,965	46,772	57,770	98,368	94,960
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		6,747	8,670	13,245	16,443	28,054	26,906
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,969	3,833	5,871	7,288	12,487	11,889
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		357	464	719	899	1,530	1,477
Wage income - All (million \$2019)		2,233	2,862	4,395	5,524	9,493	9,295

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	669	623	550	461	380	331	311
Final energy use - Residential (PJ)	241	227	206	178	155	141	134
Final energy use - Commercial (PJ)	182	178	169	158	147	141	138
Final energy use - Industry (PJ)	241	249	271	274	290	326	330

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion \$2018)		3.82	3.92	6.23	6.6	6.19	6.47

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	30.1	479	928	2,500	4,071	5,327	6,583
Vehicle stocks - LDV – All others (1000 units)	5,489	5,226	4,964	3,618	2,271	1,285	299
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		1,055	2,704	4,381	6,637	7,223	6,887
Public EV charging plugs - DC Fast (1000 units)	0.178		1.98		8.67		14
Public EV charging plugs - L2 (1000 units)	1.67		47.5		208		337

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 (%)	7.5	22.5	72.3	86.1	87.5	87.8	87.4
Sales of space heating units - Electric Resistance (%)	19.7	22.4	10	6.61	6.36	6.55	6.72
Sales of space heating units - Gas (%)	63.5	41.4	10.2	1.69	1.08	1.04	1.02
Sales of space heating units - Fossil (%)	9.34	13.6	7.39	5.58	5.03	4.63	4.86
Sales of water heating units - Electric Heat Pump (%)	0	8.7	46.5	56.1	56.7	56.7	56.7
Sales of water heating units - Electric Resistance (%)	42.5	55.5	45.3	43.3	43.3	43.3	43.3
Sales of water heating units - Gas Furnace (%)	57.4	35.7	8.23	0.581	0.019	0	0
Sales of water heating units - Other (%)	0.034	0.035	0.036	0.035	0.035	0.036	0.036
Sales of cooking units - Electric Resistance (%)	76.5	81.5	96.8	99.8	100	100	100
Sales of cooking units - Gas (%)	23.5	18.5	3.16	0.159	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		5.85	7.79				

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 (%)	4.52	24.4	70.6	87.7	89.7	89.7	89.7
Sales of space heating units - Electric Resistance (%)	8.06	5.73	7.1	9.32	9.79	9.8	9.8
Sales of space heating units - Gas (%)	87.4	68.1	22	2.94	0.553	0.458	0.459
Sales of space heating units - Fossil (%)	0	1.75	0.337	0.014	0	0	0
Sales of water heating units - Electric Heat Pump (%)	1.19	10.6	53.1	64.2	65	65	65
Sales of water heating units - Electric Resistance (%)	10.1	11	28.4	33.8	34.3	34.3	34.3
Sales of water heating units - Gas (%)	87.7	77.5	17.8	1.26	0.041	0	0
Sales of water heating units - Other (%)	0.996	0.947	0.735	0.688	0.685	0.688	0.687
Sales of cooking units - Electric Resistance (%)	44.8	57.1	84	89.3	89.6	89.6	89.6
Sales of cooking units - Gas (%)	55.2	42.9	16	10.7	10.4	10.4	10.4
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		16,269	17,611				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	7,000	1,299	0	0	0	0	0
Installed thermal - Natural gas (MW)	6,692	4,262	4,134	3,844	2,056	5,529	8,394

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Nuclear (MW)	1,236	1,236	1,236	1,236	1,236	0	0
Installed renewables - Rooftop PV (MW)	153	269	400	605	898	1,277	1,767
Installed renewables - Solar - Base land use assumptions (MW)	110	8,903	20,953	40,065	57,163	102,834	132,465
Installed renewables - Wind - Base land use assumptions (MW)	5,327	25,030	42,116	75,250	119,064	170,086	198,707
Installed renewables - Solar - Constrained land use assumptions (MW)	33.6	8,809	22,631	37,113	57,486	98,641	116,501
Installed renewables - Wind - Constrained land use assumptions (MW)	5,101	27,080	51,233	93,031	97,026	99,812	231,168
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion \$2018)		11.8	14.4	21.1	17.8	44.8	27.5
Capital invested - Wind - Base (billion \$2018)		29	22.7	41.1	51.8	57.2	30.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	216	16,765	39,441	75,390	107,459	193,354	249,128
Wind - Base land use assumptions (GWh)	19,737	84,539	140,172	247,311	386,254	545,010	631,310
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	145	33,147	85,095	139,507	215,976	370,604	437,809
Wind - Constrained land use assumptions (GWh)	35,330	177,376	330,559	588,274	614,269	631,531	1,466,853
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)							-82
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-379
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,973
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-77
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-1,071
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-787
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-5,328
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-1,597
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,244
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-13,537
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-123
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,326
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-5,357

