



Net-Zero America - North Dakota data

October 29, 2021 (updated January 9, 2022)

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

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

Contents

1	E+ scenario - IMPACTS - Health	1
2	E+ scenario - IMPACTS - Jobs	2
3	E+ scenario - IMPACTS - Fossil fuel industries	3
4	E+ scenario - PILLAR 1: Efficiency/Electrification - Overview	3
5	E+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand	3
6	E+ scenario - PILLAR 1: Efficiency/Electrification - Transportation	3
7	E+ scenario - PILLAR 1: Efficiency/Electrification - Residential	4
8	E+ scenario - PILLAR 1: Efficiency/Electrification - Commercial	4
9	E+ scenario - PILLAR 2: Clean Electricity - Generating capacity	4
10	E+ scenario - PILLAR 2: Clean Electricity - Generation	5
11	E+ scenario - PILLAR 3: Clean fuels - Bioenergy	5
12	E+ scenario - PILLAR 4: CCUS - CO2 capture	5
13	E+ scenario - PILLAR 4: CCUS - CO2 pipelines	5
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	19
32	E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Residential	19
33	E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Commercial	19
34	E+RE+ scenario - PILLAR 2: Clean Electricity - Generating capacity	19
35	E+RE+ scenario - PILLAR 2: Clean Electricity - Generation	20
36	E+RE+ scenario - PILLAR 6: Land sinks - Forests	20
37	E+RE+ scenario - PILLAR 6: Land sinks - Agriculture	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	41
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	42
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)		2.82	0.002	0.002	0.001	0.001	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		0.681	0.376	0.225	0.192	0.121	0.053
Premature deaths from air pollution - Mobile - On-Road (deaths)		2.73	2.51	1.88	1.06	0.474	0.179
Premature deaths from air pollution - Gas Stations (deaths)		0.255	0.232	0.174	0.103	0.051	0.026
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		0.479	0.405	0.287	0.167	0.084	0.035
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.049	0.041	0.028	0.016	0.006	0.002
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.165	0.157	0.131	0.092	0.051	0.021
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.967	0.92	0.871	0.821	0.769	0.716
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		0.387	0.343	0.265	0.176	0.103	0.053
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.079	0.063	0.048	0.035	0.024	0.015
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.062	0.052	0.042	0.032	0.023	0.015
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.4	0.043	0.038	0.032	0.028	0.026
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		22.4	21.8	20.8	16.1	12.5	8.02
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		25	0.018	0.017	0.013	0.008	0
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		6.03	3.33	2	1.7	1.07	0.466
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		24.3	22.3	16.7	9.47	4.22	1.6
Monetary damages from air pollution - Gas Stations (million \$2019)		2.26	2.05	1.54	0.911	0.453	0.228
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		4.25	3.59	2.54	1.48	0.744	0.313
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		0.437	0.36	0.245	0.138	0.055	0.015
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		1.46	1.39	1.16	0.812	0.448	0.19
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		8.56	8.15	7.71	7.27	6.8	6.34
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		3.43	3.03	2.35	1.56	0.913	0.473

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)		0.697	0.555	0.426	0.31	0.214	0.135
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		0.553	0.458	0.368	0.285	0.206	0.134
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		3.53	0.379	0.336	0.282	0.248	0.232
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		199	193	185	143	111	71.3

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		819	828	1,590	1,258	787	918
By economic sector - Construction (jobs)		9,497	11,281	15,011	15,806	18,132	21,439
By economic sector - Manufacturing (jobs)		8,553	9,189	10,515	9,373	8,023	8,408
By economic sector - Mining (jobs)		11,230	8,984	7,222	4,831	3,348	2,008
By economic sector - Other (jobs)		350	531	824	1,123	1,462	1,912
By economic sector - Pipeline (jobs)		1,477	1,486	1,775	1,313	1,210	1,181
By economic sector - Professional (jobs)		5,466	6,636	9,336	11,012	12,968	15,956
By economic sector - Trade (jobs)		9,127	8,687	9,043	8,531	8,745	9,492
By economic sector - Utilities (jobs)		3,965	4,609	8,010	9,374	12,860	17,665
By resource sector - Biomass (jobs)		1,923	1,891	4,037	3,498	2,907	4,055
By resource sector - CO2 (jobs)		72	432	3,217	1,824	3,002	5,307
By resource sector - Coal (jobs)		1,398	306	18.4	13.6	10.5	8.79
By resource sector - Grid (jobs)		4,804	6,277	10,769	14,848	20,757	28,151
By resource sector - Natural Gas (jobs)		6,390	5,139	3,906	2,818	2,150	1,641
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		28,669	26,333	24,126	17,859	13,626	8,672
By resource sector - Solar (jobs)		697	901	1,328	1,361	1,201	1,387
By resource sector - Wind (jobs)		6,532	10,953	15,926	20,400	23,883	29,757
By education level - All sectors - High school diploma or less (jobs)		21,577	22,298	27,119	26,324	27,864	32,274
By education level - All sectors - Associates degree or some college (jobs)		14,050	14,847	18,487	18,743	20,806	24,840
By education level - All sectors - Bachelors degree (jobs)		11,787	11,914	13,900	13,651	14,579	16,819
By education level - All sectors - Masters or professional degree (jobs)		2,680	2,758	3,309	3,364	3,690	4,344
By education level - All sectors - Doctoral degree (jobs)		390	416	510	539	597	702
Related work experience - All sectors - None (jobs)		7,188	7,454	9,113	8,975	9,680	11,347
Related work experience - All sectors - Up to 1 year (jobs)		10,233	10,619	12,936	12,655	13,379	15,573
Related work experience - All sectors - 1 to 4 years (jobs)		18,491	19,028	22,947	22,693	24,503	28,572
Related work experience - All sectors - 4 to 10 years (jobs)		11,442	11,897	14,465	14,471	15,843	18,657
Related work experience - All sectors - Over 10 years (jobs)		3,130	3,232	3,865	3,827	4,131	4,831
On-the-Job Training - All sectors - None (jobs)		3,009	3,060	3,592	3,502	3,715	4,277
On-the-Job Training - All sectors - Up to 1 year (jobs)		34,911	35,810	42,981	42,074	44,739	51,895

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

Item	2020	2025	2030	2035	2040	2045	2050
On-the-Job Training - All sectors - 1 to 4 years (jobs)		9,451	9,977	12,401	12,540	13,937	16,597
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,633	2,879	3,747	3,912	4,517	5,487
On-the-Job Training - All sectors - Over 10 years (jobs)		480	506	606	593	627	723
On-Site or In-Plant Training - All sectors - None (jobs)		8,139	8,448	10,274	10,219	11,017	12,903
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		31,528	32,341	38,801	37,991	40,478	46,985
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		7,554	7,929	9,781	9,816	10,817	12,809
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,914	3,132	3,978	4,087	4,648	5,583
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		349	382	493	509	577	700
Wage income - All (million \$2019)		2,856	2,982	3,659	3,679	4,055	4,825

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

Item	2020	2025	2030	2035	2040	2045	2050
Oil consumption - Annual (million bbls)		46	42.8	37.1	31.1	26.4	21.8
Oil consumption - Cumulative (million bbls)							1,120
Oil production - Annual (million bbls)		598	600	599	475	386	257
Natural gas consumption - Annual (tcf)		98.1	82.7	66.3	49.9	31.4	21.8
Natural gas consumption - Cumulative (tcf)							1,997
Natural gas production - Annual (tcf)		690	653	568	481	381	296

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	104	97.6	88.2	76.6	66	59.6	57.2
Final energy use - Residential (PJ)	38.3	36.3	34.5	31.9	28.4	25	22.3
Final energy use - Commercial (PJ)	25.2	24.8	24	22.9	21.6	20.3	19.5
Final energy use - Industry (PJ)	124	130	131	130	129	129	130

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)		0.777	0.801	1.5	1.61	1.57	1.66

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	2	75.7	149	407	665	871	1,077
Vehicle stocks - LDV – All others (1000 units)	898	855	812	592	372	210	48.9
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		173	442	719	1,088	1,186	1,130
Public EV charging plugs - DC Fast (1000 units)	0.024		0.353		1.57		2.54
Public EV charging plugs - L2 (1000 units)	0.043		8.49		37.8		61.2

