



## **Net-Zero America - Vermont data**

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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 . . . . .	3
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 . . . . .	11
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 . . . . .	18
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 . . . . .	22
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 . . . . .	26
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 . . . . .	27
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 . . . . .	33
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 . . . . .	34
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 . . . . .	35
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)		7.77	0.009	0.009	0.008	0.005	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		1.93	1.07	0.66	0.6	0.368	0.149
Premature deaths from air pollution - Mobile - On-Road (deaths)		7.53	6.78	4.97	2.75	1.19	0.418
Premature deaths from air pollution - Gas Stations (deaths)		0.412	0.365	0.263	0.148	0.067	0.028
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		1.95	1.6	1.07	0.586	0.27	0.099
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		2.38	1.8	1.14	0.606	0.244	0.068
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.49	0.432	0.322	0.203	0.105	0.048
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.149	0.138	0.127	0.116	0.106	0.096
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		1.57	1.37	1.04	0.69	0.418	0.224
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.52	1.17	0.763	0.432	0.272	0.194
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.237	0.193	0.153	0.115	0.081	0.051
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.051	0.024	0.023	0.022	0.022	0.021
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		3.94	3.5	2.96	2.23	1.54	0.892
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		68.9	0.077	0.077	0.073	0.043	0.002
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		17.1	9.52	5.85	5.32	3.26	1.32
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		67	60.3	44.2	24.5	10.5	3.71
Monetary damages from air pollution - Gas Stations (million \$2019)		3.65	3.23	2.33	1.31	0.592	0.245
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		17.3	14.1	9.5	5.19	2.39	0.874
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		21.1	16	10.1	5.37	2.16	0.605
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		4.34	3.82	2.86	1.8	0.931	0.422
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		1.32	1.22	1.12	1.03	0.939	0.849
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		13.9	12.1	9.22	6.1	3.7	1.98

Table 1: *E+ scenario - IMPACTS - Health (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		13.4	10.3	6.75	3.83	2.4	1.72
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		2.1	1.71	1.35	1.02	0.721	0.456
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		0.446	0.215	0.206	0.195	0.191	0.183
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		35	31.1	26.3	19.8	13.6	7.92

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		28.6	61.9	29.5	24.2	19.7	32.6
By economic sector - Construction (jobs)		1,041	903	992	1,075	1,844	4,768
By economic sector - Manufacturing (jobs)		661	965	1,144	1,000	1,275	1,997
By economic sector - Mining (jobs)		300	232	167	119	85.5	63
By economic sector - Other (jobs)		159	111	133	156	356	1,204
By economic sector - Pipeline (jobs)		41.9	38.4	33	27.9	23.4	20.4
By economic sector - Professional (jobs)		485	514	556	649	1,046	2,509
By economic sector - Trade (jobs)		414	377	392	428	692	1,766
By economic sector - Utilities (jobs)		263	516	597	672	1,138	2,757
By resource sector - Biomass (jobs)		123	171	84.2	72.7	71.8	139
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Grid (jobs)		409	946	1,107	1,255	2,212	5,520
By resource sector - Natural Gas (jobs)		95.5	78	60.8	44.7	27.5	18.7
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		890	760	610	487	395	330
By resource sector - Solar (jobs)		1,568	999	894	1,018	2,339	7,032
By resource sector - Wind (jobs)		308	763	1,288	1,276	1,434	2,077
By education level - All sectors - High school diploma or less (jobs)		1,462	1,594	1,724	1,751	2,734	6,400
By education level - All sectors - Associates degree or some college (jobs)		1,026	1,135	1,260	1,305	2,069	4,882
By education level - All sectors - Bachelors degree (jobs)		711	778	835	858	1,307	2,969
By education level - All sectors - Masters or professional degree (jobs)		168	183	196	207	322	750
By education level - All sectors - Doctoral degree (jobs)		26.4	26.9	28.4	31.2	48.9	116
Related work experience - All sectors - None (jobs)		482	529	575	592	932	2,205
Related work experience - All sectors - Up to 1 year (jobs)		711	771	836	852	1,332	3,122
Related work experience - All sectors - 1 to 4 years (jobs)		1,217	1,335	1,447	1,488	2,317	5,398
Related work experience - All sectors - 4 to 10 years (jobs)		775	849	929	961	1,500	3,487
Related work experience - All sectors - Over 10 years (jobs)		208	233	256	261	400	906
On-the-Job Training - All sectors - None (jobs)		197	205	221	227	357	846
On-the-Job Training - All sectors - Up to 1 year (jobs)		2,268	2,508	2,715	2,768	4,275	9,868
On-the-Job Training - All sectors - 1 to 4 years (jobs)		683	748	825	857	1,357	3,200

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

Item	2020	2025	2030	2035	2040	2045	2050
On-the-Job Training - All sectors - 4 to 10 years (jobs)		209	218	240	259	427	1,055
On-the-Job Training - All sectors - Over 10 years (jobs)		36.3	38.2	42.4	42.5	65.3	148
On-Site or In-Plant Training - All sectors - None (jobs)		565	613	667	685	1,068	2,490
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		2,049	2,261	2,450	2,500	3,871	8,960
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		537	588	646	668	1,055	2,484
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		216	226	248	265	431	1,051
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		26.5	29.6	33.2	34.9	55.9	133
Wage income - All (million \$2019)		178	199	218	228	359	846

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

Item	2020	2025	2030	2035	2040	2045	2050
Oil consumption - Annual (million bbls)		20	18.6	16.2	13.9	12.1	10.7
Oil consumption - Cumulative (million bbls)							496
Oil production - Annual (million bbls)		0	0	0	0	0	0
Natural gas consumption - Annual (tcf)		10.6	8.98	7.2	5.42	3.41	2.37
Natural gas consumption - Cumulative (tcf)							217
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)	51.8	48.3	42.1	34.2	27	22.5	20.5
Final energy use - Residential (PJ)	33.2	29.9	26.5	22.3	18.3	15.4	13.7
Final energy use - Commercial (PJ)	18.9	17.7	16.9	15.8	14.7	13.9	13.5
Final energy use - Industry (PJ)	20.1	20.1	20.5	19.9	19.4	19.3	19.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion \$2018)		0.313	0.322	0.616	0.66	0.557	0.583

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV - EV (1000 units)	10.7	60.8	111	286	462	602	742
Vehicle stocks - LDV - All others (1000 units)	619	589	559	408	256	145	33.7
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		118	306	489	743	806	770
Public EV charging plugs - DC Fast (1000 units)	0.047		0.305		1.27		2.04
Public EV charging plugs - L2 (1000 units)	0.543		7.34		30.5		49.1

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 (%)	3.07	12.1	61.6	90	93.8	94.1	94.1

Table 7: E+ scenario - PILLAR 1: Efficiency/Electrification - Residential (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Resistance (%)	1.43	1.61	1.3	0.591	0.438	0.433	0.475
Sales of space heating units - Gas (%)	17.8	9.73	6.95	1.18	0.152	0.087	0.086
Sales of space heating units - Fossil (%)	77.8	76.6	30.1	8.25	5.56	5.39	5.36
Sales of water heating units - Electric Heat Pump (%)	0	2.16	17	36.8	40.1	40.3	40.3
Sales of water heating units - Electric Resistance (%)	19.3	34	45.2	57.5	59.5	59.7	59.6
Sales of water heating units - Gas Furnace (%)	54.1	47.8	34.7	5.56	0.327	0	0
Sales of water heating units - Other (%)	26.6	16	3.08	0.198	0.072	0.073	0.073
Sales of cooking units - Electric Resistance (%)	46.9	58.2	92.8	99.6	100	100	100
Sales of cooking units - Gas (%)	53.1	41.8	7.15	0.36	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		0.48	0.516				