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 tCO ₂ e/y)							-113
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO ₂ e/y)							-2,141
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO ₂ e/y)							-1,517
Carbon sink potential - Mid - Reforest cropland (1000 tCO ₂ e/y)							-7,992
Carbon sink potential - Mid - Reforest pasture (1000 tCO ₂ e/y)							-11,338
Carbon sink potential - Mid - Restore productivity (1000 tCO ₂ e/y)							-2,467
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO ₂ e/y)							-32,374
Carbon sink potential - High - Accelerate regeneration (1000 tCO ₂ e/y)							-164
Carbon sink potential - High - Avoid deforestation (1000 tCO ₂ e/y)							-2,274
Carbon sink potential - High - Extend rotation length (1000 tCO ₂ e/y)							-7,741
Carbon sink potential - High - Improve plantations (1000 tCO ₂ e/y)							-151
Carbon sink potential - High - Increase retention of HWP (1000 tCO ₂ e/y)							-3,212
Carbon sink potential - High - Increase trees outside forests (1000 tCO ₂ e/y)							-2,247
Carbon sink potential - High - Reforest cropland (1000 tCO ₂ e/y)							-10,656
Carbon sink potential - High - Reforest pasture (1000 tCO ₂ e/y)							-21,079
Carbon sink potential - High - All (not counting overlap) (1000 tCO ₂ e/y)							-51,213
Carbon sink potential - High - Restore productivity (1000 tCO ₂ e/y)							-3,690
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							13.4
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							289
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,512
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							27.9
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)							112
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							352
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							104
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							740

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)							3,151
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							20.1
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							298
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							2,730
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							41.9
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)							163
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							528
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							751
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,490
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							6,022
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							26.8
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							308
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							3,947
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							55.7
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							214
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							705
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							599
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,223
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							7,077

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO ₂ e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO ₂ e/y)							-7,068
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO ₂ e/y)							-157
Carbon sink potential - Moderate deployment - Total (1000 tCO ₂ e/y)							-7,225
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO ₂ e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO ₂ e/y)							-13,495
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO ₂ e/y)							-313
Carbon sink potential - Aggressive deployment - Total (1000 tCO ₂ e/y)							-13,808
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							3,016
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							285
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							3,301
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							5,748
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							570
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							6,318

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)		62.8	0.052	0.05	0.042	0.028	0.001
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		24.1	12.1	12.8	9.67	3.68	1.31
Premature deaths from air pollution - Mobile - On-Road (deaths)		146	136	103	59.5	27.6	11.6
Premature deaths from air pollution - Gas Stations (deaths)		11.4	10.5	7.88	4.68	2.33	1.16

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)		22.2	17.8	11.6	6.23	2.82	1.1
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.545	0.448	0.315	0.193	0.096	0.045
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		4.05	3.67	2.81	1.81	0.904	0.365
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		5.84	5.59	5.32	5.02	4.72	4.41
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		16.2	13.9	10.2	6.49	3.84	2.2
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.97	1.63	1.28	0.946	0.657	0.418
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		1.38	1.15	0.937	0.728	0.531	0.348
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		2.64	1.72	1.7	1.67	1.68	1.58
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		95.1	91.8	89.6	75.3	62.5	46.2
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		556	0.465	0.445	0.372	0.247	0.01
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		213	107	114	85.7	32.6	11.6
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		1,300	1,208	916	529	246	103
Monetary damages from air pollution - Gas Stations (million \$2019)		101	92.6	69.7	41.5	20.6	10.3
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		197	158	103	55.2	25	9.74
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		4.83	3.97	2.79	1.71	0.849	0.394
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		35.9	32.5	24.9	16	8.01	3.23
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		51.7	49.5	47.1	44.5	41.8	39
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		144	123	90.6	57.5	34	19.5
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		17.5	14.4	11.3	8.38	5.81	3.7
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		12.2	10.2	8.29	6.44	4.7	3.08
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		23.3	15.2	15	14.7	14.9	14