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 (%)	8.4	12.9	25.9	58.5	84	88	87.9
Sales of space heating units - Electric Resistance (%)	28.4	34.1	30.9	19.4	10.1	8.76	8.9
Sales of space heating units - Gas (%)	49.5	34.6	28.9	14.1	2.65	0.854	0.684
Sales of space heating units - Fossil (%)	13.7	18.3	14.3	8.01	3.29	2.43	2.5
Sales of water heating units - Electric Heat Pump (%)	0	0.203	3.49	14.3	21.9	23	23.1
Sales of water heating units - Electric Resistance (%)	52.4	66.9	67.7	71.6	76.1	76.8	76.8
Sales of water heating units - Gas Furnace (%)	47.6	32.8	28.8	14	2.01	0.152	0
Sales of water heating units - Other (%)	0.036	0.035	0.035	0.035	0.035	0.035	0.035
Sales of cooking units - Electric Resistance (%)	80.2	84.4	97.3	99.9	100	100	100
Sales of cooking units - Gas (%)	19.8	15.6	2.66	0.134	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		0.514	0.598				

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 (%)	6.09	4.46	15.5	53	81.8	86.3	86.7
Sales of space heating units - Electric Resistance (%)	9.99	5.81	8.04	12	12.9	12.9	12.9
Sales of space heating units - Gas Furnace (%)	74.1	87.3	76	35	5.3	0.843	0.483
Sales of space heating units - Fossil (%)	9.8	2.42	0.475	0.02	0	0	0
Sales of water heating units - Electric Heat Pump (%)	1.62	1.17	6.88	27.5	44	46.5	46.7
Sales of water heating units - Electric Resistance (%)	13.6	7.49	13.1	33.4	49.8	52.4	52.6
Sales of water heating units - Gas Furnace (%)	82.1	90.4	79.3	38.4	5.51	0.416	0
Sales of water heating units - Other (%)	2.67	0.964	0.742	0.696	0.692	0.695	0.695
Sales of cooking units - Electric Resistance (%)	44.8	57.1	84	89.3	89.6	89.6	89.6
Sales of cooking units - Gas (%)	55.2	42.9	16	10.7	10.4	10.4	10.4
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		2,165	2,361				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	4,244	2,128	0	0	0	0	0
Installed thermal - Natural gas (MW)	772	772	772	772	772	2,883	4,957
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	0.496	0.883	1.13	1.5	2	2.58	3.26
Installed renewables - Wind - Base land use assumptions (MW)	4,732	4,732	4,732	4,963	5,473	8,346	16,863
Installed renewables - Wind - Constrained land use assumptions (MW)	4,732	4,732	5,564	9,404	16,174	39,067	104,561
Capital invested - Wind - Base (billion \$2018)		0	0	0.287	0.603	3.22	9.02
Capital invested - Wind - Constrained (billion \$2018)		0.092	1.88	4.94	9.39	26.8	72.8
Capital invested - Biomass power plant (billion \$2018)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Biomass w/ccu allam power plant (billion \$2018)	0	0	0	0.024	0	0.007	0
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	0.081	0	0	0.013	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Wind - Base land use assumptions (GWh)	19,216	19,216	19,216	20,024	21,802	32,070	62,105
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0
Wind - Constrained land use assumptions (GWh)	19,216	19,216	22,168	35,712	58,941	137,238	352,916
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0
Biomass power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu power plant (GWh)	0	0	90.7	90.7	90.7	105	105
Biomass w/ccu allam power plant (GWh)	0	0	0	23.9	23.9	30.8	30.8

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

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu (quantity)	0	0	1	1	1	2	2
Number of facilities - Allam power w ccu (quantity)	0	0	0	1	1	2	2
Number of facilities - Beccs hydrogen (quantity)	0	0	0	7	10	13	17
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	1	2	3	3
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	1	2	3	3
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	1	1	1	2	2
Conversion capital investment - Cumulative 5-yr (million \$2018)		0	74.4	5,477	1,614	1,086	5,582
Biomass purchases (million \$2018/y)		0	4.97	410	529	609	1,023

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0.09	7.12	9.17	10.5	17.7
Annual - BECCS (MMT)		0	0.09	7.08	9.15	10.5	17.7
Annual - NGCC (MMT)		0	0	0.03	0.03	0.02	0.01
Annual - Cement and lime (MMT)		0	0	0	0	0	0
Cumulative - All (MMT)		0	0.09	7.21	16.4	26.9	44.6
Cumulative - BECCS (MMT)		0	0.09	7.17	16.3	26.8	44.5
Cumulative - NGCC (MMT)		0	0	0.03	0.06	0.08	0.09
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	138	446	446	446	446
Spur (km)		0	416	1,805	2,044	2,633	4,042

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

Item	2020	2025	2030	2035	2040	2045	2050
All (km)		0	554	2,251	2,490	3,079	4,487
Cumulative investment - Trunk (million \$2018)		0	199	1,726	1,726	1,726	1,726
Cumulative investment - Spur (million \$2018)		0	217	1,178	1,327	1,659	2,742
Cumulative investment - All (million \$2018)		0	416	2,905	3,053	3,385	4,468

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual (MMT)		0	2.19	6.17	11.7	18.9	25.2
Injection wells (wells)		0	4	15	26	44	54
Resource characterization, appraisal, permitting costs (million \$2020)		135	406	542	542	542	542
Wells and facilities construction costs (million \$2020)		0	113	439	783	1,309	1,625

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)							-19.3
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-137
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-159
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-10.5
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-13.8
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-1,170
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-6,693
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-400
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-64.3
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-8,666
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-28.9
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-479
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-286
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-15.4
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-27.6
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-2,256
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-10,039
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,837
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-127

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-16,097
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-38.5
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-821
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-414
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-20.6
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-41.5
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-3,342
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-13,386
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-5,274
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-23,528
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-191
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							3.15
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							104
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							80.8
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							3.79
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)							167
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							443
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							26
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							38.2
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							866
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							4.72
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							108
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							146
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							5.71

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 - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							242
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							664
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							188
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							77
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,435
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							6.3
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							111
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							211
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							7.59
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)							317
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							885
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							150
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							63.2
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,752

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO ₂ e/y)							-551
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO ₂ e/y)							-5,330
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO ₂ e/y)							-330
Carbon sink potential - Moderate deployment - Total (1000 tCO ₂ e/y)							-6,211

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)							-551
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-10,108
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-660
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-11,319
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							300
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							5,237
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							546
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							6,083
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							300
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							9,928
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							1,092
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							11,320

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)		2.82	0.002	0.002	0.001	0.001	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		0.684	0.337	0.178	0.102	0.05	0.034
Premature deaths from air pollution - Mobile - On-Road (deaths)		2.77	2.75	2.63	2.34	1.84	1.25
Premature deaths from air pollution - Gas Stations (deaths)		0.259	0.257	0.244	0.216	0.171	0.118
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		0.482	0.436	0.388	0.332	0.265	0.195
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.05	0.049	0.047	0.043	0.037	0.03
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.166	0.166	0.166	0.159	0.138	0.112
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.967	0.92	0.871	0.821	0.769	0.716
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		0.389	0.374	0.354	0.318	0.268	0.212

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)		0.079	0.068	0.058	0.048	0.04	0.033
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.062	0.055	0.049	0.043	0.036	0.031
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.377	0.044	0.041	0.037	0.029	0.016
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		22.4	21.5	20.3	18.9	17.4	11.7
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		25	0.018	0.017	0.013	0.008	0
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		6.06	2.98	1.58	0.901	0.439	0.301
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		24.6	24.4	23.4	20.8	16.4	11.1
Monetary damages from air pollution - Gas Stations (million \$2019)		2.3	2.27	2.16	1.91	1.51	1.05
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		4.27	3.87	3.44	2.94	2.35	1.73
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		0.445	0.432	0.415	0.382	0.324	0.263
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		1.47	1.47	1.47	1.41	1.22	0.989
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		8.56	8.15	7.71	7.27	6.8	6.34
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		3.44	3.31	3.13	2.82	2.37	1.88
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		0.698	0.599	0.512	0.429	0.355	0.291
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		0.553	0.491	0.432	0.376	0.323	0.273
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		3.33	0.387	0.364	0.33	0.253	0.141
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		199	191	181	168	154	104

Table 18: E- scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		820	846	2,279	1,934	1,079	918
By economic sector - Construction (jobs)		9,546	11,487	15,960	17,628	22,309	27,297
By economic sector - Manufacturing (jobs)		8,666	9,315	10,321	10,526	10,869	11,158
By economic sector - Mining (jobs)		11,221	8,915	7,191	5,715	4,660	2,965
By economic sector - Other (jobs)		354	547	834	1,161	1,657	2,308
By economic sector - Pipeline (jobs)		1,477	1,498	2,017	1,666	1,796	1,876
By economic sector - Professional (jobs)		5,507	6,764	10,235	12,869	15,446	19,218