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	2.16	10.9	39.6	72.4	77.6	77.8	77.9
Sales of space heating units - Electric Resistance (%)	1.2	4.38	16.6	21.3	22	22.2	22.1
Sales of space heating units - Gas Furnace (%)	35.1	52.6	37.6	6.02	0.358	0	0
Sales of space heating units - Fossil (%)	61.5	32.1	6.16	0.26	0	0	0
Sales of water heating units - Electric Heat Pump (%)	2.07	3.51	16	41.2	45.7	46	46
Sales of water heating units - Electric Resistance (%)	10.3	12.2	23.9	48	52.2	52.5	52.5
Sales of water heating units - Gas Furnace (%)	79.6	80	58.2	9.28	0.549	0	0
Sales of water heating units - Other (%)	8.05	4.21	1.92	1.56	1.53	1.54	1.56
Sales of cooking units - Electric Resistance (%)	36.9	49.9	81.2	87.4	87.7	87.7	87.7
Sales of cooking units - Gas (%)	63.1	50.1	18.8	12.6	12.3	12.3	12.3
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		1,350	1,474				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Natural gas (MW)	0	0	0	0	0	0	0
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	204	354	415	486	566	655	755
Installed renewables - Solar - Base land use assumptions (MW)	32.5	32.5	32.5	32.5	32.5	1,080	5,634
Installed renewables - Wind - Base land use assumptions (MW)	144	144	991	1,230	1,477	1,687	1,877
Installed renewables - Solar - Constrained land use assumptions (MW)	14	14	14	14	14	2,560	5,144
Installed renewables - Wind - Constrained land use assumptions (MW)	144	144	725	894	1,236	1,303	1,782
Capital invested - Solar PV - Base (billion \$2018)		0	0	0	0	1.03	4.22
Capital invested - Wind - Base (billion \$2018)		0	2.03	0.534	0.524	0.425	0.362
Capital invested - Solar PV - Constrained (billion \$2018)		0.025	0.104	0	0	4.36	3.86

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Wind - Constrained (billion \$2018)		0	1.39	0.377	0.727	0.135	0.915
Capital invested - Biomass power plant (billion \$2018)	0	0	0.03	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	60.7	60.7	60.7	60.7	60.7	1,884	9,749
Wind - Base land use assumptions (GWh)	604	604	3,846	4,774	5,738	6,560	7,286
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	0	0	0	0	0	4,415	8,864
Wind - Constrained land use assumptions (GWh)	604	604	2,807	3,458	4,768	5,010	6,814
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0
Biomass power plant (GWh)	0	0	59.4	59.4	59.4	59.4	59.4
Biomass w/ccu power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Power (quantity)	0	0	1	1	1	1	1
Number of facilities - Power ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel (quantity)	0	0	0	1	1	1	1
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis (quantity)	0	0	0	1	1	1	1
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	0	0	0
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)		0.036	33.8	27.1	8.69	19	249
Biomass purchases (million \$2018/y)		0.021	2.53	3.75	4.15	5.03	16.6

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

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



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

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

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-7.17
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-48.3
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-1,211
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-13.3
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-511
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-39.6
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-54.5
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-248
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-2,132
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-10.7
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-169
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-2,182
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-19.5
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-1,021
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-76.3
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-387

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-491
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-4,357
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-14.3
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-290
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-3,153
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-26.2
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-1,532
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-113
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-719
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-6,582
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-734
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							1.17
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							36.8
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							616
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							4.83
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)							5.65
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							3.54
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							147
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							815
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							1.76
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							38
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							1,112

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							7.26
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)							8.19
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							25.6
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							297
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,490
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							2.34
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							39.2
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							1,608
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							9.65
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)							10.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							20.4
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							243
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,934

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-175
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-5.31
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-181

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-332
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-10.6
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-343
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)							92.3
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							9.65
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							102
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)							175
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							19.3
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							194

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)		7.77	0.009	0.009	0.008	0.005	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		1.87	0.885	0.349	0.146	0.044	0.038
Premature deaths from air pollution - Mobile - On-Road (deaths)		7.66	7.46	6.99	6.05	4.64	3.06
Premature deaths from air pollution - Gas Stations (deaths)		0.421	0.41	0.38	0.327	0.25	0.165
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		1.96	1.75	1.5	1.21	0.883	0.574
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		2.42	2.16	1.93	1.62	1.2	0.799
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.495	0.474	0.447	0.396	0.314	0.226
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.149	0.138	0.127	0.116	0.106	0.096
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		1.58	1.5	1.4	1.24	1.02	0.785

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.53	1.29	1.07	0.858	0.709	0.587
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.237	0.207	0.179	0.152	0.127	0.105
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.049	0.024	0.024	0.022	0.022	0.02
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		3.93	3.32	2.62	2.09	1.72	1.19
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		68.9	0.077	0.077	0.073	0.043	0.002
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		16.6	7.84	3.09	1.29	0.393	0.341
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		68.1	66.4	62.2	53.8	41.2	27.2
Monetary damages from air pollution - Gas Stations (million \$2019)		3.73	3.63	3.37	2.9	2.21	1.46
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		17.4	15.5	13.3	10.7	7.83	5.08
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		21.4	19.1	17.1	14.3	10.6	7.08
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		4.39	4.2	3.96	3.51	2.78	2
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		1.32	1.22	1.12	1.03	0.939	0.849
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		13.9	13.3	12.4	11	9.07	6.95
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		13.5	11.5	9.51	7.6	6.27	5.2
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		2.1	1.84	1.59	1.35	1.13	0.928
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		0.432	0.215	0.208	0.199	0.191	0.177
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		34.9	29.5	23.2	18.6	15.3	10.6

Table 18: E- scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		34.9	60.5	30.7	23.5	19.8	32.8
By economic sector - Construction (jobs)		1,029	909	933	1,029	2,043	5,172
By economic sector - Manufacturing (jobs)		677	1,003	1,032	957	1,611	2,563
By economic sector - Mining (jobs)		302	242	192	149	112	80
By economic sector - Other (jobs)		158	112	128	151	386	1,254
By economic sector - Pipeline (jobs)		42.1	39.4	36.6	33.9	30.6	26.1
By economic sector - Professional (jobs)		483	512	537	640	1,156	2,736

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Trade (jobs)		413	386	398	441	775	1,910
By economic sector - Utilities (jobs)		235	502	476	562	1,275	3,168
By resource sector - Biomass (jobs)		132	163	102	99	84.3	135
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Grid (jobs)		348	919	858	1,023	2,482	6,354
By resource sector - Natural Gas (jobs)		95.5	72.3	53.6	43.3	34.9	26.7
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		897	797	705	613	520	417
By resource sector - Solar (jobs)		1,584	1,021	848	966	2,568	7,184
By resource sector - Wind (jobs)		318	795	1,196	1,241	1,721	2,825
By education level - All sectors - High school diploma or less (jobs)		1,457	1,617	1,603	1,678	3,131	7,175
By education level - All sectors - Associates degree or some college (jobs)		1,017	1,149	1,161	1,241	2,361	5,469
By education level - All sectors - Bachelors degree (jobs)		708	789	787	835	1,497	3,335
By education level - All sectors - Masters or professional degree (jobs)		167	184	185	201	365	836
By education level - All sectors - Doctoral degree (jobs)		26.4	27.1	27.6	31	54.8	127
Related work experience - All sectors - None (jobs)		479	536	534	567	1,064	2,465
Related work experience - All sectors - Up to 1 year (jobs)		710	782	779	819	1,525	3,494
Related work experience - All sectors - 1 to 4 years (jobs)		1,210	1,352	1,349	1,430	2,648	6,050
Related work experience - All sectors - 4 to 10 years (jobs)		769	860	864	921	1,712	3,909
Related work experience - All sectors - Over 10 years (jobs)		207	236	238	250	460	1,023
On-the-Job Training - All sectors - None (jobs)		196	208	209	221	407	942
On-the-Job Training - All sectors - Up to 1 year (jobs)		2,259	2,544	2,533	2,665	4,903	11,085
On-the-Job Training - All sectors - 1 to 4 years (jobs)		677	756	761	814	1,545	3,582
On-the-Job Training - All sectors - 4 to 10 years (jobs)		206	219	221	245	479	1,166
On-the-Job Training - All sectors - Over 10 years (jobs)		36.3	39	39.5	41	75.2	167
On-Site or In-Plant Training - All sectors - None (jobs)		563	621	622	659	1,221	2,786
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		2,040	2,293	2,284	2,406	4,437	10,061
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		533	595	597	636	1,203	2,781
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		213	228	230	252	485	1,163
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		26.1	29.9	30.4	33	63.6	149
Wage income - All (million \$2019)		177	201	203	219	409	948

