



Net-Zero America - South Dakota data

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

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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)		4.82	0.004	0.004	0.003	0.002	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		1.4	0.785	0.44	0.361	0.225	0.101
Premature deaths from air pollution - Mobile - On-Road (deaths)		4.26	3.93	2.95	1.67	0.744	0.282
Premature deaths from air pollution - Gas Stations (deaths)		0.378	0.344	0.258	0.152	0.075	0.036
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		0.843	0.713	0.499	0.284	0.138	0.056
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.049	0.041	0.028	0.016	0.007	0.002
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.244	0.232	0.187	0.126	0.066	0.027
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.208	0.198	0.187	0.176	0.165	0.153
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		0.734	0.647	0.491	0.318	0.183	0.095
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.138	0.111	0.086	0.063	0.043	0.028
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.063	0.052	0.042	0.033	0.024	0.015
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.322	0.038	0.035	0.03	0.027	0.025
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		12.1	11.3	10.4	8.01	5.96	3.7
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		42.7	0.034	0.033	0.024	0.015	0
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		12.4	6.96	3.89	3.2	1.99	0.891
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		37.9	34.9	26.2	14.9	6.62	2.51
Monetary damages from air pollution - Gas Stations (million \$2019)		3.34	3.05	2.28	1.35	0.662	0.322
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		7.47	6.32	4.42	2.52	1.23	0.497
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		0.437	0.361	0.247	0.141	0.058	0.018
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		2.16	2.05	1.66	1.12	0.588	0.236
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		1.84	1.75	1.66	1.56	1.46	1.35
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		6.5	5.73	4.35	2.81	1.62	0.84

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)		1.22	0.981	0.758	0.555	0.385	0.244
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		0.557	0.462	0.373	0.288	0.209	0.136
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		2.84	0.339	0.305	0.262	0.236	0.222
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		107	101	92	71.1	52.9	32.8

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		1,821	1,823	1,921	1,082	268	1,389
By economic sector - Construction (jobs)		1,966	2,579	4,193	4,157	5,210	8,983
By economic sector - Manufacturing (jobs)		1,879	1,997	2,218	1,746	1,306	2,483
By economic sector - Mining (jobs)		502	400	311	228	204	175
By economic sector - Other (jobs)		140	202	292	367	483	707
By economic sector - Pipeline (jobs)		103	89.5	303	86.8	111	497
By economic sector - Professional (jobs)		1,385	1,835	2,609	3,001	3,616	6,931
By economic sector - Trade (jobs)		1,367	1,473	1,691	1,711	1,925	3,120
By economic sector - Utilities (jobs)		1,913	2,312	4,085	3,881	5,080	9,413
By resource sector - Biomass (jobs)		4,261	4,149	4,373	2,612	1,062	6,229
By resource sector - CO2 (jobs)		23.5	60.7	1,988	356	750	4,100
By resource sector - Coal (jobs)		60.9	0	0	0	0	0
By resource sector - Grid (jobs)		2,986	3,882	5,613	6,767	8,849	14,398
By resource sector - Natural Gas (jobs)		804	634	560	468	448	367
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		1,229	1,023	789	581	431	312
By resource sector - Solar (jobs)		97.6	121	178	184	260	217
By resource sector - Wind (jobs)		1,613	2,841	4,120	5,292	6,405	8,072
By education level - All sectors - High school diploma or less (jobs)		5,522	6,162	8,077	7,022	7,391	13,401
By education level - All sectors - Associates degree or some college (jobs)		2,924	3,474	5,113	4,903	5,812	10,424
By education level - All sectors - Bachelors degree (jobs)		2,046	2,378	3,305	3,235	3,759	6,893
By education level - All sectors - Masters or professional degree (jobs)		509	604	843	847	990	1,819
By education level - All sectors - Doctoral degree (jobs)		72.8	89.8	124	132	156	294
Related work experience - All sectors - None (jobs)		1,746	1,971	2,664	2,385	2,613	4,757
Related work experience - All sectors - Up to 1 year (jobs)		2,878	3,201	4,071	3,512	3,566	6,497
Related work experience - All sectors - 1 to 4 years (jobs)		3,648	4,233	5,953	5,648	6,521	11,807
Related work experience - All sectors - 4 to 10 years (jobs)		2,209	2,607	3,784	3,645	4,303	7,777
Related work experience - All sectors - Over 10 years (jobs)		594	696	990	950	1,105	1,992
On-the-Job Training - All sectors - None (jobs)		633	716	950	876	964	1,756
On-the-Job Training - All sectors - Up to 1 year (jobs)		7,890	8,921	11,871	10,791	11,755	21,453