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)		845	815	796	669	555	410

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		442	458	434	426	337	740
By economic sector - Construction (jobs)		13,084	14,336	15,959	19,524	18,099	16,870
By economic sector - Manufacturing (jobs)		2,922	2,766	2,771	3,225	3,042	3,196
By economic sector - Mining (jobs)		2,237	1,668	1,197	830	618	460
By economic sector - Other (jobs)		1,840	2,110	2,805	3,630	3,364	2,854
By economic sector - Pipeline (jobs)		412	666	323	291	283	397
By economic sector - Professional (jobs)		5,738	5,713	6,855	8,925	8,621	8,664
By economic sector - Trade (jobs)		4,407	4,327	4,942	6,046	5,734	5,377
By economic sector - Utilities (jobs)		8,469	9,767	10,758	14,513	14,772	15,826
By resource sector - Biomass (jobs)		1,040	1,048	982	1,274	1,331	3,145
By resource sector - CO2 (jobs)		15.1	2,547	187	382	841	2,148
By resource sector - Coal (jobs)		1,494	587	505	469	440	228
By resource sector - Grid (jobs)		11,690	13,416	18,369	25,774	27,725	29,162
By resource sector - Natural Gas (jobs)		3,603	3,048	2,613	3,073	1,958	1,644
By resource sector - Nuclear (jobs)		624	614	604	350	0	0
By resource sector - Oil (jobs)		5,418	4,356	3,168	2,195	1,553	1,173
By resource sector - Solar (jobs)		12,561	13,824	17,350	20,611	17,363	12,893
By resource sector - Wind (jobs)		3,107	2,372	2,266	3,284	3,661	3,990
By education level - All sectors - High school diploma or less (jobs)		16,997	18,100	19,873	24,574	23,378	23,180
By education level - All sectors - Associates degree or some college (jobs)		12,383	13,273	14,677	18,501	17,762	17,516
By education level - All sectors - Bachelors degree (jobs)		7,913	8,128	8,910	11,086	10,612	10,573
By education level - All sectors - Masters or professional degree (jobs)		1,961	2,012	2,247	2,826	2,717	2,719
By education level - All sectors - Doctoral degree (jobs)		298	298	338	424	401	397
Related work experience - All sectors - None (jobs)		5,765	6,150	6,770	8,458	8,092	8,044
Related work experience - All sectors - Up to 1 year (jobs)		8,120	8,573	9,491	11,704	11,084	10,969
Related work experience - All sectors - 1 to 4 years (jobs)		14,149	14,921	16,429	20,537	19,682	19,516
Related work experience - All sectors - 4 to 10 years (jobs)		9,163	9,695	10,643	13,329	12,772	12,640
Related work experience - All sectors - Over 10 years (jobs)		2,354	2,473	2,712	3,383	3,242	3,215
On-the-Job Training - All sectors - None (jobs)		2,212	2,307	2,552	3,148	2,977	2,914
On-the-Job Training - All sectors - Up to 1 year (jobs)		25,772	27,054	29,797	37,049	35,405	35,246
On-the-Job Training - All sectors - 1 to 4 years (jobs)		8,354	8,961	9,856	12,387	11,880	11,715
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,827	3,082	3,399	4,290	4,108	4,028
On-the-Job Training - All sectors - Over 10 years (jobs)		386	407	441	537	501	482
On-Site or In-Plant Training - All sectors - None (jobs)		6,408	6,734	7,430	9,258	8,810	8,697
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		23,460	24,671	27,172	33,789	32,298	32,120

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

Item	2020	2025	2030	2035	2040	2045	2050
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		6,483	6,940	7,637	9,577	9,179	9,055
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,856	3,093	3,393	4,265	4,080	4,011
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		344	374	413	522	504	501
Wage income - All (million \$2019)		2,150	2,298	2,553	3,228	3,133	3,159

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	669	623	550	461	380	331	311
Final energy use - Residential (PJ)	241	227	206	178	155	141	134
Final energy use - Commercial (PJ)	182	178	169	158	147	141	138
Final energy use - Industry (PJ)	241	249	271	274	290	326	330

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion \$2018)		3.82	3.92	6.23	6.6	6.19	6.47

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	30.1	479	928	2,500	4,071	5,327	6,583
Vehicle stocks - LDV – All others (1000 units)	5,489	5,226	4,964	3,618	2,271	1,285	299
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		1,055	2,704	4,381	6,637	7,223	6,887
Public EV charging plugs - DC Fast (1000 units)	0.178		1.98		8.67		14
Public EV charging plugs - L2 (1000 units)	1.67		47.5		208		337

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 (%)	7.5	22.5	72.3	86.1	87.5	87.8	87.4
Sales of space heating units - Electric Resistance (%)	19.7	22.4	10	6.61	6.36	6.55	6.72
Sales of space heating units - Gas (%)	63.5	41.4	10.2	1.69	1.08	1.04	1.02
Sales of space heating units - Fossil (%)	9.34	13.6	7.39	5.58	5.03	4.63	4.86
Sales of water heating units - Electric Heat Pump (%)	0	8.7	46.5	56.1	56.7	56.7	56.7
Sales of water heating units - Electric Resistance (%)	42.5	55.5	45.3	43.3	43.3	43.3	43.3
Sales of water heating units - Gas Furnace (%)	57.4	35.7	8.23	0.581	0.019	0	0
Sales of water heating units - Other (%)	0.034	0.035	0.036	0.035	0.035	0.036	0.036
Sales of cooking units - Electric Resistance (%)	76.5	81.5	96.8	99.8	100	100	100
Sales of cooking units - Gas (%)	23.5	18.5	3.16	0.159	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		5.85	7.79				