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	51.9	48.7	44.2	40.3	37.2	33.7	29.5
Final energy use - Residential (PJ)	33.2	30	27.8	25.9	24	22	20
Final energy use - Commercial (PJ)	18.9	17.8	17.3	16.8	16.3	15.9	15.6
Final energy use - Industry (PJ)	20.1	20.1	20.7	20.3	20	20	19.8

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion \$2018)		0.233	0.233	0.327	0.339	0.493	0.522

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	8.28	23	37.7	106	174	324	475
Vehicle stocks - LDV – All others (1000 units)	621	621	621	589	557	429	302
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		0	19.7	39.9	136	424	620
Public EV charging plugs - DC Fast (1000 units)	0.047		0.104		0.478		1.31
Public EV charging plugs - L2 (1000 units)	0.543		2.49		11.5		31.4

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 (%)	3.07	2.85	5.68	14	28.4	40.3	45.7
Sales of space heating units - Electric Resistance (%)	1.43	1.62	1.64	1.66	1.46	1.25	1.16
Sales of space heating units - Gas (%)	17.8	9.93	9.83	9.3	7.95	6.45	5.52
Sales of space heating units - Fossil (%)	77.8	85.6	82.9	75	62.2	52	47.7
Sales of water heating units - Electric Heat Pump (%)	0	0.306	1.16	3.82	9.35	15.4	18.6
Sales of water heating units - Electric Resistance (%)	19.3	32.3	32.8	34.8	38.7	42.6	44.7
Sales of water heating units - Gas Furnace (%)	54.1	48.6	48	45.5	39.4	31.5	26.9
Sales of water heating units - Other (%)	26.6	18.8	18	15.8	12.6	10.5	9.75
Sales of cooking units - Electric Resistance (%)	46.7	48.1	52.9	65.8	83.7	94.7	98.6
Sales of cooking units - Gas (%)	53.3	51.9	47.1	34.2	16.3	5.26	1.42
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		0.481	0.555				

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	2.16	6.95	8.53	13.3	22.9	32.9	38.2
Sales of space heating units - Electric Resistance (%)	1.2	1.93	2.57	4.61	8	10.5	11.4
Sales of space heating units - Gas Furnace (%)	35.1	53.4	52.1	49.5	43.2	35.1	30.1
Sales of space heating units - Fossil (%)	61.5	37.7	36.8	32.6	25.9	21.5	20.2
Sales of water heating units - Electric Heat Pump (%)	2.07	2.63	3.32	5.68	11.3	18.2	22.2
Sales of water heating units - Electric Resistance (%)	10.3	11.4	11.8	14.3	19.6	26	29.9
Sales of water heating units - Gas Furnace (%)	79.6	81.3	80.5	76	65.6	52.7	44.9
Sales of water heating units - Other (%)	8.05	4.66	4.38	4.02	3.56	3.09	2.97
Sales of cooking units - Electric Resistance (%)	36.9	40.7	44.7	56.5	72.7	82.9	86.4
Sales of cooking units - Gas (%)	63.1	59.3	55.3	43.5	27.3	17.1	13.6
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		1,350	1,475				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Natural gas (MW)	0	0	0	0	0	0	0
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-7.17
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-48.3
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-1,211
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-13.3
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-511
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-39.6
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-54.5
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-248
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-2,132
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-10.7
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-169
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-2,182
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-19.5
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-1,021
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-76.3
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-387
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-491
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-4,357
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-14.3
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-290
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-3,153
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-26.2
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-1,532
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-113



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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-719
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-6,582
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-734
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							1.17
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							36.8
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							616
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							4.83
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)							5.65
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							3.54
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							147
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							815
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							1.76
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							38
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							1,112
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							7.26
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)							8.19
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							25.6
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							297

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 - Total impacted (over 30 years) (1000 hectares)							1,490
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							2.34
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							39.2
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							1,608
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							9.65
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)							10.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							20.4
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							243
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,934

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)							-175
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-5.31
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-181
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-332
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-10.6
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-343
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							0

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							92.3
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							9.65
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							102
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)							175
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							19.3
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							194

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)		7.77	0.009	0.009	0.008	0.005	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		1.77	0.949	0.495	0.362	0.126	0.035
Premature deaths from air pollution - Mobile - On-Road (deaths)		7.53	6.78	4.97	2.75	1.19	0.418
Premature deaths from air pollution - Gas Stations (deaths)		0.412	0.365	0.263	0.148	0.067	0.028
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		1.95	1.6	1.07	0.586	0.27	0.099
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		2.38	1.8	1.14	0.606	0.244	0.068
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.49	0.432	0.322	0.203	0.105	0.048
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.149	0.138	0.127	0.116	0.106	0.096
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		1.57	1.37	1.04	0.69	0.418	0.224
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.52	1.17	0.763	0.432	0.272	0.194
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.237	0.193	0.153	0.115	0.081	0.051
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.055	0.024	0.023	0.022	0.022	0.019
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		3.85	3.43	2.72	1.87	1.03	0.106

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		68.9	0.077	0.077	0.073	0.043	0.002
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		15.7	8.4	4.39	3.21	1.12	0.31
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		67	60.3	44.2	24.5	10.5	3.71
Monetary damages from air pollution - Gas Stations (million \$2019)		3.65	3.23	2.33	1.31	0.592	0.245
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		17.3	14.1	9.5	5.19	2.39	0.874
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		21.1	16	10.1	5.37	2.16	0.605
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		4.34	3.82	2.86	1.8	0.931	0.422
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		1.32	1.22	1.12	1.03	0.939	0.849
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		13.9	12.1	9.22	6.1	3.7	1.98
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		13.4	10.3	6.75	3.83	2.4	1.72
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		2.1	1.71	1.35	1.02	0.721	0.456
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		0.482	0.215	0.205	0.195	0.191	0.17
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		34.2	30.4	24.1	16.6	9.15	0.938