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Trade (jobs)		9,139	8,742	9,309	9,895	10,843	11,884
By economic sector - Utilities (jobs)		3,954	4,712	9,091	10,437	15,832	22,022
By resource sector - Biomass (jobs)		1,924	1,937	6,703	7,336	4,595	3,922
By resource sector - CO2 (jobs)		73.3	684	5,522	3,167	5,147	9,049
By resource sector - Coal (jobs)		1,382	307	20.1	16.1	10.7	4.88
By resource sector - Grid (jobs)		4,763	6,371	11,056	15,935	24,529	33,413
By resource sector - Natural Gas (jobs)		6,370	4,768	3,259	2,362	2,442	1,746
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		28,683	26,416	24,353	22,034	19,587	12,848
By resource sector - Solar (jobs)		741	950	1,041	1,144	1,405	1,443
By resource sector - Wind (jobs)		6,749	11,393	15,281	19,839	26,777	37,221
By education level - All sectors - High school diploma or less (jobs)		21,658	22,553	28,962	30,407	35,143	40,864
By education level - All sectors - Associates degree or some college (jobs)		14,113	15,035	19,555	21,179	25,854	31,373
By education level - All sectors - Bachelors degree (jobs)		11,831	12,030	14,656	15,740	18,214	21,142
By education level - All sectors - Masters or professional degree (jobs)		2,690	2,787	3,516	3,878	4,553	5,404
By education level - All sectors - Doctoral degree (jobs)		392	420	547	628	728	863
Related work experience - All sectors - None (jobs)		7,215	7,539	9,735	10,339	12,145	14,332
Related work experience - All sectors - Up to 1 year (jobs)		10,276	10,747	13,827	14,664	16,810	19,599
Related work experience - All sectors - 1 to 4 years (jobs)		18,561	19,237	24,323	26,005	30,637	36,054
Related work experience - All sectors - 4 to 10 years (jobs)		11,488	12,035	15,295	16,475	19,737	23,553
Related work experience - All sectors - Over 10 years (jobs)		3,144	3,267	4,055	4,348	5,164	6,108
On-the-Job Training - All sectors - None (jobs)		3,021	3,092	3,804	4,054	4,659	5,389
On-the-Job Training - All sectors - Up to 1 year (jobs)		35,047	36,201	45,670	48,571	56,168	65,409
On-the-Job Training - All sectors - 1 to 4 years (jobs)		9,491	10,100	13,121	14,147	17,316	20,996
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,643	2,920	4,008	4,389	5,561	6,929
On-the-Job Training - All sectors - Over 10 years (jobs)		483	512	634	670	788	923
On-Site or In-Plant Training - All sectors - None (jobs)		8,175	8,550	10,923	11,728	13,741	16,238
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		31,649	32,692	41,195	43,805	50,817	59,259
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		7,585	8,024	10,349	11,113	13,473	16,207
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,924	3,172	4,244	4,611	5,746	7,060
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		351	387	526	575	715	883
Wage income - All (million \$2019)		2,866	3,014	3,886	4,212	5,062	6,081

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	104	98.2	91.1	85.7	81.6	76.8	71
Final energy use - Residential (PJ)	38.3	36.3	34.8	33.5	32.4	31.2	29.7
Final energy use - Commercial (PJ)	25.2	24.8	24.2	23.7	23.1	22.6	22.2
Final energy use - Industry (PJ)	124	130	132	133	133	134	134

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)		0.635	0.643	0.813	0.84	1.28	1.36

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	1.55	23.2	44.9	145	246	468	690
Vehicle stocks - LDV – All others (1000 units)	902	902	902	856	809	624	438
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		0	27.7	58.9	198	626	911
Public EV charging plugs - DC Fast (1000 units)	0.024		0.106		0.58		1.63
Public EV charging plugs - L2 (1000 units)	0.043		2.55		14		39.2

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 (%)	8.4	11.6	12.7	15.6	22.9	33.8	43
Sales of space heating units - Electric Resistance (%)	28.4	34.3	33.8	33	30.5	26.9	23.9
Sales of space heating units - Gas (%)	49.5	35.1	34.6	33.4	30.5	25.7	21.2
Sales of space heating units - Fossil (%)	13.7	19	18.9	18	16.1	13.6	12
Sales of water heating units - Electric Heat Pump (%)	0	0.054	0.328	1.13	3.24	6.62	9.51
Sales of water heating units - Electric Resistance (%)	52.4	66.9	67	67.1	67.8	69.2	70.5
Sales of water heating units - Gas Furnace (%)	47.6	33	32.6	31.8	29	24.2	19.9
Sales of water heating units - Other (%)	0.036	0.035	0.035	0.035	0.035	0.035	0.035
Sales of cooking units - Electric Resistance (%)	80.2	80.7	82.5	87.3	93.9	98	99.5
Sales of cooking units - Gas (%)	19.8	19.3	17.5	12.7	6.06	1.96	0.527
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		0.511	0.578				

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 (%)	6.09	3.87	4.9	7.61	14.7	26.5	37
Sales of space heating units - Electric Resistance (%)	9.99	5.53	5.63	6.05	7.05	8.18	8.82
Sales of space heating units - Gas Furnace (%)	74.1	87.8	86.6	83.8	76.1	63.6	52.6
Sales of space heating units - Fossil (%)	9.8	2.84	2.83	2.55	2.12	1.71	1.57
Sales of water heating units - Electric Heat Pump (%)	1.62	0.913	1.44	2.92	6.86	13.4	19.4
Sales of water heating units - Electric Resistance (%)	13.6	7.24	7.77	9.19	13.1	19.6	25.5
Sales of water heating units - Gas Furnace (%)	82.1	90.8	89.8	86.9	79.2	66.1	54.3
Sales of water heating units - Other (%)	2.67	1.01	0.99	0.955	0.899	0.868	0.856
Sales of cooking units - Electric Resistance (%)	44.8	49.3	53.1	63	76.9	85.5	88.5
Sales of cooking units - Gas (%)	55.2	50.7	46.9	37	23.1	14.5	11.5
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		2,165	2,363				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	4,244	2,128	0	0	0	0	0
Installed thermal - Natural gas (MW)	772	772	772	772	1,105	5,018	4,957
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)							-19.3
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-137
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-159
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-10.5
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-13.8
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-1,170
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-6,693
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-400
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-64.3
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-8,666
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-28.9
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-479
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-286
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-15.4
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-27.6
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-2,256
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-10,039
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,837
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-127
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-16,097
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-38.5
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-821
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-414
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-20.6
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-41.5

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-3,342
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-13,386
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-5,274
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-23,528
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-191
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							3.15
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							104
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							80.8
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							3.79
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)							167
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							443
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							26
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							38.2
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							866
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							4.72
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							108
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							146
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							5.71
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)							242
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							664
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							188

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 - Restore productivity (1000 hectares)							77
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,435
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							6.3
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							111
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							211
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							7.59
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)							317
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							885
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							150
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							63.2
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,752

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)							-551
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-5,330
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-330
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-6,211
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-551
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-10,108
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-660
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-11,319

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 - Corn-ethanol to energy grasses (1000 hectares)							300
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							5,237
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							546
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							6,083
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							300
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							9,928
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							1,092
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							11,320

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)		2.82	0.002	0.002	0.001	0.001	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		0.623	0.332	0.136	0.102	0.054	0.03
Premature deaths from air pollution - Mobile - On-Road (deaths)		2.73	2.51	1.88	1.06	0.474	0.179
Premature deaths from air pollution - Gas Stations (deaths)		0.255	0.232	0.174	0.103	0.051	0.026
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		0.479	0.405	0.287	0.167	0.084	0.035
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.049	0.041	0.028	0.016	0.006	0.002
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.165	0.157	0.131	0.092	0.051	0.021
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.967	0.92	0.871	0.821	0.769	0.716
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		0.387	0.343	0.265	0.176	0.103	0.053
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.079	0.063	0.048	0.035	0.024	0.015
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.062	0.052	0.042	0.032	0.023	0.015
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.46	0.043	0.038	0.031	0.028	0.003