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 (%)	4.52	24.4	70.6	87.7	89.7	89.7	89.7
Sales of space heating units - Electric Resistance (%)	8.06	5.73	7.1	9.32	9.79	9.8	9.8
Sales of space heating units - Gas (%)	87.4	68.1	22	2.94	0.553	0.458	0.459
Sales of space heating units - Fossil (%)	0	1.75	0.337	0.014	0	0	0
Sales of water heating units - Electric Heat Pump (%)	1.19	10.6	53.1	64.2	65	65	65
Sales of water heating units - Electric Resistance (%)	10.1	11	28.4	33.8	34.3	34.3	34.3
Sales of water heating units - Gas (%)	87.7	77.5	17.8	1.26	0.041	0	0
Sales of water heating units - Other (%)	0.996	0.947	0.735	0.688	0.685	0.688	0.687
Sales of cooking units - Electric Resistance (%)	44.8	57.1	84	89.3	89.6	89.6	89.6
Sales of cooking units - Gas (%)	55.2	42.9	16	10.7	10.4	10.4	10.4
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		16,269	17,611				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	7,000	1,299	999	999	999	999	0
Installed thermal - Natural gas (MW)	6,692	4,262	5,706	6,189	4,839	4,341	4,057
Installed thermal - Nuclear (MW)	1,236	1,236	1,236	1,236	0	0	0
Installed renewables - Rooftop PV (MW)	153	269	400	605	898	1,277	1,767
Installed renewables - Solar - Base land use assumptions (MW)	33.6	10,071	19,446	29,638	43,884	51,858	51,858
Installed renewables - Wind - Base land use assumptions (MW)	4,409	21,499	26,901	26,901	36,539	49,328	70,070
Installed renewables - Solar - Constrained land use assumptions (MW)	111	9,629	19,626	28,260	40,546	47,421	47,421
Installed renewables - Wind - Constrained land use assumptions (MW)	4,138	23,048	29,268	29,541	43,453	65,037	90,259
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion \$2018)		13.4	11.2	11.2	14.8	7.82	0
Capital invested - Wind - Base (billion \$2018)		25.1	7.19	0	11.4	14.3	21.8
Capital invested - Solar PV - Constrained (billion \$2018)		12.7	12	9.51	12.8	6.74	0
Capital invested - Wind - Constrained (billion \$2018)		27.8	8.28	0.338	16.4	24.2	26.7

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	72.4	18,933	36,537	55,667	82,436	97,369	97,369
Wind - Base land use assumptions (GWh)	16,617	73,100	90,582	90,582	122,043	163,615	228,918
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	216	18,113	36,914	53,140	76,195	89,104	89,104
Wind - Constrained land use assumptions (GWh)	14,915	76,207	96,035	97,035	141,929	209,549	285,205
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)							-82
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-379
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,973
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-77
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-1,071
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-787
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-5,328
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-1,597
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,244
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-13,537
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-123
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,326
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-5,357
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-113
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-2,141
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,517
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-7,992
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-11,338
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,467
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-32,374
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-164
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-2,274
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-7,741
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-151
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-3,212
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-2,247
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-10,656
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-21,079
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-51,213
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,690

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)							13.4
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							289
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,512
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							27.9
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)							112
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							352
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							104
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							740
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,151
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							20.1
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							298
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							2,730
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							41.9
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)							163
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							528
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							751
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,490
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							6,022
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							26.8
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							308

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)							3,947
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							55.7
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							214
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							705
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							599
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,223
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							7,077

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 tCO ₂ e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO ₂ e/y)							-7,068
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO ₂ e/y)							-157
Carbon sink potential - Moderate deployment - Total (1000 tCO ₂ e/y)							-7,225
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO ₂ e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO ₂ e/y)							-13,495
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO ₂ e/y)							-313
Carbon sink potential - Aggressive deployment - Total (1000 tCO ₂ e/y)							-13,808
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							3,016
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							285
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							3,301

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)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							5,748
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							570
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							6,318

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)		62.8	0.052	0.05	0.042	0.028	0.001
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		22.7	9.88	5.78	3.74	1.65	0.849
Premature deaths from air pollution - Mobile - On-Road (deaths)		149	149	145	131	104	71.3
Premature deaths from air pollution - Gas Stations (deaths)		11.6	11.7	11.2	10	7.95	5.51
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		22.4	20.3	17.8	14.5	10.6	6.8
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.556	0.531	0.505	0.451	0.363	0.271
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		4.1	4.16	4.14	3.78	2.98	2.08
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		5.84	5.59	5.32	5.02	4.72	4.41
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		16.3	15.6	14.6	12.7	10.1	7.49
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.98	1.78	1.59	1.38	1.14	0.924
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		1.38	1.24	1.1	0.962	0.831	0.708
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		2.8	1.72	1.71	1.69	1.7	1.66
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		93.8	85.1	74.1	64.9	57.4	39.9
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		556	0.465	0.445	0.372	0.247	0.01
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		201	87.5	51.2	33.1	14.6	7.52
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		1,321	1,328	1,290	1,161	924	634
Monetary damages from air pollution - Gas Stations (million \$2019)		103	103	99.3	88.7	70.4	48.8

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)		199	180	157	128	93.6	60.3
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		4.93	4.7	4.47	4	3.22	2.4
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		36.3	36.9	36.7	33.5	26.4	18.4
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		51.7	49.5	47.1	44.5	41.8	39
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		144	138	129	112	89.8	66.3
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		17.5	15.7	14.1	12.2	10.1	8.18
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		12.2	11	9.72	8.52	7.36	6.27
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		24.7	15.2	15.1	14.9	15	14.7
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		833	756	658	576	509	355