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		28.8	59.8	28.8	20.5	17.3	31.6
By economic sector - Construction (jobs)		1,052	925	1,085	2,457	7,496	9,807
By economic sector - Manufacturing (jobs)		703	1,070	1,708	1,379	2,165	2,977
By economic sector - Mining (jobs)		299	230	163	112	74.6	0.757
By economic sector - Other (jobs)		160	113	143	463	1,792	2,318
By economic sector - Pipeline (jobs)		41.5	37.8	31.4	25.3	19.9	1.07
By economic sector - Professional (jobs)		487	535	630	1,300	3,660	4,937
By economic sector - Trade (jobs)		414	384	426	851	2,530	3,386
By economic sector - Utilities (jobs)		269	528	658	1,378	4,050	6,827
By resource sector - Biomass (jobs)		112	169	77.5	66.8	64.4	139
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Grid (jobs)		421	970	1,221	2,663	8,092	13,907
By resource sector - Natural Gas (jobs)		91.8	73.7	48.6	30.5	17.3	11
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		890	755	599	461	347	0.002
By resource sector - Solar (jobs)		1,621	1,110	1,155	3,035	10,937	12,542
By resource sector - Wind (jobs)		318	806	1,772	1,729	2,347	3,687
By education level - All sectors - High school diploma or less (jobs)		1,489	1,663	2,079	3,382	9,267	12,824

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

Item	2020	2025	2030	2035	2040	2045	2050
By education level - All sectors - Associates degree or some college (jobs)		1,046	1,189	1,526	2,552	7,063	9,862
By education level - All sectors - Bachelors degree (jobs)		722	813	1,005	1,595	4,229	5,874
By education level - All sectors - Masters or professional degree (jobs)		170	190	230	395	1,077	1,500
By education level - All sectors - Doctoral degree (jobs)		26.6	27.9	32.5	60.9	169	226
Related work experience - All sectors - None (jobs)		491	552	688	1,150	3,186	4,439
Related work experience - All sectors - Up to 1 year (jobs)		724	806	1,015	1,647	4,508	6,195
Related work experience - All sectors - 1 to 4 years (jobs)		1,238	1,393	1,737	2,851	7,778	10,828
Related work experience - All sectors - 4 to 10 years (jobs)		789	888	1,117	1,849	5,040	7,019
Related work experience - All sectors - Over 10 years (jobs)		212	245	315	488	1,293	1,805
On-the-Job Training - All sectors - None (jobs)		199	214	264	442	1,225	1,672
On-the-Job Training - All sectors - Up to 1 year (jobs)		2,309	2,623	3,292	5,240	14,126	19,625
On-the-Job Training - All sectors - 1 to 4 years (jobs)		696	781	989	1,681	4,660	6,506
On-the-Job Training - All sectors - 4 to 10 years (jobs)		212	225	274	541	1,579	2,195
On-the-Job Training - All sectors - Over 10 years (jobs)		37.1	40.3	52.8	80.9	215	288
On-Site or In-Plant Training - All sectors - None (jobs)		575	641	808	1,317	3,588	4,937
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		2,086	2,363	2,965	4,750	12,848	17,865
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		547	614	776	1,306	3,610	5,035
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		219	234	284	543	1,565	2,175
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		27	30.9	39.6	69.3	194	273
Wage income - All (million \$2019)		181	207	259	436	1,205	1,712

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	51.8	48.3	42.1	34.2	27	22.5	20.5
Final energy use - Residential (PJ)	33.2	29.9	26.5	22.3	18.3	15.4	13.7
Final energy use - Commercial (PJ)	18.9	17.7	16.9	15.8	14.7	13.9	13.5
Final energy use - Industry (PJ)	20.1	20.1	20.5	19.9	19.4	19.3	19.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion \$2018)		0.313	0.322	0.616	0.66	0.557	0.583

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	10.7	60.8	111	286	462	602	742
Vehicle stocks - LDV – All others (1000 units)	619	589	559	408	256	145	33.7

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		118	306	489	743	806	770
Public EV charging plugs - DC Fast (1000 units)	0.047		0.305		1.27		2.04
Public EV charging plugs - L2 (1000 units)	0.543		7.34		30.5		49.1

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 (%)	3.07	12.1	61.6	90	93.8	94.1	94.1
Sales of space heating units - Electric Resistance (%)	1.43	1.61	1.3	0.591	0.438	0.433	0.475
Sales of space heating units - Gas (%)	17.8	9.73	6.95	1.18	0.152	0.087	0.086
Sales of space heating units - Fossil (%)	77.8	76.6	30.1	8.25	5.56	5.39	5.36
Sales of water heating units - Electric Heat Pump (%)	0	2.16	17	36.8	40.1	40.3	40.3
Sales of water heating units - Electric Resistance (%)	19.3	34	45.2	57.5	59.5	59.7	59.6
Sales of water heating units - Gas Furnace (%)	54.1	47.8	34.7	5.56	0.327	0	0
Sales of water heating units - Other (%)	26.6	16	3.08	0.198	0.072	0.073	0.073
Sales of cooking units - Electric Resistance (%)	46.9	58.2	92.8	99.6	100	100	100
Sales of cooking units - Gas (%)	53.1	41.8	7.15	0.36	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		0.48	0.516				

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	2.16	10.9	39.6	72.4	77.6	77.8	77.9
Sales of space heating units - Electric Resistance (%)	1.2	4.38	16.6	21.3	22	22.2	22.1
Sales of space heating units - Gas Furnace (%)	35.1	52.6	37.6	6.02	0.358	0	0
Sales of space heating units - Fossil (%)	61.5	32.1	6.16	0.26	0	0	0
Sales of water heating units - Electric Heat Pump (%)	2.07	3.51	16	41.2	45.7	46	46
Sales of water heating units - Electric Resistance (%)	10.3	12.2	23.9	48	52.2	52.5	52.5
Sales of water heating units - Gas Furnace (%)	79.6	80	58.2	9.28	0.549	0	0
Sales of water heating units - Other (%)	8.05	4.21	1.92	1.56	1.53	1.54	1.56
Sales of cooking units - Electric Resistance (%)	36.9	49.9	81.2	87.4	87.7	87.7	87.7
Sales of cooking units - Gas (%)	63.1	50.1	18.8	12.6	12.3	12.3	12.3
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		1,350	1,474				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Natural gas (MW)	0	0	0	0	0	0	0
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	204	354	415	486	566	655	755
Installed renewables - Solar - Base land use assumptions (MW)	32.5	32.5	32.5	32.5	1,608	9,438	18,537

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed renewables - Wind - Base land use assumptions (MW)	144	144	991	1,230	1,477	1,687	2,086
Installed renewables - Solar - Constrained land use assumptions (MW)	32.5	32.5	32.5	32.5	3,046	8,777	17,229
Installed renewables - Wind - Constrained land use assumptions (MW)	164	164	746	915	1,257	1,323	1,840
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion \$2018)		0	0	0	1.64	7.68	8.43
Capital invested - Wind - Base (billion \$2018)		0	2.03	0.534	0.524	0.425	0.759

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	60.7	60.7	60.7	60.7	2,816	16,224	31,686
Wind - Base land use assumptions (GWh)	604	604	3,846	4,774	5,738	6,560	8,066
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	121	121	121	121	10,396	30,052	58,702
Wind - Constrained land use assumptions (GWh)	1,207	1,207	5,615	6,915	9,535	10,020	13,895
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)							-7.17
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-48.3
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-1,211
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-13.3
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-511
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-39.6
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-54.5
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-248
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-2,132
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-10.7
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-169
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-2,182
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-19.5
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-1,021