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		22.3	21.7	20	14.6	9.66	1.92
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		25	0.018	0.017	0.013	0.008	0
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		5.52	2.94	1.21	0.905	0.477	0.265
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		24.3	22.3	16.7	9.47	4.22	1.6
Monetary damages from air pollution - Gas Stations (million \$2019)		2.26	2.05	1.54	0.911	0.453	0.228
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		4.25	3.59	2.54	1.48	0.744	0.313
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		0.437	0.36	0.245	0.138	0.055	0.015
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		1.46	1.39	1.16	0.812	0.448	0.19
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		8.56	8.15	7.71	7.27	6.8	6.34
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		3.43	3.03	2.35	1.56	0.913	0.473
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		0.697	0.555	0.426	0.31	0.214	0.135
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		0.553	0.458	0.368	0.285	0.206	0.134
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		4.06	0.379	0.333	0.277	0.244	0.028
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		198	192	178	129	85.8	17

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		819	823	1,522	1,192	680	922
By economic sector - Construction (jobs)		9,710	11,715	15,837	20,276	25,165	33,372
By economic sector - Manufacturing (jobs)		8,829	9,946	12,182	12,056	12,888	13,600
By economic sector - Mining (jobs)		11,115	8,811	6,747	4,168	2,323	356
By economic sector - Other (jobs)		369	581	1,034	1,647	2,384	3,604
By economic sector - Pipeline (jobs)		1,470	1,449	1,369	1,026	709	150
By economic sector - Professional (jobs)		5,605	7,006	10,766	14,744	19,343	27,457
By economic sector - Trade (jobs)		9,200	8,846	9,617	10,156	11,620	14,704
By economic sector - Utilities (jobs)		4,075	4,809	8,062	13,755	19,558	30,270
By resource sector - Biomass (jobs)		1,922	1,875	3,728	3,495	2,559	4,190
By resource sector - CO2 (jobs)		0	0.001	0.001	0.001	0.002	0.001
By resource sector - Coal (jobs)		1,438	306	18.2	13.3	10.3	0.028
By resource sector - Grid (jobs)		5,031	6,860	13,433	24,370	35,633	57,118
By resource sector - Natural Gas (jobs)		6,181	4,971	3,421	2,589	1,714	683
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		28,670	26,326	23,542	16,483	10,807	2,091

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

Item	2020	2025	2030	2035	2040	2045	2050
By resource sector - Solar (jobs)		806	1,362	2,107	2,484	3,544	3,116
By resource sector - Wind (jobs)		7,143	12,286	20,887	29,586	40,401	57,236
By education level - All sectors - High school diploma or less (jobs)		21,883	23,024	28,529	32,842	38,530	49,920
By education level - All sectors - Associates degree or some college (jobs)		14,281	15,411	19,688	24,131	29,731	39,821
By education level - All sectors - Bachelors degree (jobs)		11,922	12,276	14,802	17,087	20,339	26,532
By education level - All sectors - Masters or professional degree (jobs)		2,711	2,845	3,558	4,275	5,223	7,017
By education level - All sectors - Doctoral degree (jobs)		395	430	559	686	847	1,144
Related work experience - All sectors - None (jobs)		7,287	7,694	9,591	11,281	13,472	17,727
Related work experience - All sectors - Up to 1 year (jobs)		10,389	10,997	13,765	15,912	18,758	24,489
Related work experience - All sectors - 1 to 4 years (jobs)		18,738	19,644	24,303	28,575	34,243	44,950
Related work experience - All sectors - 4 to 10 years (jobs)		11,604	12,304	15,354	18,392	22,340	29,586
Related work experience - All sectors - Over 10 years (jobs)		3,174	3,347	4,124	4,862	5,856	7,682
On-the-Job Training - All sectors - None (jobs)		3,047	3,155	3,813	4,371	5,157	6,692
On-the-Job Training - All sectors - Up to 1 year (jobs)		35,385	36,997	45,614	52,764	62,473	81,436
On-the-Job Training - All sectors - 1 to 4 years (jobs)		9,596	10,333	13,132	16,077	19,767	26,433
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,675	2,976	3,930	5,061	6,385	8,744
On-the-Job Training - All sectors - Over 10 years (jobs)		488	526	648	748	885	1,128
On-Site or In-Plant Training - All sectors - None (jobs)		8,258	8,750	10,965	12,937	15,551	20,472
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		31,954	33,403	41,135	47,665	56,500	73,707
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		7,668	8,206	10,352	12,527	15,283	20,318
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,956	3,230	4,162	5,232	6,510	8,813
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		356	397	522	660	825	1,122
Wage income - All (million \$2019)		2,892	3,075	3,862	4,643	5,667	7,607

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	104	97.6	88.2	76.6	66	59.6	57.2
Final energy use - Residential (PJ)	38.3	36.3	34.5	31.9	28.4	25	22.3
Final energy use - Commercial (PJ)	25.2	24.8	24	22.9	21.6	20.3	19.5
Final energy use - Industry (PJ)	124	130	131	130	129	129	130

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)		0.777	0.801	1.5	1.61	1.57	1.66

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	2	75.7	149	407	665	871	1,077
Vehicle stocks - LDV – All others (1000 units)	898	855	812	592	372	210	48.9
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		173	442	719	1,088	1,186	1,130
Public EV charging plugs - DC Fast (1000 units)	0.024		0.353		1.57		2.54
Public EV charging plugs - L2 (1000 units)	0.043		8.49		37.8		61.2

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 (%)	8.4	12.9	25.9	58.5	84	88	87.9
Sales of space heating units - Electric Resistance (%)	28.4	34.1	30.9	19.4	10.1	8.76	8.9
Sales of space heating units - Gas (%)	49.5	34.6	28.9	14.1	2.65	0.854	0.684
Sales of space heating units - Fossil (%)	13.7	18.3	14.3	8.01	3.29	2.43	2.5
Sales of water heating units - Electric Heat Pump (%)	0	0.203	3.49	14.3	21.9	23	23.1
Sales of water heating units - Electric Resistance (%)	52.4	66.9	67.7	71.6	76.1	76.8	76.8
Sales of water heating units - Gas Furnace (%)	47.6	32.8	28.8	14	2.01	0.152	0
Sales of water heating units - Other (%)	0.036	0.035	0.035	0.035	0.035	0.035	0.035
Sales of cooking units - Electric Resistance (%)	80.2	84.4	97.3	99.9	100	100	100
Sales of cooking units - Gas (%)	19.8	15.6	2.66	0.134	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		0.514	0.598				

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 (%)	6.09	4.46	15.5	53	81.8	86.3	86.7
Sales of space heating units - Electric Resistance (%)	9.99	5.81	8.04	12	12.9	12.9	12.9
Sales of space heating units - Gas Furnace (%)	74.1	87.3	76	35	5.3	0.843	0.483
Sales of space heating units - Fossil (%)	9.8	2.42	0.475	0.02	0	0	0
Sales of water heating units - Electric Heat Pump (%)	1.62	1.17	6.88	27.5	44	46.5	46.7
Sales of water heating units - Electric Resistance (%)	13.6	7.49	13.1	33.4	49.8	52.4	52.6
Sales of water heating units - Gas Furnace (%)	82.1	90.4	79.3	38.4	5.51	0.416	0
Sales of water heating units - Other (%)	2.67	0.964	0.742	0.696	0.692	0.695	0.695
Sales of cooking units - Electric Resistance (%)	44.8	57.1	84	89.3	89.6	89.6	89.6
Sales of cooking units - Gas (%)	55.2	42.9	16	10.7	10.4	10.4	10.4
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		2,165	2,361				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	4,244	2,128	0	0	0	0	0
Installed thermal - Natural gas (MW)	772	772	772	772	2,883	5,018	4,957
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed renewables - Rooftop PV (MW)	0.496	0.883	1.13	1.5	2	2.58	3.26
Installed renewables - Wind - Base land use assumptions (MW)	4,732	4,732	4,732	5,303	8,154	21,114	53,385
Installed renewables - Solar - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - Wind - Constrained land use assumptions (MW)	5,222	5,222	6,659	11,599	37,319	139,727	183,272
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Capital invested - Wind - Base (billion \$2018)		0	0	0.709	3.37	14.5	34.2

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Wind - Base land use assumptions (GWh)	19,216	19,216	19,216	21,195	31,306	76,704	185,837
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0
Wind - Constrained land use assumptions (GWh)	38,431	38,431	48,634	83,200	259,155	921,913	1,175,106
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)							-19.3
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-137
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-159
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-10.5
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-13.8
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-1,170
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-6,693
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-400
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-64.3
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-8,666
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-28.9
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-479
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-286
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-15.4
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-27.6

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 tCO2e/y)							-2,256
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-10,039
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,837
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-127
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-16,097
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-38.5
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-821
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-414
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-20.6
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-41.5
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-3,342
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-13,386
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-5,274
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-23,528
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-191
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							3.15
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							104
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							80.8
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							3.79
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)							167
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							443
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							26
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							38.2
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							866
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							4.72