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)		1,886	2,257	3,377	3,252	3,899	6,965
On-the-Job Training - All sectors - 4 to 10 years (jobs)		570	703	1,108	1,076	1,328	2,368
On-the-Job Training - All sectors - Over 10 years (jobs)		95	111	156	144	162	288
On-Site or In-Plant Training - All sectors - None (jobs)		1,737	2,008	2,766	2,595	2,931	5,325
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		7,099	8,036	10,737	9,768	10,680	19,451
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		1,537	1,818	2,662	2,535	2,994	5,357
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		609	739	1,139	1,096	1,335	2,395
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		92.4	109	158	146	168	303
Wage income - All (million \$2019)		554	649	923	879	1,020	1,878

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

Item	2020	2025	2030	2035	2040	2045	2050
Oil consumption - Annual (million bbls)		26	23.4	19.3	15.3	12.1	9.45
Oil consumption - Cumulative (million bbls)							589
Oil production - Annual (million bbls)		1.65	1.66	1.65	1.31	1.06	0.708
Natural gas consumption - Annual (tcf)		69.2	58.4	46.8	35.2	22.2	15.4
Natural gas consumption - Cumulative (tcf)							1,410
Natural gas production - Annual (tcf)		0.526	0.497	0.433	0.366	0.29	0.226

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	91.4	85.5	75.8	64.3	53.8	47.5	44.9
Final energy use - Residential (PJ)	41.4	39	36.9	32.9	28.4	24.9	22.5
Final energy use - Commercial (PJ)	30.2	29.7	28.5	26.9	25.1	23.7	22.9
Final energy use - Industry (PJ)	163	170	174	174	176	178	179

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)		0.836	0.87	1.6	1.72	1.54	1.62

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	2.57	107	210	574	938	1,229	1,520
Vehicle stocks - LDV – All others (1000 units)	1,267	1,207	1,146	835	524	297	68.9
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		244	624	1,015	1,535	1,673	1,594
Public EV charging plugs - DC Fast (1000 units)	0.054		0.519		2.31		3.75
Public EV charging plugs - L2 (1000 units)	0.074		12.5		55.8		90.3

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 (%)	6.73	12	35.6	81.1	89.5	90.1	89.6
Sales of space heating units - Electric Resistance (%)	18.5	23.6	18.7	8.06	6.1	6.05	6.33
Sales of space heating units - Gas (%)	59.2	43.3	30.6	5.66	1.24	0.955	0.922
Sales of space heating units - Fossil (%)	15.6	21.1	15.1	5.2	3.21	2.91	3.1
Sales of water heating units - Electric Heat Pump (%)	0	0.703	9.63	29.2	32.7	32.9	33
Sales of water heating units - Electric Resistance (%)	41.1	57.1	59.9	65.9	67	67.1	67
Sales of water heating units - Gas Furnace (%)	58.8	42.1	30.5	4.89	0.289	0	0
Sales of water heating units - Other (%)	0.032	0.033	0.033	0.033	0.033	0.033	0.033
Sales of cooking units - Electric Resistance (%)	71.5	77.5	96.2	99.8	100	100	100
Sales of cooking units - Gas (%)	28.5	22.5	3.84	0.193	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		0.653	0.813				