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)							-76.3
Carbon sink potential - Mid - Reforest cropland (1000 tCO <sub>2</sub> e/y)							0
Carbon sink potential - Mid - Reforest pasture (1000 tCO <sub>2</sub> e/y)							-387
Carbon sink potential - Mid - Restore productivity (1000 tCO <sub>2</sub> e/y)							-491
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)							-4,357
Carbon sink potential - High - Accelerate regeneration (1000 tCO <sub>2</sub> e/y)							-14.3
Carbon sink potential - High - Avoid deforestation (1000 tCO <sub>2</sub> e/y)							-290
Carbon sink potential - High - Extend rotation length (1000 tCO <sub>2</sub> e/y)							-3,153
Carbon sink potential - High - Improve plantations (1000 tCO <sub>2</sub> e/y)							-26.2
Carbon sink potential - High - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)							-1,532
Carbon sink potential - High - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)							-113
Carbon sink potential - High - Reforest cropland (1000 tCO <sub>2</sub> e/y)							0
Carbon sink potential - High - Reforest pasture (1000 tCO <sub>2</sub> e/y)							-719
Carbon sink potential - High - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)							-6,582
Carbon sink potential - High - Restore productivity (1000 tCO <sub>2</sub> e/y)							-734
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							1.17
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							36.8
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							616
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							4.83
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)							5.65
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							3.54
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							147
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							815
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							1.76



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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							38
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							1,112
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							7.26
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)							8.19
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							25.6
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							297
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,490
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							2.34
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							39.2
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							1,608
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							9.65
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)							10.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							20.4
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							243
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,934

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-175
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-5.31
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-181
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-332
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-10.6
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-343
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)							92.3
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							9.65
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							102
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)							175
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							19.3
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							194

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)		7.77	0.009	0.009	0.008	0.005	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		1.89	1.04	1.16	0.866	0.386	0.092
Premature deaths from air pollution - Mobile - On-Road (deaths)		7.53	6.78	4.97	2.75	1.19	0.418
Premature deaths from air pollution - Gas Stations (deaths)		0.412	0.365	0.263	0.148	0.067	0.028
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		1.95	1.6	1.07	0.586	0.27	0.099
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		2.38	1.8	1.14	0.606	0.244	0.068

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.49	0.432	0.322	0.203	0.105	0.048
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.149	0.138	0.127	0.116	0.106	0.096
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		1.57	1.37	1.04	0.69	0.418	0.224
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.52	1.17	0.763	0.432	0.272	0.194
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.237	0.193	0.153	0.115	0.081	0.051
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.046	0.024	0.023	0.022	0.022	0.019
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		4	3.7	3.49	2.93	2.38	1.73
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		68.9	0.077	0.077	0.073	0.043	0.002
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		16.8	9.17	10.3	7.67	3.42	0.817
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		67	60.3	44.2	24.5	10.5	3.71
Monetary damages from air pollution - Gas Stations (million \$2019)		3.65	3.23	2.33	1.31	0.592	0.245
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		17.3	14.1	9.5	5.19	2.39	0.874
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		21.1	16	10.1	5.37	2.16	0.605
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		4.34	3.82	2.86	1.8	0.931	0.422
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		1.32	1.22	1.12	1.03	0.939	0.849
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		13.9	12.1	9.22	6.1	3.7	1.98
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		13.4	10.3	6.75	3.83	2.4	1.72
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		2.1	1.71	1.35	1.02	0.721	0.456
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		0.41	0.214	0.206	0.195	0.191	0.17
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		35.6	32.9	31	26.1	21.1	15.4

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		32.8	63.9	29.5	23	19.8	33.5
By economic sector - Construction (jobs)		1,024	771	908	901	902	1,335
By economic sector - Manufacturing (jobs)		873	599	765	474	388	911
By economic sector - Mining (jobs)		300	233	169	122	89	68.3
By economic sector - Other (jobs)		157	99.5	119	134	147	309
By economic sector - Pipeline (jobs)		42.2	39	34.8	30.3	26.4	24
By economic sector - Professional (jobs)		468	423	626	515	540	799
By economic sector - Trade (jobs)		404	335	392	354	362	547
By economic sector - Utilities (jobs)		254	380	1,553	797	800	917
By resource sector - Biomass (jobs)		115	164	101	86	77.6	139
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Grid (jobs)		390	674	1,023	1,125	1,143	1,378
By resource sector - Natural Gas (jobs)		99.4	84.9	79.1	70.1	56.1	45.4
By resource sector - Nuclear (jobs)		0	0	1,340	271	267	263
By resource sector - Oil (jobs)		889	760	610	487	401	348
By resource sector - Solar (jobs)		1,482	689	737	759	774	2,118
By resource sector - Wind (jobs)		580	572	706	552	556	651
By education level - All sectors - High school diploma or less (jobs)		1,539	1,268	1,493	1,328	1,288	2,004
By education level - All sectors - Associates degree or some college (jobs)		1,078	886	1,108	983	966	1,503
By education level - All sectors - Bachelors degree (jobs)		741	619	768	649	633	961
By education level - All sectors - Masters or professional degree (jobs)		171	147	188	161	160	238
By education level - All sectors - Doctoral degree (jobs)		26.2	22.4	29.7	24.7	25	37.2
Related work experience - All sectors - None (jobs)		504	421	508	453	443	685
Related work experience - All sectors - Up to 1 year (jobs)		750	610	730	638	621	983
Related work experience - All sectors - 1 to 4 years (jobs)		1,272	1,061	1,293	1,133	1,107	1,696
Related work experience - All sectors - 4 to 10 years (jobs)		809	671	832	729	714	1,090
Related work experience - All sectors - Over 10 years (jobs)		221	180	224	192	186	290
On-the-Job Training - All sectors - None (jobs)		204	165	199	174	170	265
On-the-Job Training - All sectors - Up to 1 year (jobs)		2,389	1,982	2,401	2,078	2,021	3,142
On-the-Job Training - All sectors - 1 to 4 years (jobs)		713	589	730	653	642	980
On-the-Job Training - All sectors - 4 to 10 years (jobs)		210	177	221	209	209	308
On-the-Job Training - All sectors - Over 10 years (jobs)		38.8	29.6	35.9	30.4	29.2	47.6
On-Site or In-Plant Training - All sectors - None (jobs)		593	484	594	513	501	786
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		2,156	1,788	2,166	1,883	1,833	2,842
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		561	464	570	509	499	764
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		218	184	228	213	212	311
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		27.5	23.2	29.5	26.8	26.6	40.3
Wage income - All (million \$2019)		185	159	197	175	174	265

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	51.8	48.3	42.1	34.2	27	22.5	20.5
Final energy use - Residential (PJ)	33.2	29.9	26.5	22.3	18.3	15.4	13.7
Final energy use - Commercial (PJ)	18.9	17.7	16.9	15.8	14.7	13.9	13.5
Final energy use - Industry (PJ)	20.1	20.1	20.5	19.9	19.4	19.3	19.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion \$2018)		0.313	0.322	0.616	0.66	0.557	0.583

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	10.7	60.8	111	286	462	602	742
Vehicle stocks - LDV – All others (1000 units)	619	589	559	408	256	145	33.7
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		118	306	489	743	806	770
Public EV charging plugs - DC Fast (1000 units)	0.047		0.305		1.27		2.04
Public EV charging plugs - L2 (1000 units)	0.543		7.34		30.5		49.1

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 (%)	3.07	12.1	61.6	90	93.8	94.1	94.1
Sales of space heating units - Electric Resistance (%)	1.43	1.61	1.3	0.591	0.438	0.433	0.475
Sales of space heating units - Gas (%)	17.8	9.73	6.95	1.18	0.152	0.087	0.086
Sales of space heating units - Fossil (%)	77.8	76.6	30.1	8.25	5.56	5.39	5.36
Sales of water heating units - Electric Heat Pump (%)	0	2.16	17	36.8	40.1	40.3	40.3
Sales of water heating units - Electric Resistance (%)	19.3	34	45.2	57.5	59.5	59.7	59.6
Sales of water heating units - Gas Furnace (%)	54.1	47.8	34.7	5.56	0.327	0	0
Sales of water heating units - Other (%)	26.6	16	3.08	0.198	0.072	0.073	0.073
Sales of cooking units - Electric Resistance (%)	46.9	58.2	92.8	99.6	100	100	100
Sales of cooking units - Gas (%)	53.1	41.8	7.15	0.36	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		0.48	0.516				