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)							108
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							146
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							5.71
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)							242
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							664
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							188
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							77
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,435
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							6.3
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							111
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							211
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							7.59
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)							317
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							885
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							150
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							63.2
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,752

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)							-551

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)							-5,330
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-330
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-6,211
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-551
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-10,108
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-660
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-11,319
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							300
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							5,237
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							546
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							6,083
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							300
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							9,928
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							1,092
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							11,320

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)		2.82	0.002	0.002	0.001	0.001	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		0.689	0.381	0.376	0.348	0.16	0.054
Premature deaths from air pollution - Mobile - On-Road (deaths)		2.73	2.51	1.88	1.06	0.474	0.179
Premature deaths from air pollution - Gas Stations (deaths)		0.255	0.232	0.174	0.103	0.051	0.026
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		0.479	0.405	0.287	0.167	0.084	0.035
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.049	0.041	0.028	0.016	0.006	0.002

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)		0.165	0.157	0.131	0.092	0.051	0.021
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.967	0.92	0.871	0.821	0.769	0.716
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		0.387	0.343	0.265	0.176	0.103	0.053
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.079	0.063	0.048	0.035	0.024	0.015
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.062	0.052	0.042	0.032	0.023	0.015
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.341	0.042	0.038	0.032	0.028	0.003
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		22.5	22	21.5	17.1	13.9	10.1
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		25	0.018	0.017	0.013	0.008	0
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		6.1	3.38	3.33	3.08	1.42	0.482
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		24.3	22.3	16.7	9.47	4.22	1.6
Monetary damages from air pollution - Gas Stations (million \$2019)		2.26	2.05	1.54	0.911	0.453	0.228
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		4.25	3.59	2.54	1.48	0.744	0.313
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		0.437	0.36	0.245	0.138	0.055	0.015
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		1.46	1.39	1.16	0.812	0.448	0.19
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		8.56	8.15	7.71	7.27	6.8	6.34
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		3.43	3.03	2.35	1.56	0.913	0.473
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		0.697	0.555	0.426	0.31	0.214	0.135
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		0.553	0.458	0.368	0.285	0.206	0.134
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		3.01	0.374	0.334	0.28	0.249	0.027
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		200	196	191	152	124	89.3

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		819	848	2,301	1,635	878	915
By economic sector - Construction (jobs)		9,265	9,885	13,294	12,159	12,512	13,617
By economic sector - Manufacturing (jobs)		8,122	7,683	8,136	7,269	5,984	4,904
By economic sector - Mining (jobs)		11,298	9,245	7,783	5,449	4,095	2,798
By economic sector - Other (jobs)		329	391	525	644	718	779
By economic sector - Pipeline (jobs)		1,484	1,530	2,149	1,539	1,576	1,847
By economic sector - Professional (jobs)		5,302	5,563	7,982	8,168	7,880	8,026
By economic sector - Trade (jobs)		9,039	8,206	8,254	7,045	6,188	5,457
By economic sector - Utilities (jobs)		3,844	3,846	7,788	7,596	8,500	10,694
By resource sector - Biomass (jobs)		1,922	1,939	6,941	5,515	3,460	3,938
By resource sector - CO2 (jobs)		74.1	799	6,267	3,555	5,785	10,211
By resource sector - Coal (jobs)		1,358	331	55.9	49.2	44.7	13.1
By resource sector - Grid (jobs)		4,559	4,694	7,928	10,035	10,444	11,125
By resource sector - Natural Gas (jobs)		6,587	5,602	4,990	4,488	3,440	2,488
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		28,669	26,333	24,126	17,858	13,921	9,746
By resource sector - Solar (jobs)		559	506	420	403	357	296
By resource sector - Wind (jobs)		5,773	6,993	7,485	9,601	10,877	11,220
By education level - All sectors - High school diploma or less (jobs)		21,158	20,246	25,347	22,068	20,390	20,654
By education level - All sectors - Associates degree or some college (jobs)		13,734	13,221	16,655	15,024	14,570	15,196
By education level - All sectors - Bachelors degree (jobs)		11,590	10,861	12,731	11,254	10,416	10,246
By education level - All sectors - Masters or professional degree (jobs)		2,636	2,496	3,018	2,729	2,554	2,546
By education level - All sectors - Doctoral degree (jobs)		384	372	460	429	401	395
Related work experience - All sectors - None (jobs)		7,053	6,758	8,493	7,470	7,001	7,165
Related work experience - All sectors - Up to 1 year (jobs)		10,020	9,576	11,959	10,479	9,591	9,661
Related work experience - All sectors - 1 to 4 years (jobs)		18,146	17,243	21,111	18,688	17,566	17,743
Related work experience - All sectors - 4 to 10 years (jobs)		11,216	10,712	13,162	11,757	11,232	11,503
Related work experience - All sectors - Over 10 years (jobs)		3,067	2,909	3,487	3,110	2,941	2,965
On-the-Job Training - All sectors - None (jobs)		2,957	2,787	3,306	2,896	2,667	2,642
On-the-Job Training - All sectors - Up to 1 year (jobs)		34,245	32,472	39,704	34,917	32,238	32,241
On-the-Job Training - All sectors - 1 to 4 years (jobs)		9,252	8,925	11,240	10,097	9,828	10,277
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,579	2,562	3,423	3,118	3,147	3,421
On-the-Job Training - All sectors - Over 10 years (jobs)		469	451	538	475	450	455
On-Site or In-Plant Training - All sectors - None (jobs)		7,972	7,593	9,376	8,323	7,794	7,890
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		30,931	29,339	35,832	31,519	29,179	29,241
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		7,398	7,115	8,898	7,953	7,671	7,958
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,859	2,812	3,658	3,301	3,283	3,516
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		341	338	447	408	403	432
Wage income - All (million \$2019)		2,804	2,705	3,384	3,040	2,910	3,005

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	104	97.6	88.2	76.6	66	59.6	57.2
Final energy use - Residential (PJ)	38.3	36.3	34.5	31.9	28.4	25	22.3
Final energy use - Commercial (PJ)	25.2	24.8	24	22.9	21.6	20.3	19.5
Final energy use - Industry (PJ)	124	130	131	130	129	129	130

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)		0.777	0.801	1.5	1.61	1.57	1.66

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	2	75.7	149	407	665	871	1,077
Vehicle stocks - LDV – All others (1000 units)	898	855	812	592	372	210	48.9
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		173	442	719	1,088	1,186	1,130
Public EV charging plugs - DC Fast (1000 units)	0.024		0.353		1.57		2.54
Public EV charging plugs - L2 (1000 units)	0.043		8.49		37.8		61.2

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 (%)	8.4	12.9	25.9	58.5	84	88	87.9
Sales of space heating units - Electric Resistance (%)	28.4	34.1	30.9	19.4	10.1	8.76	8.9
Sales of space heating units - Gas (%)	49.5	34.6	28.9	14.1	2.65	0.854	0.684
Sales of space heating units - Fossil (%)	13.7	18.3	14.3	8.01	3.29	2.43	2.5
Sales of water heating units - Electric Heat Pump (%)	0	0.203	3.49	14.3	21.9	23	23.1
Sales of water heating units - Electric Resistance (%)	52.4	66.9	67.7	71.6	76.1	76.8	76.8
Sales of water heating units - Gas Furnace (%)	47.6	32.8	28.8	14	2.01	0.152	0
Sales of water heating units - Other (%)	0.036	0.035	0.035	0.035	0.035	0.035	0.035
Sales of cooking units - Electric Resistance (%)	80.2	84.4	97.3	99.9	100	100	100
Sales of cooking units - Gas (%)	19.8	15.6	2.66	0.134	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		0.514	0.598				

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 (%)	6.09	4.46	15.5	53	81.8	86.3	86.7
Sales of space heating units - Electric Resistance (%)	9.99	5.81	8.04	12	12.9	12.9	12.9
Sales of space heating units - Gas Furnace (%)	74.1	87.3	76	35	5.3	0.843	0.483
Sales of space heating units - Fossil (%)	9.8	2.42	0.475	0.02	0	0	0
Sales of water heating units - Electric Heat Pump (%)	1.62	1.17	6.88	27.5	44	46.5	46.7
Sales of water heating units - Electric Resistance (%)	13.6	7.49	13.1	33.4	49.8	52.4	52.6