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		442	444	1,129	1,147	2,009	2,027
By economic sector - Construction (jobs)		15,343	17,280	19,378	21,856	21,766	24,266
By economic sector - Manufacturing (jobs)		3,194	3,677	4,180	4,253	5,491	6,305
By economic sector - Mining (jobs)		2,238	1,663	1,298	1,025	760	490
By economic sector - Other (jobs)		2,288	2,588	3,327	4,049	3,604	4,059
By economic sector - Pipeline (jobs)		404	623	305	289	278	356
By economic sector - Professional (jobs)		6,565	7,098	9,485	11,454	13,733	15,319
By economic sector - Trade (jobs)		4,942	5,125	6,225	7,309	7,739	8,602
By economic sector - Utilities (jobs)		8,787	11,290	12,750	15,187	18,861	22,242
By resource sector - Biomass (jobs)		1,042	1,013	3,332	4,389	9,281	9,633
By resource sector - CO2 (jobs)		14.9	2,304	163	363	779	1,935
By resource sector - Coal (jobs)		1,495	345	151	132	119	105
By resource sector - Grid (jobs)		12,290	17,523	23,046	28,041	36,793	42,899
By resource sector - Natural Gas (jobs)		3,481	2,220	1,847	2,025	1,143	859
By resource sector - Nuclear (jobs)		624	614	604	350	0	0
By resource sector - Oil (jobs)		5,479	4,662	3,974	3,387	2,560	1,630
By resource sector - Solar (jobs)		16,191	16,757	19,944	22,698	16,907	17,568
By resource sector - Wind (jobs)		3,585	4,350	5,016	5,183	6,658	9,037
By education level - All sectors - High school diploma or less (jobs)		19,052	21,506	25,078	28,512	31,667	35,536
By education level - All sectors - Associates degree or some college (jobs)		13,874	15,830	18,274	21,062	23,244	26,407
By education level - All sectors - Bachelors degree (jobs)		8,764	9,684	11,378	13,097	14,858	16,698
By education level - All sectors - Masters or professional degree (jobs)		2,177	2,408	2,897	3,370	3,866	4,351
By education level - All sectors - Doctoral degree (jobs)		337	360	450	527	606	673

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

Item	2020	2025	2030	2035	2040	2045	2050
Related work experience - All sectors - None (jobs)		6,438	7,298	8,522	9,785	10,924	12,312
Related work experience - All sectors - Up to 1 year (jobs)		9,136	10,232	12,079	13,748	15,322	17,165
Related work experience - All sectors - 1 to 4 years (jobs)		15,780	17,758	20,725	23,800	26,581	29,962
Related work experience - All sectors - 4 to 10 years (jobs)		10,229	11,547	13,343	15,336	17,052	19,288
Related work experience - All sectors - Over 10 years (jobs)		2,620	2,955	3,409	3,900	4,361	4,938
On-the-Job Training - All sectors - None (jobs)		2,486	2,750	3,225	3,694	4,065	4,548
On-the-Job Training - All sectors - Up to 1 year (jobs)		28,735	32,223	37,900	43,393	48,869	54,928
On-the-Job Training - All sectors - 1 to 4 years (jobs)		9,355	10,670	12,234	14,052	15,446	17,537
On-the-Job Training - All sectors - 4 to 10 years (jobs)		3,188	3,659	4,168	4,811	5,207	5,919
On-the-Job Training - All sectors - Over 10 years (jobs)		438	487	550	618	653	734
On-Site or In-Plant Training - All sectors - None (jobs)		7,193	8,043	9,443	10,825	12,031	13,526
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		26,157	29,372	34,450	39,444	44,321	49,854
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		7,258	8,263	9,500	10,900	12,000	13,602
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		3,210	3,666	4,173	4,807	5,229	5,933
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		385	445	511	591	658	751
Wage income - All (million \$2019)		2,394	2,730	3,209	3,728	4,227	4,835

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	670	628	574	531	498	459	413
Final energy use - Residential (PJ)	241	228	218	206	189	170	154
Final energy use - Commercial (PJ)	182	179	174	169	162	155	149
Final energy use - Industry (PJ)	241	250	272	277	295	331	335

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)		3.2	3.23	3.9	4.01	5.79	6.1

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	23.3	155	287	899	1,510	2,863	4,216
Vehicle stocks - LDV – All others (1000 units)	5,511	5,511	5,511	5,228	4,944	3,810	2,676
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		0	171	359	1,211	3,810	5,551
Public EV charging plugs - DC Fast (1000 units)	0.178		0.611		3.21		8.98
Public EV charging plugs - L2 (1000 units)	1.67		14.7		77.3		216

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 (%)	7.5	13	18.7	35.2	61.1	79	85.2
Sales of space heating units - Electric Resistance (%)	19.7	24.8	23.3	19.2	12.8	8.51	7.04
Sales of space heating units - Gas (%)	63.5	47.3	43.7	33.5	17.6	6.67	2.55
Sales of space heating units - Fossil (%)	9.34	14.9	14.4	12.2	8.46	5.78	5.24
Sales of water heating units - Electric Heat Pump (%)	0	1.51	5.81	18.2	37.5	50.4	55
Sales of water heating units - Electric Resistance (%)	42.5	57.5	56.3	52.9	47.8	44.7	43.6
Sales of water heating units - Gas Furnace (%)	57.4	40.9	37.8	28.9	14.7	4.93	1.34
Sales of water heating units - Other (%)	0.034	0.035	0.036	0.036	0.036	0.036	0.036
Sales of cooking units - Electric Resistance (%)	76.4	77	79.2	84.9	92.8	97.7	99.4
Sales of cooking units - Gas (%)	23.6	23	20.8	15.1	7.21	2.33	0.626
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		5.81	7.68				