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	2.16	10.9	39.6	72.4	77.6	77.8	77.9
Sales of space heating units - Electric Resistance (%)	1.2	4.38	16.6	21.3	22	22.2	22.1
Sales of space heating units - Gas Furnace (%)	35.1	52.6	37.6	6.02	0.358	0	0
Sales of space heating units - Fossil (%)	61.5	32.1	6.16	0.26	0	0	0
Sales of water heating units - Electric Heat Pump (%)	2.07	3.51	16	41.2	45.7	46	46
Sales of water heating units - Electric Resistance (%)	10.3	12.2	23.9	48	52.2	52.5	52.5

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Gas Furnace (%)	79.6	80	58.2	9.28	0.549	0	0
Sales of water heating units - Other (%)	8.05	4.21	1.92	1.56	1.53	1.54	1.56
Sales of cooking units - Electric Resistance (%)	36.9	49.9	81.2	87.4	87.7	87.7	87.7
Sales of cooking units - Gas (%)	63.1	50.1	18.8	12.6	12.3	12.3	12.3
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		1,350	1,474				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Natural gas (MW)	0	0	0	0	0	0	0
Installed thermal - Nuclear (MW)	0	0	0	563	563	563	563
Installed renewables - Rooftop PV (MW)	204	354	415	486	566	655	755
Installed renewables - Solar - Base land use assumptions (MW)	32.5	32.5	32.5	32.5	32.5	32.5	32.5
Installed renewables - Wind - Base land use assumptions (MW)	144	144	613	613	613	613	991
Installed renewables - Solar - Constrained land use assumptions (MW)	32.5	32.5	32.5	32.5	32.5	32.5	32.5
Installed renewables - Wind - Constrained land use assumptions (MW)	144	144	343	343	343	426	725
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion \$2018)		0	0	0	0	0	0
Capital invested - Wind - Base (billion \$2018)		0	1.13	0	0	0	0.72
Capital invested - Solar PV - Constrained (billion \$2018)		0	0	0	0	0	0
Capital invested - Wind - Constrained (billion \$2018)		0	0.479	0	0	0.166	0.571

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	60.7	60.7	60.7	60.7	60.7	60.7	60.7
Wind - Base land use assumptions (GWh)	604	604	2,425	2,425	2,425	2,425	3,846
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	60.7	60.7	60.7	60.7	60.7	60.7	60.7
Wind - Constrained land use assumptions (GWh)	604	604	1,366	1,366	1,366	1,675	2,807
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)							-7.17
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-48.3
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-1,211
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-13.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-511
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-39.6
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-54.5
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-248
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-2,132
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-10.7
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-169
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-2,182
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-19.5
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-1,021
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-76.3
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-387
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-491
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-4,357
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-14.3
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-290
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-3,153
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-26.2
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-1,532
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-113
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-719
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-6,582
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-734
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							1.17
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							36.8
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							616

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 - Improve plantations (1000 hectares)							4.83
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)							5.65
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							3.54
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							147
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							815
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							1.76
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							38
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							1,112
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							7.26
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)							8.19
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							25.6
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							297
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,490
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							2.34
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							39.2
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							1,608
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							9.65
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0



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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							10.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							20.4
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							243
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,934

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-175
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-5.31
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-181
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-332
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-10.6
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-343
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)							92.3
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							9.65
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							102
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)							175
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							19.3

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 - Total (1000 hectares)							194

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)		7.77	0.009	0.009	0.008	0.005	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		1.88	0.83	0.414	0.304	0.173	0.055
Premature deaths from air pollution - Mobile - On-Road (deaths)		7.66	7.46	6.99	6.05	4.64	3.06
Premature deaths from air pollution - Gas Stations (deaths)		0.421	0.41	0.38	0.327	0.25	0.165
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		1.96	1.75	1.5	1.21	0.883	0.574
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		2.42	2.16	1.93	1.62	1.2	0.799
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.495	0.474	0.447	0.396	0.314	0.226
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.149	0.138	0.127	0.116	0.106	0.096
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		1.58	1.5	1.4	1.24	1.02	0.785
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.53	1.29	1.07	0.858	0.709	0.587
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.237	0.207	0.179	0.152	0.127	0.105
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.05	0.024	0.024	0.023	0.022	0.021
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		3.93	3.32	2.62	2.09	1.72	1.19
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		68.9	0.077	0.077	0.073	0.043	0.002
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		16.6	7.35	3.66	2.69	1.53	0.488
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		68.1	66.4	62.2	53.8	41.2	27.2
Monetary damages from air pollution - Gas Stations (million \$2019)		3.73	3.63	3.37	2.9	2.21	1.46
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		17.4	15.5	13.3	10.7	7.83	5.08
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		21.4	19.1	17.1	14.3	10.6	7.08
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		4.39	4.2	3.96	3.51	2.78	2

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		1.32	1.22	1.12	1.03	0.939	0.849
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		13.9	13.3	12.4	11	9.07	6.95
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		13.5	11.5	9.51	7.6	6.27	5.2
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		2.1	1.84	1.59	1.35	1.13	0.928
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		0.444	0.215	0.208	0.199	0.194	0.185
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		34.9	29.5	23.2	18.6	15.3	10.6

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		31.9	54.3	26.7	26.3	154	270
By economic sector - Construction (jobs)		1,031	916	912	936	1,689	4,717
By economic sector - Manufacturing (jobs)		676	1,007	925	667	1,179	2,224
By economic sector - Mining (jobs)		302	242	192	152	113	78.3
By economic sector - Other (jobs)		158	112	125	141	302	1,160
By economic sector - Pipeline (jobs)		42	39.3	36.8	34.7	30.6	25.5
By economic sector - Professional (jobs)		483	511	520	573	1,178	2,870
By economic sector - Trade (jobs)		414	387	391	409	701	1,830
By economic sector - Utilities (jobs)		236	507	457	485	1,099	2,793
By resource sector - Biomass (jobs)		127	146	90.3	110	711	1,272
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Grid (jobs)		350	926	820	881	2,129	5,564
By resource sector - Natural Gas (jobs)		94.2	72.1	54.9	44.1	33.4	25.1
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		897	797	705	627	521	409
By resource sector - Solar (jobs)		1,579	1,015	819	873	1,865	6,761
By resource sector - Wind (jobs)		326	819	1,096	888	1,185	1,938
By education level - All sectors - High school diploma or less (jobs)		1,455	1,619	1,525	1,442	2,738	6,797
By education level - All sectors - Associates degree or some college (jobs)		1,018	1,154	1,105	1,058	1,992	5,049
By education level - All sectors - Bachelors degree (jobs)		708	790	751	720	1,328	3,183
By education level - All sectors - Masters or professional degree (jobs)		167	185	177	176	333	811
By education level - All sectors - Doctoral degree (jobs)		26.4	27.1	26.6	27.7	53.2	129
Related work experience - All sectors - None (jobs)		479	537	509	489	932	2,332
Related work experience - All sectors - Up to 1 year (jobs)		709	783	741	701	1,349	3,351
Related work experience - All sectors - 1 to 4 years (jobs)		1,210	1,355	1,286	1,231	2,302	5,691
Related work experience - All sectors - 4 to 10 years (jobs)		770	863	824	791	1,471	3,646
Related work experience - All sectors - Over 10 years (jobs)		207	237	225	211	390	949