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	4.48	7.71	30.2	77.8	86.2	86.8	86.8
Sales of space heating units - Electric Resistance (%)	7.28	5.82	8.4	12	12.7	12.7	12.7
Sales of space heating units - Gas Furnace (%)	82.1	84.3	61	10.1	1.04	0.469	0.47
Sales of space heating units - Fossil (%)	6.1	2.18	0.424	0.018	0	0	0
Sales of water heating units - Electric Heat Pump (%)	1.15	1.83	14.5	42	46.9	47.2	47.2
Sales of water heating units - Electric Resistance (%)	9.7	8.05	20.3	47	51.8	52.1	52.1
Sales of water heating units - Gas Furnace (%)	87.4	89.2	64.4	10.3	0.61	0	0
Sales of water heating units - Other (%)	1.76	0.95	0.735	0.688	0.684	0.687	0.687
Sales of cooking units - Electric Resistance (%)	44.8	57.1	84	89.3	89.6	89.6	89.6
Sales of cooking units - Gas (%)	55.2	42.9	16	10.7	10.4	10.4	10.4
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		2,507	2,731				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	450	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	1,092	853	968	1,213	1,239	1,606	1,584
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	1.38	2.45	3.13	4.18	5.55	7.15	9.05
Installed renewables - Solar - Base land use assumptions (MW)	0	0	0	0	0	96.1	96.1
Installed renewables - Wind - Base land use assumptions (MW)	1,296	2,960	6,343	9,786	12,198	18,195	30,167
Installed renewables - Solar - Constrained land use assumptions (MW)	0	0	0	0	0	76.9	76.9
Installed renewables - Wind - Constrained land use assumptions (MW)	2,594	3,489	5,770	13,384	27,469	52,840	93,514
Capital invested - Solar PV - Base (billion \$2018)		0	0	0	0	0.094	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Wind - Base (billion \$2018)		0.537	4.5	4.27	2.85	6.72	12.7
Capital invested - Wind - Constrained (billion \$2018)		1.93	4.75	8.88	18.1	29.2	41.3
Capital invested - Biomass power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	0.023	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	0	0	0	0	0	185	185
Wind - Base land use assumptions (GWh)	10,866	12,231	24,637	37,043	45,634	66,984	108,855
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	0	0	0	0	0	146	146
Wind - Constrained land use assumptions (GWh)	10,866	14,150	22,381	49,476	97,419	181,317	312,996
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	26	26	26	26	26
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu (quantity)	0	0	1	1	1	1	1
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Beccs hydrogen (quantity)	0	0	0	2	2	3	12
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	0	0	10
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	21.3	1,107	0	283	24,538
Biomass purchases (million \$2018/y)		0	1.37	78.9	78.9	98.7	1,354

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0.03	1.45	1.45	1.81	20.4
Annual - BECCS (MMT)		0	0.03	1.45	1.45	1.81	20.4
Annual - NGCC (MMT)		0	0	0	0	0	0
Annual - Cement and lime (MMT)		0	0	0	0	0	0
Cumulative - All (MMT)		0	0.03	1.48	2.93	4.74	25.1
Cumulative - BECCS (MMT)		0	0.03	1.48	2.93	4.74	25.1
Cumulative - NGCC (MMT)		0	0	0	0	0	0
Cumulative - Cement and lime (MMT)		0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	0	335	335	335	335
Spur (km)		0	160	302	302	516	3,140
All (km)		0	160	637	637	851	3,475
Cumulative investment - Trunk (million \$2018)		0	0	1,662	1,662	1,662	1,662
Cumulative investment - Spur (million \$2018)		0	82.3	191	191	309	2,299
Cumulative investment - All (million \$2018)		0	82.3	1,853	1,853	1,971	3,961

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual (MMT)		0	1.1	1.76	3.61	6.02	8.39
Injection wells (wells)		0	1	5	9	14	18
Resource characterization, appraisal, permitting costs (million \$2020)		44.3	133	177	177	177	177
Wells and facilities construction costs (million \$2020)		0	36.9	144	256	428	531

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)							-190
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-129
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-115
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-21.1
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-148
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-845
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-2,286
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-360
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-222
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-4,315
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-284
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-450
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-208
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-30.9
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-296
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,630
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-3,429

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,553
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-440
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-9,320
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-378
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-771
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-301
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-41.4
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-444
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-2,415
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-4,571
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-4,746
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-14,326
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-658
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							31
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							98
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							58.7
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							7.63
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)							121
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							151
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							23.4
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							132
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							622
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							46.4
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							101

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							106
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							11.5
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)							175
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							227
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							169
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							266
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,102
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							61.9
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							104
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							153
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							15.3
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)							229
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							302
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							135
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							218
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,219

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)							-1,155
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO ₂ e/y)							-3,896

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-215
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-5,266
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-1,155
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-7,394
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-431
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-8,980
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							699
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							3,484
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							358
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							4,540
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							699
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							6,610
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							716
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							8,024