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 (%)	82.1	90.4	79.3	38.4	5.51	0.416	0
Sales of water heating units - Other (%)	2.67	0.964	0.742	0.696	0.692	0.695	0.695
Sales of cooking units - Electric Resistance (%)	44.8	57.1	84	89.3	89.6	89.6	89.6
Sales of cooking units - Gas (%)	55.2	42.9	16	10.7	10.4	10.4	10.4
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		2,165	2,361				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	4,244	2,128	106	106	106	106	0
Installed thermal - Natural gas (MW)	772	772	774	774	2,239	1,505	711
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	0.496	0.883	1.13	1.5	2	2.58	3.26
Installed renewables - Wind - Base land use assumptions (MW)	4,732	4,732	4,732	4,732	4,928	5,218	5,218
Installed renewables - Solar - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - Wind - Constrained land use assumptions (MW)	4,732	4,732	4,917	5,753	7,961	10,934	10,965
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Capital invested - Wind - Base (billion \$2018)		0	0	0	0.232	0.325	0
Capital invested - Wind - Constrained (billion \$2018)		0	0.248	1.04	2.61	3.33	0.033

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Wind - Base land use assumptions (GWh)	19,216	19,216	19,216	19,216	19,895	20,908	20,908
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0
Wind - Constrained land use assumptions (GWh)	19,216	19,216	19,875	22,824	30,646	41,008	41,114
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)							-19.3
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-137
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-159
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-10.5
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-13.8
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-1,170
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-6,693

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-400
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-64.3
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-8,666
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-28.9
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-479
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-286
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-15.4
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-27.6
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-2,256
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-10,039
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,837
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-127
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-16,097
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-38.5
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-821
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-414
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-20.6
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-41.5
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-3,342
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-13,386
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-5,274
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-23,528
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-191
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							3.15
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							104
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							80.8
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							3.79
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							167
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							443
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							26
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							38.2
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							866
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							4.72
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							108
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							146
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							5.71
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)							242
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							664
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							188
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							77
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,435
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							6.3
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							111
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							211
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							7.59
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)							317
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							885

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							150
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							63.2
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,752

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)							-551
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-5,330
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-330
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-6,211
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-551
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-10,108
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-660
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-11,319
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							300
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							5,237
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							546
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							6,083
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							300
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							9,928
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							1,092
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							11,320

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)		2.82	0.002	0.002	0.001	0.001	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		0.654	0.309	0.2	0.147	0.079	0.034
Premature deaths from air pollution - Mobile - On-Road (deaths)		2.77	2.75	2.63	2.34	1.84	1.25
Premature deaths from air pollution - Gas Stations (deaths)		0.259	0.257	0.244	0.216	0.171	0.118
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		0.482	0.436	0.388	0.332	0.265	0.195
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.05	0.049	0.047	0.043	0.037	0.03
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.166	0.166	0.166	0.159	0.138	0.112
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.967	0.92	0.871	0.821	0.769	0.716
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		0.389	0.374	0.354	0.318	0.268	0.212
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.079	0.068	0.058	0.048	0.04	0.033
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.062	0.055	0.049	0.043	0.036	0.031
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.397	0.044	0.041	0.038	0.034	0.029
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		22.4	21.5	20.3	18.9	17.4	11.7
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		25	0.018	0.017	0.013	0.008	0
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		5.8	2.74	1.77	1.3	0.704	0.304
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		24.6	24.4	23.4	20.8	16.4	11.1
Monetary damages from air pollution - Gas Stations (million \$2019)		2.3	2.27	2.16	1.91	1.51	1.05
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		4.27	3.87	3.44	2.94	2.35	1.73
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		0.445	0.432	0.415	0.382	0.324	0.263
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		1.47	1.47	1.47	1.41	1.22	0.989
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		8.56	8.15	7.71	7.27	6.8	6.34
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		3.44	3.31	3.13	2.82	2.37	1.88

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		0.698	0.599	0.512	0.429	0.355	0.291
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		0.553	0.491	0.432	0.376	0.323	0.273
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		3.51	0.385	0.365	0.333	0.297	0.26
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		199	191	181	168	154	104

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		819	832	2,434	2,108	2,291	1,984
By economic sector - Construction (jobs)		9,599	11,628	15,869	15,825	19,552	23,163
By economic sector - Manufacturing (jobs)		8,706	9,368	9,954	9,031	9,940	10,239
By economic sector - Mining (jobs)		11,198	8,900	7,221	5,786	4,717	2,848
By economic sector - Other (jobs)		359	559	817	973	1,331	1,777
By economic sector - Pipeline (jobs)		1,475	1,499	2,036	1,679	1,815	1,869
By economic sector - Professional (jobs)		5,544	6,852	10,299	11,748	15,187	17,234
By economic sector - Trade (jobs)		9,160	8,787	9,307	9,292	10,165	10,156
By economic sector - Utilities (jobs)		3,980	4,799	9,111	9,077	13,609	19,172
By resource sector - Biomass (jobs)		1,923	1,901	7,323	8,054	10,574	9,490
By resource sector - CO2 (jobs)		73.2	686	5,660	3,292	5,317	9,211
By resource sector - Coal (jobs)		1,396	307	20.1	16.3	12.8	9.96
By resource sector - Grid (jobs)		4,821	6,514	10,975	13,466	20,633	27,898
By resource sector - Natural Gas (jobs)		6,300	4,745	3,338	2,399	2,085	1,819
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		28,684	26,416	24,353	22,052	19,678	12,414
By resource sector - Solar (jobs)		729	937	870	747	859	1,387
By resource sector - Wind (jobs)		6,914	11,719	14,508	15,493	19,449	26,212
By education level - All sectors - High school diploma or less (jobs)		21,724	22,710	28,925	27,895	33,101	36,788
By education level - All sectors - Associates degree or some college (jobs)		14,163	15,169	19,441	19,062	23,393	27,312
By education level - All sectors - Bachelors degree (jobs)		11,861	12,113	14,617	14,430	17,105	18,773
By education level - All sectors - Masters or professional degree (jobs)		2,698	2,808	3,514	3,552	4,300	4,794
By education level - All sectors - Doctoral degree (jobs)		393	424	549	579	707	774
Related work experience - All sectors - None (jobs)		7,237	7,595	9,723	9,462	11,366	12,805
Related work experience - All sectors - Up to 1 year (jobs)		10,310	10,825	13,811	13,441	15,985	17,733
Related work experience - All sectors - 1 to 4 years (jobs)		18,615	19,380	24,255	23,734	28,437	31,899
Related work experience - All sectors - 4 to 10 years (jobs)		11,524	12,133	15,229	14,945	18,090	20,648
Related work experience - All sectors - Over 10 years (jobs)		3,153	3,292	4,030	3,935	4,728	5,358
On-the-Job Training - All sectors - None (jobs)		3,029	3,114	3,797	3,724	4,395	4,815
On-the-Job Training - All sectors - Up to 1 year (jobs)		35,151	36,455	45,579	44,494	52,924	58,622

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

Item	2020	2025	2030	2035	2040	2045	2050
On-the-Job Training - All sectors - 1 to 4 years (jobs)		9,523	10,189	13,049	12,750	15,616	18,234
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,653	2,950	3,994	3,949	4,958	5,965
On-the-Job Training - All sectors - Over 10 years (jobs)		485	516	628	603	714	806
On-Site or In-Plant Training - All sectors - None (jobs)		8,201	8,616	10,892	10,682	12,824	14,411
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		31,742	32,923	41,104	40,106	47,742	53,006
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		7,610	8,092	10,297	10,044	12,224	14,139
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,934	3,202	4,231	4,170	5,170	6,114
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		352	391	523	517	646	771
Wage income - All (million \$2019)		2,874	3,036	3,878	3,845	4,695	5,382

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	104	98.2	91.1	85.7	81.6	76.8	71
Final energy use - Residential (PJ)	38.3	36.3	34.8	33.5	32.4	31.2	29.7
Final energy use - Commercial (PJ)	25.2	24.8	24.2	23.7	23.1	22.6	22.2
Final energy use - Industry (PJ)	124	130	132	133	133	134	134

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)		0.635	0.643	0.813	0.84	1.28	1.36

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	1.55	23.2	44.9	145	246	468	690
Vehicle stocks - LDV – All others (1000 units)	902	902	902	856	809	624	438
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		0	27.7	58.9	198	626	911
Public EV charging plugs - DC Fast (1000 units)	0.024		0.106		0.58		1.63
Public EV charging plugs - L2 (1000 units)	0.043		2.55		14		39.2