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

Item	2020	2025	2030	2035	2040	2045	2050
On-the-Job Training - All sectors - None (jobs)		196	209	199	191	359	899
On-the-Job Training - All sectors - Up to 1 year (jobs)		2,258	2,548	2,408	2,282	4,314	10,548
On-the-Job Training - All sectors - 1 to 4 years (jobs)		677	760	726	699	1,303	3,296
On-the-Job Training - All sectors - 4 to 10 years (jobs)		206	220	214	216	407	1,072
On-the-Job Training - All sectors - Over 10 years (jobs)		36.3	39.1	37.4	34.4	62	154
On-Site or In-Plant Training - All sectors - None (jobs)		563	622	592	565	1,065	2,641
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		2,039	2,297	2,173	2,062	3,892	9,547
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		533	597	570	546	1,019	2,568
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		214	229	221	222	415	1,075
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		26.2	30.1	29	28.3	54.1	138
Wage income - All (million \$2019)		177	202	194	189	359	895

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	51.9	48.7	44.2	40.3	37.2	33.7	29.5
Final energy use - Residential (PJ)	33.2	30	27.8	25.9	24	22	20
Final energy use - Commercial (PJ)	18.9	17.8	17.3	16.8	16.3	15.9	15.6
Final energy use - Industry (PJ)	20.1	20.1	20.7	20.3	20	20	19.8

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion \$2018)		0.233	0.233	0.327	0.339	0.493	0.522

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	8.28	23	37.7	106	174	324	475
Vehicle stocks - LDV – All others (1000 units)	621	621	621	589	557	429	302
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		0	19.7	39.9	136	424	620
Public EV charging plugs - DC Fast (1000 units)	0.047		0.104		0.478		1.31
Public EV charging plugs - L2 (1000 units)	0.543		2.49		11.5		31.4

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 (%)	3.07	2.85	5.68	14	28.4	40.3	45.7
Sales of space heating units - Electric Resistance (%)	1.43	1.62	1.64	1.66	1.46	1.25	1.16
Sales of space heating units - Gas (%)	17.8	9.93	9.83	9.3	7.95	6.45	5.52
Sales of space heating units - Fossil (%)	77.8	85.6	82.9	75	62.2	52	47.7
Sales of water heating units - Electric Heat Pump (%)	0	0.306	1.16	3.82	9.35	15.4	18.6

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Electric Resistance (%)	19.3	32.3	32.8	34.8	38.7	42.6	44.7
Sales of water heating units - Gas Furnace (%)	54.1	48.6	48	45.5	39.4	31.5	26.9
Sales of water heating units - Other (%)	26.6	18.8	18	15.8	12.6	10.5	9.75
Sales of cooking units - Electric Resistance (%)	46.7	48.1	52.9	65.8	83.7	94.7	98.6
Sales of cooking units - Gas (%)	53.3	51.9	47.1	34.2	16.3	5.26	1.42
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		0.481	0.555				

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	2.16	6.95	8.53	13.3	22.9	32.9	38.2
Sales of space heating units - Electric Resistance (%)	1.2	1.93	2.57	4.61	8	10.5	11.4
Sales of space heating units - Gas Furnace (%)	35.1	53.4	52.1	49.5	43.2	35.1	30.1
Sales of space heating units - Fossil (%)	61.5	37.7	36.8	32.6	25.9	21.5	20.2
Sales of water heating units - Electric Heat Pump (%)	2.07	2.63	3.32	5.68	11.3	18.2	22.2
Sales of water heating units - Electric Resistance (%)	10.3	11.4	11.8	14.3	19.6	26	29.9
Sales of water heating units - Gas Furnace (%)	79.6	81.3	80.5	76	65.6	52.7	44.9
Sales of water heating units - Other (%)	8.05	4.66	4.38	4.02	3.56	3.09	2.97
Sales of cooking units - Electric Resistance (%)	36.9	40.7	44.7	56.5	72.7	82.9	86.4
Sales of cooking units - Gas (%)	63.1	59.3	55.3	43.5	27.3	17.1	13.6
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		1,350	1,475				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Natural gas (MW)	0	0	0	0	0	0	0
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Capital invested - Biomass power plant (billion \$2018)	0	0	0.049	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass power plant (GWh)	0	0	95.9	95.9	95.9	95.9	95.9
Biomass w/ccu power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Power (quantity)	0	0	1	1	1	1	1
Number of facilities - Power ccu (quantity)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel (quantity)	0	0	0	1	1	1	1
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis (quantity)	0	0	0	1	1	2	4
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	0	0	0
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)		0.043	54.6	46.5	68	1,651	1,879
Biomass purchases (million \$2018/y)		0.048	7.89	12	18.1	166	335

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

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

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

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

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-7.17
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-48.3
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-1,211

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-13.3
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-511
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-39.6
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-54.5
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-248
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-2,132
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-10.7
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-169
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-2,182
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-19.5
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-1,021
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-76.3
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-387
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-491
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-4,357
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-14.3
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-290
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-3,153
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-26.2
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-1,532
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-113
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-719
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-6,582
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-734
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							1.17
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							36.8

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 - Extend rotation length (1000 hectares)							616
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							4.83
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)							5.65
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							3.54
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							147
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							815
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							1.76
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							38
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							1,112
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							7.26
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)							8.19
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							25.6
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							297
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,490
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							2.34
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							39.2
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							1,608
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							9.65



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 - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							10.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							20.4
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							243
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,934

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 <sub>2</sub> e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO <sub>2</sub> e/y)							-175
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO <sub>2</sub> e/y)							-5.31
Carbon sink potential - Moderate deployment - Cropland to woody energy crops (1000 tCO <sub>2</sub> e/y)							0
Carbon sink potential - Moderate deployment - Pasture to energy crops (1000 tCO <sub>2</sub> e/y)							0
Carbon sink potential - Moderate deployment - Total (1000 tCO <sub>2</sub> e/y)							-181
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO <sub>2</sub> e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO <sub>2</sub> e/y)							-332
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO <sub>2</sub> e/y)							-10.6
Carbon sink potential - Aggressive deployment - Cropland to woody energy crops (1000 tCO <sub>2</sub> e/y)							0
Carbon sink potential - Aggressive deployment - Pasture to energy crops (1000 tCO <sub>2</sub> e/y)							0
Carbon sink potential - Aggressive deployment - Total (1000 tCO <sub>2</sub> e/y)							-343
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)							92.3

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 - Permanent conservation cover (1000 hectares)							9.65
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)							16.4
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							118
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)							432
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							19.3
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)							16.4
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							468

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)		21	13.2	12.1	11.7	11.4	10.1
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		1.44	1.19	1.43	1.38	1.33	1.25
Premature deaths from air pollution - Mobile - On-Road (deaths)		7.65	7.56	7.44	7.35	7.26	7.18
Premature deaths from air pollution - Gas Stations (deaths)		0.42	0.413	0.404	0.398	0.391	0.383
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		1.95	1.79	1.7	1.63	1.57	1.49
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		2.34	1.78	1.13	0.658	0.374	0.229
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.482	0.451	0.418	0.394	0.372	0.353
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.155	0.151	0.146	0.14	0.135	0.129
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		1.6	1.56	1.47	1.36	1.32	1.33
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.53	1.27	0.957	0.648	0.477	0.383