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 (%)	4.52	15.9	21.2	36.6	61.3	79.5	86.8
Sales of space heating units - Electric Resistance (%)	8.06	5.57	5.72	6.25	7.38	8.69	9.45
Sales of space heating units - Gas (%)	87.4	76.5	71.1	55.7	30.6	11.6	3.64
Sales of space heating units - Fossil (%)	0	2.02	1.9	1.42	0.689	0.224	0.059
Sales of water heating units - Electric Heat Pump (%)	1.19	2.53	7.36	21.3	43.1	57.7	63
Sales of water heating units - Electric Resistance (%)	10.1	7.76	9.75	15.5	24.6	31	33.4
Sales of water heating units - Gas (%)	87.7	88.7	81.9	62.3	31.6	10.6	2.88
Sales of water heating units - Other (%)	0.996	0.987	0.962	0.892	0.786	0.72	0.695
Sales of cooking units - Electric Resistance (%)	44.8	49.3	53.1	63	76.9	85.5	88.5
Sales of cooking units - Gas (%)	55.2	50.7	46.9	37	23.1	14.5	11.5
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		16,266	17,675				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	7,000	1,299	0	0	0	0	0
Installed thermal - Natural gas (MW)	6,692	4,262	4,134	3,736	1,071	1,404	1,302
Installed thermal - Nuclear (MW)	1,236	1,236	1,236	1,236	0	0	0
Capital invested - Biomass power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion \$2018)	0	0	0	0	0	0.01	0
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	0	0	3.67	21.9	3.22

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	4,118	28,723	32,333
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	9.64	9.64

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	3	23	26
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	0	1	1
Number of facilities - Beccs hydrogen (quantity)	0	0	0	7	10	18	21
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	1	1
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	1	1	2
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0
Conversion capital investment - Cumulative 5-yr (million \$2018)		0	0	6,005	6,222	27,270	5,804
Biomass purchases (million \$2018/y)		0	0	549	1,075	3,318	3,802

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	3.24	11.1	18.8	59.3	66.5
Annual - BECCS (MMT)		0	0	7.72	15.5	49	55.9
Annual - NGCC (MMT)		0	0	0	0	0	0
Annual - Cement and lime (MMT)		0	3.24	3.35	3.32	10.3	10.6
Cumulative - All (MMT)		0	3.24	14.3	33.1	92.3	159
Cumulative - BECCS (MMT)		0	0	7.72	23.2	72.2	128
Cumulative - NGCC (MMT)		0	0	0	0	0	0
Cumulative - Cement and lime (MMT)		0	3.24	6.59	9.91	20.2	30.8

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	409	409	409	409	409
Spur (km)		0	10.4	173	393	2,027	2,587
All (km)		0	420	582	802	2,436	2,996
Cumulative investment - Trunk (million \$2018)		0	1,950	1,950	2,145	2,145	2,145
Cumulative investment - Spur (million \$2018)		0	11.9	351	550	2,677	3,120
Cumulative investment - All (million \$2018)		0	1,962	2,301	2,695	4,822	5,266

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual (MMT)		0	0.92	4.28	7.13	10.8	10.9
Injection wells (wells)		0	2	7	13	22	27
Resource characterization, appraisal, permitting costs (million \$2020)		27.9	123	190	190	190	190
Wells and facilities construction costs (million \$2020)		0	55.8	217	387	648	804

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)							-82
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-379
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,973
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-77
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-1,071
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-787
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-5,328
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-1,597
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,244
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-13,537
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-123
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,326
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-5,357
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-113
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-2,141
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,517
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-7,992
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-11,338
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,467
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-32,374
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-164
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-2,274
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-7,741
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-151
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-3,212
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-2,247
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-10,656
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-21,079
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-51,213
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,690

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)							13.4
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							289
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,512
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							27.9
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)							112
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							352
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							104
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							740
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,151
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							20.1
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							298
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							2,730
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							41.9
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)							163
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							528
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							751
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,490
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							6,022
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							26.8
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							308

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)							3,947
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							55.7
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							214
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							705
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							599
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,223
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							7,077

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 tCO ₂ e/y)							-1,072
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO ₂ e/y)							-6,467
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO ₂ e/y)							-142
Carbon sink potential - Moderate deployment - Cropland to woody energy crops (1000 tCO ₂ e/y)							0
Carbon sink potential - Moderate deployment - Pasture to energy crops (1000 tCO ₂ e/y)							0
Carbon sink potential - Moderate deployment - Total (1000 tCO ₂ e/y)							-7,681
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO ₂ e/y)							-1,072
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO ₂ e/y)							-12,355
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO ₂ e/y)							-284
Carbon sink potential - Aggressive deployment - Cropland to woody energy crops (1000 tCO ₂ e/y)							0
Carbon sink potential - Aggressive deployment - Pasture to energy crops (1000 tCO ₂ e/y)							0
Carbon sink potential - Aggressive deployment - Total (1000 tCO ₂ e/y)							-13,711

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)							497
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							2,765
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							259
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)							292
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)							979
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							4,793
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							497
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							13,018
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							517
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)							292
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)							979
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							15,303