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 (%)	8.4	11.6	12.7	15.6	22.9	33.8	43
Sales of space heating units - Electric Resistance (%)	28.4	34.3	33.8	33	30.5	26.9	23.9
Sales of space heating units - Gas (%)	49.5	35.1	34.6	33.4	30.5	25.7	21.2
Sales of space heating units - Fossil (%)	13.7	19	18.9	18	16.1	13.6	12
Sales of water heating units - Electric Heat Pump (%)	0	0.054	0.328	1.13	3.24	6.62	9.51
Sales of water heating units - Electric Resistance (%)	52.4	66.9	67	67.1	67.8	69.2	70.5
Sales of water heating units - Gas Furnace (%)	47.6	33	32.6	31.8	29	24.2	19.9
Sales of water heating units - Other (%)	0.036	0.035	0.035	0.035	0.035	0.035	0.035

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of cooking units - Electric Resistance (%)	80.2	80.7	82.5	87.3	93.9	98	99.5
Sales of cooking units - Gas (%)	19.8	19.3	17.5	12.7	6.06	1.96	0.527
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		0.511	0.578				

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 (%)	6.09	3.87	4.9	7.61	14.7	26.5	37
Sales of space heating units - Electric Resistance (%)	9.99	5.53	5.63	6.05	7.05	8.18	8.82
Sales of space heating units - Gas Furnace (%)	74.1	87.8	86.6	83.8	76.1	63.6	52.6
Sales of space heating units - Fossil (%)	9.8	2.84	2.83	2.55	2.12	1.71	1.57
Sales of water heating units - Electric Heat Pump (%)	1.62	0.913	1.44	2.92	6.86	13.4	19.4
Sales of water heating units - Electric Resistance (%)	13.6	7.24	7.77	9.19	13.1	19.6	25.5
Sales of water heating units - Gas Furnace (%)	82.1	90.8	89.8	86.9	79.2	66.1	54.3
Sales of water heating units - Other (%)	2.67	1.01	0.99	0.955	0.899	0.868	0.856
Sales of cooking units - Electric Resistance (%)	44.8	49.3	53.1	63	76.9	85.5	88.5
Sales of cooking units - Gas (%)	55.2	50.7	46.9	37	23.1	14.5	11.5
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		2,165	2,363				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	4,244	2,128	0	0	0	0	0
Installed thermal - Natural gas (MW)	772	772	772	772	772	2,883	4,957
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Capital invested - Biomass power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion \$2018)	0	0	0	0.025	0	0	0
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	0.093	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu power plant (GWh)	0	0	104	104	104	104	104
Biomass w/ccu allam power plant (GWh)	0	0	0	25.4	25.4	25.4	25.4

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

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu (quantity)	0	0	1	1	1	1	1
Number of facilities - Allam power w ccu (quantity)	0	0	0	1	1	1	1
Number of facilities - Beccs hydrogen (quantity)	0	0	0	15	19	32	32
Number of facilities - Diesel (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 - Diesel ccu (quantity)	0	0	0	1	1	1	1
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	1	1	1	1
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	1	1	1	1	1
Conversion capital investment - Cumulative 5-yr (million \$2018)		0	85.5	14,002	5,075	11,208	0
Biomass purchases (million \$2018/y)		0	7.15	1,263	1,720	2,728	2,728

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0.11	18.1	24.6	39	39
Annual - BECCS (MMT)		0	0.11	18	24.6	39	39
Annual - NGCC (MMT)		0	0	0.02	0.02	0.01	0.01
Annual - Cement and lime (MMT)		0	0	0	0	0	0
Cumulative - All (MMT)		0	0.11	18.2	42.8	81.8	121
Cumulative - BECCS (MMT)		0	0.11	18.1	42.7	81.7	121
Cumulative - NGCC (MMT)		0	0	0.02	0.04	0.05	0.06
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	138	446	446	446	446
Spur (km)		0	317	1,882	2,546	3,432	3,467
All (km)		0	455	2,328	2,992	3,878	3,913
Cumulative investment - Trunk (million \$2018)		0	199	1,822	1,822	1,822	1,822
Cumulative investment - Spur (million \$2018)		0	166	1,623	2,107	3,191	3,210
Cumulative investment - All (million \$2018)		0	366	3,445	3,929	5,013	5,032

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual (MMT)		0	4.62	20.3	40.4	56.1	58.5
Injection wells (wells)		0	10	38	68	113	141
Resource characterization, appraisal, permitting costs (million \$2020)		135	623	975	975	975	975
Wells and facilities construction costs (million \$2020)		0	293	1,142	2,035	3,403	4,225

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)							-19.3
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-137
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-159
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-10.5
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-13.8
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-1,170

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Reforest cropland (1000 tCO ₂ e/y)							-6,693
Carbon sink potential - Low - Reforest pasture (1000 tCO ₂ e/y)							-400
Carbon sink potential - Low - Restore productivity (1000 tCO ₂ e/y)							-64.3
Carbon sink potential - Low - All (not counting overlap) (1000 tCO ₂ e/y)							-8,666
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO ₂ e/y)							-28.9
Carbon sink potential - Mid - Avoid deforestation (1000 tCO ₂ e/y)							-479
Carbon sink potential - Mid - Extend rotation length (1000 tCO ₂ e/y)							-286
Carbon sink potential - Mid - Improve plantations (1000 tCO ₂ e/y)							-15.4
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO ₂ e/y)							-27.6
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO ₂ e/y)							-2,256
Carbon sink potential - Mid - Reforest cropland (1000 tCO ₂ e/y)							-10,039
Carbon sink potential - Mid - Reforest pasture (1000 tCO ₂ e/y)							-2,837
Carbon sink potential - Mid - Restore productivity (1000 tCO ₂ e/y)							-127
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO ₂ e/y)							-16,097
Carbon sink potential - High - Accelerate regeneration (1000 tCO ₂ e/y)							-38.5
Carbon sink potential - High - Avoid deforestation (1000 tCO ₂ e/y)							-821
Carbon sink potential - High - Extend rotation length (1000 tCO ₂ e/y)							-414
Carbon sink potential - High - Improve plantations (1000 tCO ₂ e/y)							-20.6
Carbon sink potential - High - Increase retention of HWP (1000 tCO ₂ e/y)							-41.5
Carbon sink potential - High - Increase trees outside forests (1000 tCO ₂ e/y)							-3,342
Carbon sink potential - High - Reforest cropland (1000 tCO ₂ e/y)							-13,386
Carbon sink potential - High - Reforest pasture (1000 tCO ₂ e/y)							-5,274
Carbon sink potential - High - All (not counting overlap) (1000 tCO ₂ e/y)							-23,528
Carbon sink potential - High - Restore productivity (1000 tCO ₂ e/y)							-191
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							3.15
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							104
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							80.8
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							3.79

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							167
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							443
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							26
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							38.2
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							866
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							4.72
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							108
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							146
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							5.71
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)							242
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							664
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							188
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							77
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,435
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							6.3
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							111
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							211
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							7.59
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)							317

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							885
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							150
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							63.2
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,752

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-1,265
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-4,981
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-309
Carbon sink potential - Moderate deployment - Cropland to woody energy crops (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Pasture to energy crops (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-6,555
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-1,265
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-9,446
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-619
Carbon sink potential - Aggressive deployment - Cropland to woody energy crops (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Pasture to energy crops (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-11,329
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							925
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							4,910
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							512
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)							63.5

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 - Pasture to energy crops (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							6,411
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							925
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							22,983
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							1,024
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)							63.5
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							24,995

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)		8.74	4.02	2.45	1.93	1.68	1.61
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		0.764	0.693	0.716	0.506	0.431	0.358
Premature deaths from air pollution - Mobile - On-Road (deaths)		2.77	2.79	2.81	2.85	2.89	2.93
Premature deaths from air pollution - Gas Stations (deaths)		0.259	0.259	0.258	0.26	0.261	0.263
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		0.478	0.437	0.402	0.381	0.371	0.362
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.049	0.043	0.031	0.019	0.01	0.004
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.162	0.162	0.165	0.167	0.165	0.16
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		1.01	1.01	1	0.992	0.979	0.965
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		0.393	0.381	0.348	0.309	0.285	0.279
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.082	0.078	0.075	0.071	0.069	0.067
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.065	0.066	0.066	0.067	0.067	0.068
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.09	0.688	0.512	0.467	0.433	0.39