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.248	0.246	0.243	0.24	0.236	0.231
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.098	0.068	0.055	0.051	0.048	0.044
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		3.96	4.11	4.11	3.8	3.69	3.42
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		187	117	107	104	101	89.7
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		12.7	10.5	12.7	12.2	11.8	11.1
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		68	67.2	66.2	65.3	64.5	63.8
Monetary damages from air pollution - Gas Stations (million \$2019)		3.72	3.66	3.58	3.53	3.46	3.39
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		17.2	15.9	15	14.4	13.9	13.2
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		20.7	15.8	10	5.83	3.32	2.03
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		4.27	3.99	3.71	3.49	3.3	3.13
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		1.38	1.34	1.29	1.24	1.2	1.14
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		14.1	13.8	13	12.1	11.7	11.8
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		13.5	11.2	8.47	5.74	4.22	3.39
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		2.19	2.18	2.16	2.12	2.09	2.05
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		0.865	0.604	0.488	0.451	0.425	0.389
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		35.1	36.5	36.5	33.8	32.8	30.4

Table 65: REF scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		30.3	27.1	26.8	21.8	21.8	23.7
By economic sector - Construction (jobs)		305	629	663	707	752	1,149
By economic sector - Manufacturing (jobs)		290	400	725	360	369	797
By economic sector - Mining (jobs)		304	250	206	173	148	126
By economic sector - Other (jobs)		11.9	85.7	99.2	114	128	286
By economic sector - Pipeline (jobs)		42.5	42.9	43	42.9	44	45.2
By economic sector - Professional (jobs)		215	331	350	389	430	652
By economic sector - Trade (jobs)		243	302	300	315	333	504
By economic sector - Utilities (jobs)		180	225	268	307	366	411
By resource sector - Biomass (jobs)		117	109	102	90.8	92.9	94.4

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

Item	2020	2025	2030	2035	2040	2045	2050
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Grid (jobs)		286	355	444	525	646	719
By resource sector - Natural Gas (jobs)		98	105	106	96.7	96.1	92.8
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		901	810	737	694	663	642
By resource sector - Solar (jobs)			637	684	714	733	1,765
By resource sector - Wind (jobs)		220	276	610	311	360	681
By education level - All sectors - High school diploma or less (jobs)		678	978	1,153	1,032	1,097	1,697
By education level - All sectors - Associates degree or some college (jobs)		458	681	812	738	793	1,246
By education level - All sectors - Bachelors degree (jobs)		383	497	567	515	545	819
By education level - All sectors - Masters or professional degree (jobs)		89.6	118	131	125	134	200
By education level - All sectors - Doctoral degree (jobs)		13.3	18.3	19.4	19.8	21.2	31.7
Related work experience - All sectors - None (jobs)		228	326	381	349	373	576
Related work experience - All sectors - Up to 1 year (jobs)		321	470	556	495	526	830
Related work experience - All sectors - 1 to 4 years (jobs)		599	831	965	881	938	1,432
Related work experience - All sectors - 4 to 10 years (jobs)		372	525	611	559	597	912
Related work experience - All sectors - Over 10 years (jobs)		101	140	168	147	157	242
On-the-Job Training - All sectors - None (jobs)		94.1	132	151	138	146	228
On-the-Job Training - All sectors - Up to 1 year (jobs)		1,117	1,542	1,815	1,620	1,722	2,658
On-the-Job Training - All sectors - 1 to 4 years (jobs)		309	456	535	493	529	814
On-the-Job Training - All sectors - 4 to 10 years (jobs)		86.4	138	153	155	168	252
On-the-Job Training - All sectors - Over 10 years (jobs)		15.3	23.2	28.3	24	25.2	41
On-Site or In-Plant Training - All sectors - None (jobs)		264	377	443	398	423	664
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		1,006	1,393	1,636	1,466	1,559	2,402
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		246	359	422	387	414	637
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		94.6	145	161	161	173	257
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		11.4	17.6	20.9	19.6	21.3	32.8
Wage income - All (million \$2019)		90.2	125	145	136	147	222

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	51.8	48.7	44.5	41.8	41.5	42.6	44
Final energy use - Residential (PJ)	33.2	30.1	28.1	26.6	25.5	24.7	23.9
Final energy use - Commercial (PJ)	18.9	18.1	18	17.8	17.6	17.7	18.3
Final energy use - Industry (PJ)	20.1	20.9	22.3	22.8	23.6	24.9	26

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion \$2018)		0.265	0.269	0.352	0.366	0.338	0.346

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 (%)	2.94	6.21	6.48	6.9	6.99	7.04	7.14
Sales of space heating units - Electric Resistance (%)	1.43	1.56	1.59	1.65	1.6	1.54	1.49
Sales of space heating units - Gas (%)	17.8	17.6	45.2	63.9	65.1	65.3	65.1
Sales of space heating units - Fossil (%)	77.9	74.6	46.8	27.6	26.4	26.2	26.3
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	19.3	32.1	31.9	31.9	31.9	31.8	31.7
Sales of water heating units - Gas Furnace (%)	54.1	48.9	49.1	49.2	49.2	49.3	49.4
Sales of water heating units - Other (%)	26.6	19	19	18.9	18.9	18.9	18.9
Sales of cooking units - Electric Resistance (%)	46.2	46.2	46.2	46.2	46.2	46.2	46.2
Sales of cooking units - Gas (%)	53.8	53.8	53.8	53.8	53.8	53.8	53.8
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		0.472	0.488				

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	2.16	12.9	41.1	64.2	67.8	68.1	68.2
Sales of space heating units - Electric Resistance (%)	1.2	2.59	7.38	19.7	30	31.8	31.8
Sales of space heating units - Gas Furnace (%)	35.1	48.7	26.4	6.27	0.795	0.043	0
Sales of space heating units - Fossil (%)	61.5	35.8	25.1	9.79	1.41	0.111	0
Sales of water heating units - Electric Heat Pump (%)	2.07	2.37	2.33	2.33	2.32	2.35	2.34
Sales of water heating units - Electric Resistance (%)	10.3	11.1	10.9	11.1	11.1	11	11
Sales of water heating units - Gas Furnace (%)	79.6	81.8	82.2	82	82	82.3	82.3
Sales of water heating units - Other (%)	8.05	4.7	4.54	4.51	4.58	4.35	4.3
Sales of cooking units - Electric Resistance (%)	36.9	39	38.6	38.5	38.3	38.5	38.4
Sales of cooking units - Gas (%)	63.1	61	61.4	61.5	61.7	61.5	61.6
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		1,333	1,370				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Natural gas (MW)	0	0	0	0	0	0	0
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	204	354	415	486	566	655	755
Installed renewables - Solar - Base land use assumptions (MW)	32.5	32.5	32.5	32.5	32.5	32.5	32.5
Installed renewables - Wind - Base land use assumptions (MW)	144	144	222	222	222	423	613

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	60.7	60.7	60.7	60.7	60.7	60.7	60.7
Wind - Base land use assumptions (GWh)	604	604	914	914	914	1,693	2,425
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		-3.93				-3.51
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-0.417		-0.75				-0.779
Business-as-usual carbon sink - Total (Mt CO2e/y)	3.78		-4.68				-4.29

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)							-7.17
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-48.3
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-1,211
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-13.3
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-511
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-39.6
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-54.5
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-248
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-2,132
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-10.7
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-169
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-2,182
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-19.5
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-1,021
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-76.3
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-387
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-491
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-4,357
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-14.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-290
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-3,153
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-26.2
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-1,532
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-113
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-719
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-6,582
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-734
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							1.17
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							36.8
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							616
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							4.83
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)							5.65
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							3.54
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							147
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							815
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							1.76
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							38
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							1,112
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							7.26
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0

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 - Increase trees outside forests (1000 hectares)							8.19
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							25.6
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							297
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,490
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							2.34
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							39.2
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							1,608
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							9.65
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)							10.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							20.4
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							243
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,934