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)		255	152	102	80	71.1	70.3
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		24.7	22.2	23.6	17.2	14.8	13.2
Premature deaths from air pollution - Mobile - On-Road (deaths)		149	152	155	159	163	167
Premature deaths from air pollution - Gas Stations (deaths)		11.6	11.8	11.9	12.1	12.3	12.4
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		22	19.9	17.9	16.7	16.1	15.7
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.549	0.476	0.362	0.252	0.165	0.115
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		3.83	3.74	3.71	3.73	3.71	3.64
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		6.1	6.12	6.11	6.07	6.02	5.94

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)		16.5	15.9	14.3	12.6	11.6	11.3
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		2.05	2.04	2.01	1.93	1.87	1.83
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		1.44	1.47	1.49	1.52	1.54	1.56
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		4.77	3.6	3.1	2.97	2.91	2.76
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		94.3	98.9	101	96.2	95.1	88.3
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		2,256	1,349	900	709	630	623
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		219	197	209	152	131	117
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		1,320	1,347	1,376	1,412	1,448	1,483
Monetary damages from air pollution - Gas Stations (million \$2019)		103	104	105	107	109	110
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		195	176	159	148	143	139
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		4.86	4.22	3.2	2.23	1.46	1.02
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		33.9	33.1	32.9	33.1	32.8	32.3
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		54	54.2	54.1	53.7	53.3	52.6
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		146	141	127	111	102	100
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		18.2	18.1	17.8	17.1	16.5	16.2
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		12.8	13	13.2	13.4	13.6	13.8
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		42.1	31.7	27.4	26.2	25.6	24.4
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		837	878	895	855	844	784

Table 65: REF scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		442	441	441	440	440	441
By economic sector - Construction (jobs)		4,797	4,298	7,826	9,060	9,143	10,941
By economic sector - Manufacturing (jobs)		2,241	1,995	2,050	2,383	2,262	2,522
By economic sector - Mining (jobs)		2,463	1,853	1,511	1,213	1,005	855

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Other (jobs)		260	306	1,229	1,456	1,617	2,061
By economic sector - Pipeline (jobs)		413	421	423	406	413	415
By economic sector - Professional (jobs)		2,748	2,204	3,465	4,212	4,237	5,110
By economic sector - Trade (jobs)		2,739	2,179	2,994	3,322	3,359	3,981
By economic sector - Utilities (jobs)		7,177	4,973	5,279	7,033	6,606	8,201
By resource sector - Biomass (jobs)		1,041	1,011	985	960	940	921
By resource sector - CO2 (jobs)		0	0.022	0.028	0.03	0.033	0.035
By resource sector - Coal (jobs)		2,494	1,346	875	603	246	106
By resource sector - Grid (jobs)		9,115	5,758	6,596	9,915	10,346	14,478
By resource sector - Natural Gas (jobs)		3,570	3,052	3,126	3,457	2,869	2,755
By resource sector - Nuclear (jobs)		624	614	604	595	345	0
By resource sector - Oil (jobs)		5,513	4,760	4,222	3,930	3,751	3,628
By resource sector - Solar (jobs)			1,017	7,618	7,965	8,523	10,196
By resource sector - Wind (jobs)		922	1,111	1,191	2,100	2,062	2,444
By education level - All sectors - High school diploma or less (jobs)		9,856	7,996	10,920	12,687	12,541	14,876
By education level - All sectors - Associates degree or some college (jobs)		7,116	5,655	7,810	9,273	9,153	10,975
By education level - All sectors - Bachelors degree (jobs)		4,953	3,940	5,057	5,883	5,739	6,731
By education level - All sectors - Masters or professional degree (jobs)		1,195	948	1,244	1,464	1,436	1,695
By education level - All sectors - Doctoral degree (jobs)		159	131	186	216	213	249
Related work experience - All sectors - None (jobs)		3,396	2,729	3,700	4,342	4,291	5,112
Related work experience - All sectors - Up to 1 year (jobs)		4,593	3,755	5,209	6,034	5,971	7,064
Related work experience - All sectors - 1 to 4 years (jobs)		8,466	6,745	9,024	10,574	10,405	12,359
Related work experience - All sectors - 4 to 10 years (jobs)		5,404	4,305	5,791	6,819	6,696	7,959
Related work experience - All sectors - Over 10 years (jobs)		1,420	1,134	1,493	1,755	1,718	2,034
On-the-Job Training - All sectors - None (jobs)		1,257	1,023	1,414	1,630	1,608	1,892
On-the-Job Training - All sectors - Up to 1 year (jobs)		15,513	12,448	16,555	19,299	18,998	22,486
On-the-Job Training - All sectors - 1 to 4 years (jobs)		4,793	3,817	5,251	6,223	6,130	7,333
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,516	1,211	1,755	2,093	2,073	2,498
On-the-Job Training - All sectors - Over 10 years (jobs)		200	169	242	278	273	318
On-Site or In-Plant Training - All sectors - None (jobs)		3,653	2,952	4,061	4,740	4,666	5,518
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		14,114	11,315	15,064	17,572	17,301	20,496
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		3,739	2,984	4,092	4,834	4,765	5,695
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,576	1,261	1,784	2,117	2,091	2,506
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		197	157	217	260	258	311
Wage income - All (million \$2019)		1,292	1,042	1,400	1,665	1,656	1,990