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		22.5	22.6	22.4	21.3	20.5	18.1
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		77.4	35.6	21.8	17.1	14.9	14.2
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		6.77	6.14	6.34	4.48	3.82	3.17
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		24.6	24.8	25	25.3	25.7	26.1
Monetary damages from air pollution - Gas Stations (million \$2019)		2.29	2.29	2.29	2.31	2.31	2.33
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		4.24	3.87	3.57	3.38	3.28	3.21
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		0.435	0.377	0.273	0.168	0.085	0.037
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		1.44	1.43	1.46	1.48	1.46	1.42
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		8.94	8.92	8.85	8.78	8.67	8.54
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		3.48	3.37	3.08	2.74	2.53	2.47
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		0.726	0.694	0.663	0.632	0.609	0.595
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		0.578	0.583	0.587	0.593	0.597	0.603
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		9.58	6.07	4.52	4.12	3.82	3.44
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		199	201	199	189	182	161

Table 65: REF scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		819	819	819	818	818	819
By economic sector - Construction (jobs)		8,313	8,460	8,562	9,161	9,525	9,341
By economic sector - Manufacturing (jobs)		6,601	6,926	6,982	7,113	6,753	6,217
By economic sector - Mining (jobs)		11,463	9,644	8,046	6,500	5,362	4,088
By economic sector - Other (jobs)		247	262	280	368	433	493
By economic sector - Pipeline (jobs)		1,483	1,514	1,529	1,492	1,478	1,344
By economic sector - Professional (jobs)		4,644	4,604	4,559	5,000	5,304	5,396
By economic sector - Trade (jobs)		9,066	8,099	7,316	6,851	6,467	5,794
By economic sector - Utilities (jobs)		3,483	3,339	3,221	3,673	4,081	4,452
By resource sector - Biomass (jobs)		1,923	1,869	1,820	1,776	1,738	1,703
By resource sector - CO2 (jobs)		0	0.086	0.109	0.118	0.13	0.139
By resource sector - Coal (jobs)		2,142	1,347	786	580	526	279
By resource sector - Grid (jobs)		3,951	3,792	3,774	4,864	5,654	6,362
By resource sector - Natural Gas (jobs)		6,537	6,568	6,358	5,633	5,387	5,255
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		28,702	26,455	24,437	22,225	20,403	17,140

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

Item	2020	2025	2030	2035	2040	2045	2050
By resource sector - Solar (jobs)			143	218	161	160	265
By resource sector - Wind (jobs)		2,865	3,494	3,920	5,740	6,353	6,941
By education level - All sectors - High school diploma or less (jobs)		19,822	18,862	17,952	17,835	17,513	16,486
By education level - All sectors - Associates degree or some college (jobs)		12,621	12,048	11,480	11,566	11,484	10,993
By education level - All sectors - Bachelors degree (jobs)		10,870	10,129	9,426	9,158	8,851	8,221
By education level - All sectors - Masters or professional degree (jobs)		2,454	2,293	2,140	2,103	2,059	1,943
By education level - All sectors - Doctoral degree (jobs)		354	334	316	316	315	301
Related work experience - All sectors - None (jobs)		6,582	6,260	5,948	5,917	5,829	5,517
Related work experience - All sectors - Up to 1 year (jobs)		9,335	8,858	8,407	8,364	8,205	7,737
Related work experience - All sectors - 1 to 4 years (jobs)		16,972	16,017	15,110	14,935	14,631	13,764
Related work experience - All sectors - 4 to 10 years (jobs)		10,403	9,852	9,316	9,260	9,110	8,623
Related work experience - All sectors - Over 10 years (jobs)		2,829	2,680	2,531	2,503	2,446	2,304
On-the-Job Training - All sectors - None (jobs)		2,777	2,595	2,425	2,368	2,295	2,134
On-the-Job Training - All sectors - Up to 1 year (jobs)		32,029	30,234	28,527	28,142	27,482	25,781
On-the-Job Training - All sectors - 1 to 4 years (jobs)		8,519	8,136	7,753	7,796	7,742	7,402
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,370	2,293	2,217	2,283	2,322	2,268
On-the-Job Training - All sectors - Over 10 years (jobs)		426	409	391	390	381	359
On-Site or In-Plant Training - All sectors - None (jobs)		7,374	6,966	6,570	6,511	6,375	6,010
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		28,950	27,329	25,792	25,453	24,871	23,342
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		6,840	6,521	6,206	6,218	6,155	5,861
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,646	2,547	2,449	2,491	2,510	2,428
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		311	304	296	305	310	302
Wage income - All (million \$2019)		2,621	2,509	2,400	2,406	2,395	2,294

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	104	98.2	91.8	88.1	88.4	90.8	94
Final energy use - Residential (PJ)	38.3	36.6	35.5	34.8	34.5	34.4	34.4
Final energy use - Commercial (PJ)	25.2	25.4	25.5	25.4	25.2	25.4	26
Final energy use - Industry (PJ)	124	133	138	143	148	154	160

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)		0.725	0.744	0.892	0.926	0.943	0.974

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 (%)	8.16	12.8	12.9	13.2	13.6	14.2	14.8
Sales of space heating units - Electric Resistance (%)	28.5	33.8	33.6	33.4	32.8	32.4	31.9
Sales of space heating units - Gas (%)	49.6	35.1	36.3	37.2	37.7	37.8	37.6
Sales of space heating units - Fossil (%)	13.8	18.3	17.1	16.2	15.9	15.6	15.8
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	52.4	66.9	66.9	66.7	66.7	66.6	66.5
Sales of water heating units - Gas Furnace (%)	47.6	33.1	33.1	33.3	33.3	33.4	33.4
Sales of water heating units - Other (%)	0.036	0.035	0.035	0.035	0.035	0.035	0.035
Sales of cooking units - Electric Resistance (%)	80	80	80	80	80	80	80
Sales of cooking units - Gas (%)	20	20	20	20	20	20	20
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		0.501	0.505				

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 (%)	6.09	9.24	32.5	59.3	67.6	69.1	69.4
Sales of space heating units - Electric Resistance (%)	9.99	6.97	13.8	23.6	29.3	30.1	30.1
Sales of space heating units - Gas Furnace (%)	74.1	81	51.4	16	2.93	0.762	0.485
Sales of space heating units - Fossil (%)	9.8	2.76	2.28	1.06	0.17	0.016	0
Sales of water heating units - Electric Heat Pump (%)	1.62	0.827	0.827	0.829	0.828	0.824	0.82
Sales of water heating units - Electric Resistance (%)	13.6	7.16	7.17	7.13	7.14	7.14	7.13
Sales of water heating units - Gas Furnace (%)	82.1	91	91	91	91	91	91
Sales of water heating units - Other (%)	2.67	1.01	1.01	1.01	1	1.01	1.01
Sales of cooking units - Electric Resistance (%)	44.8	47.8	47.9	47.8	47.9	47.9	48
Sales of cooking units - Gas (%)	55.2	52.2	52.1	52.2	52.1	52.1	52
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		2,141	2,215				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	4,244	3,210	2,128	1,074	1,074	1,074	0
Installed thermal - Natural gas (MW)	772	772	774	774	774	772	1,679
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	0.496	0.883	1.13	1.5	2	2.58	3.26
Installed renewables - Wind - Base land use assumptions (MW)	3,377	3,377	3,377	3,377	3,377	3,377	3,377
Installed renewables - Wind - Constrained land use assumptions (MW)	1,355	1,355	1,355	1,355	1,355	1,355	1,355

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Wind - Base land use assumptions (GWh)	19,216	19,216	19,216	19,216	19,216	19,216	19,216

Table 71: REF scenario - PILLAR 2: Clean Electricity - Generation (continued)

Item	2020	2025	2030	2035	2040	2045	2050
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)	-1.19		0.158				0.045
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-0.011		-0.023				-0.025
Business-as-usual carbon sink - Total (Mt CO2e/y)	-1.2		0.135				0.021

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)							-19.3
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-137
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-159
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-10.5
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-13.8
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-1,170
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-6,693
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-400
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-64.3
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-8,666
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-28.9
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-479
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-286
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-15.4
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-27.6
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-2,256
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-10,039
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,837
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-127
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-16,097
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-38.5
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-821

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-414
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-20.6
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-41.5
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-3,342
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-13,386
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-5,274
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-23,528
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-191
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							3.15
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							104
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							80.8
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							3.79
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)							167
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							443
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							26
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							38.2
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							866
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							4.72
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							108
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							146
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							5.71
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)							242

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 - Reforest cropland (1000 hectares)							664
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							188
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							77
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,435
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							6.3
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							111
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							211
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							7.59
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)							317
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							885
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							150
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							63.2
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,752