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	670	629	580	552	553	571	593

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Residential (PJ)	241	227	219	214	212	213	214
Final energy use - Commercial (PJ)	182	183	183	181	179	181	187
Final energy use - Industry (PJ)	241	258	268	276	288	303	318

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion \$2018)		3.46	3.52	3.75	3.83	4.56	4.72

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 (%)	4.86	29.6	30.8	32.6	34.1	35.7	37.6
Sales of space heating units - Electric Resistance (%)	20.4	20.8	20.3	19.8	19.4	18	15.9
Sales of space heating units - Gas (%)	65.2	38.7	37.8	36.4	35.8	36	36
Sales of space heating units - Fossil (%)	9.54	10.9	11.1	11.1	10.6	10.2	10.6
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	42.5	58	57.9	57.7	57.7	57.6	57.5
Sales of water heating units - Gas Furnace (%)	57.4	42	42.1	42.3	42.3	42.4	42.4
Sales of water heating units - Other (%)	0.034	0.035	0.036	0.036	0.036	0.036	0.036
Sales of cooking units - Electric Resistance (%)	76.2	76.2	76.2	76.2	76.2	76.2	76.2
Sales of cooking units - Gas (%)	23.8	23.8	23.8	23.8	23.8	23.8	23.8
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		5.54	5.98				

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 (%)	4.52	20.5	48.3	71.1	74.8	75.2	75.2
Sales of space heating units - Electric Resistance (%)	8.06	6.43	10.8	18.4	23.5	24.2	24.3
Sales of space heating units - Gas (%)	87.4	71.1	39.3	9.83	1.63	0.522	0.461
Sales of space heating units - Fossil (%)	0	1.98	1.55	0.695	0.102	0.009	0
Sales of water heating units - Electric Heat Pump (%)	1.19	0.826	0.821	0.823	0.819	0.815	0.814
Sales of water heating units - Electric Resistance (%)	10.1	7.06	7.07	7.05	7.05	7.05	7.04
Sales of water heating units - Gas (%)	87.7	91.1	91.1	91.1	91.1	91.1	91.1
Sales of water heating units - Other (%)	0.996	0.996	0.994	0.993	0.993	0.997	0.996
Sales of cooking units - Electric Resistance (%)	44.8	47.8	47.9	47.8	47.9	47.9	48
Sales of cooking units - Gas (%)	55.2	52.2	52.1	52.2	52.1	52.1	52
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		16,080	16,491				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	7,000	5,110	2,037	2,037	999	0	0
Installed thermal - Natural gas (MW)	6,687	4,262	4,724	4,828	1,659	3,268	3,730
Installed thermal - Nuclear (MW)	1,236	1,236	1,236	1,236	1,236	0	0
Installed renewables - Rooftop PV (MW)	153	269	400	605	898	1,277	1,767

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)	33.6	33.6	33.6	3,454	10,567	15,905	20,289
Installed renewables - Wind - Base land use assumptions (MW)	12,646	13,206	13,883	13,883	20,577	25,228	34,849

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	72.4	72.4	72.4	6,548	19,946	29,977	38,210
Wind - Base land use assumptions (GWh)	44,187	46,024	48,266	48,266	70,093	85,166	116,445
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)	-4.2		-13.4				-12
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-0.874		-1.57				-1.63
Business-as-usual carbon sink - Total (Mt CO2e/y)	-5.07		-15				-13.6

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)							-82
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-379
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,973
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-77
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-1,071
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-787
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-5,328
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-1,597
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,244
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-13,537
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-123
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,326
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-5,357
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-113
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-2,141
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,517
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-7,992

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Reforest pasture (1000 tCO ₂ e/y)							-11,338
Carbon sink potential - Mid - Restore productivity (1000 tCO ₂ e/y)							-2,467
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO ₂ e/y)							-32,374
Carbon sink potential - High - Accelerate regeneration (1000 tCO ₂ e/y)							-164
Carbon sink potential - High - Avoid deforestation (1000 tCO ₂ e/y)							-2,274
Carbon sink potential - High - Extend rotation length (1000 tCO ₂ e/y)							-7,741
Carbon sink potential - High - Improve plantations (1000 tCO ₂ e/y)							-151
Carbon sink potential - High - Increase retention of HWP (1000 tCO ₂ e/y)							-3,212
Carbon sink potential - High - Increase trees outside forests (1000 tCO ₂ e/y)							-2,247
Carbon sink potential - High - Reforest cropland (1000 tCO ₂ e/y)							-10,656
Carbon sink potential - High - Reforest pasture (1000 tCO ₂ e/y)							-21,079
Carbon sink potential - High - All (not counting overlap) (1000 tCO ₂ e/y)							-51,213
Carbon sink potential - High - Restore productivity (1000 tCO ₂ e/y)							-3,690
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							13.4
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							289
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,512
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							27.9
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)							112
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							352
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							104
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							740
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,151
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							20.1
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							298

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							2,730
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							41.9
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)							163
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							528
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							751
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,490
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							6,022
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							26.8
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							308
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							3,947
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							55.7
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							214
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							705
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							599
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,223
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							7,077