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)		4.82	0.004	0.004	0.003	0.002	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		1.4	0.705	0.353	0.196	0.091	0.064
Premature deaths from air pollution - Mobile - On-Road (deaths)		4.32	4.3	4.14	3.68	2.9	1.96
Premature deaths from air pollution - Gas Stations (deaths)		0.385	0.382	0.365	0.323	0.255	0.175
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		0.848	0.772	0.692	0.591	0.467	0.338
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.05	0.049	0.047	0.043	0.036	0.028
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.246	0.248	0.25	0.237	0.201	0.156

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.208	0.198	0.187	0.176	0.165	0.153
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		0.737	0.708	0.669	0.599	0.501	0.394
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.138	0.12	0.103	0.087	0.072	0.059
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.063	0.056	0.049	0.043	0.037	0.031
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.304	0.039	0.037	0.034	0.027	0.017
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		12.1	11	9.65	8.5	7.54	5.2
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		42.7	0.034	0.033	0.024	0.015	0
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		12.4	6.24	3.13	1.74	0.805	0.566
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		38.4	38.2	36.8	32.7	25.7	17.4
Monetary damages from air pollution - Gas Stations (million \$2019)		3.41	3.39	3.23	2.86	2.26	1.55
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		7.51	6.85	6.13	5.24	4.14	2.99
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		0.445	0.433	0.417	0.379	0.315	0.248
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		2.18	2.2	2.21	2.1	1.78	1.38
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		1.84	1.75	1.66	1.56	1.46	1.35
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		6.52	6.27	5.92	5.3	4.44	3.49
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		1.22	1.06	0.913	0.77	0.641	0.526
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		0.557	0.496	0.438	0.381	0.327	0.277
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		2.68	0.345	0.328	0.3	0.239	0.149
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		107	97.5	85.7	75.5	67	46.2

Table 18: E- scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		1,821	1,829	2,061	1,188	318	1,388
By economic sector - Construction (jobs)		1,960	2,603	4,573	4,164	6,016	11,335

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Manufacturing (jobs)		1,890	2,026	2,219	1,833	1,634	2,868
By economic sector - Mining (jobs)		505	427	390	332	326	277
By economic sector - Other (jobs)		140	205	280	360	539	833
By economic sector - Pipeline (jobs)		103	88.4	470	118	177	846
By economic sector - Professional (jobs)		1,389	1,877	2,728	3,195	4,144	7,869
By economic sector - Trade (jobs)		1,370	1,501	1,735	1,802	2,215	3,668
By economic sector - Utilities (jobs)		1,873	2,279	4,411	3,789	5,892	11,903
By resource sector - Biomass (jobs)		4,261	4,164	4,916	3,217	1,352	6,028
By resource sector - CO2 (jobs)		23.9	85.4	3,411	624	1,285	7,013
By resource sector - Coal (jobs)		60.9	0	0	0	0	0
By resource sector - Grid (jobs)		2,894	3,829	5,023	6,366	10,036	16,730
By resource sector - Natural Gas (jobs)		804	594	465	474	487	420
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		1,240	1,081	942	799	653	480
By resource sector - Solar (jobs)		103	128	141	156	298	224
By resource sector - Wind (jobs)		1,663	2,954	3,968	5,146	7,149	10,092
By education level - All sectors - High school diploma or less (jobs)		5,510	6,205	8,567	7,214	8,650	16,443
By education level - All sectors - Associates degree or some college (jobs)		2,914	3,505	5,479	5,000	6,775	12,870
By education level - All sectors - Bachelors degree (jobs)		2,044	2,412	3,528	3,376	4,395	8,299
By education level - All sectors - Masters or professional degree (jobs)		508	613	895	884	1,151	2,168
By education level - All sectors - Doctoral degree (jobs)		73	91.6	132	141	180	341
Related work experience - All sectors - None (jobs)		1,741	1,986	2,840	2,453	3,054	5,838
Related work experience - All sectors - Up to 1 year (jobs)		2,874	3,225	4,286	3,623	4,165	7,874
Related work experience - All sectors - 1 to 4 years (jobs)		3,638	4,277	6,358	5,818	7,618	14,429
Related work experience - All sectors - 4 to 10 years (jobs)		2,203	2,635	4,060	3,746	5,022	9,544
Related work experience - All sectors - Over 10 years (jobs)		593	704	1,056	977	1,292	2,436
On-the-Job Training - All sectors - None (jobs)		632	724	1,009	911	1,127	2,123
On-the-Job Training - All sectors - Up to 1 year (jobs)		7,876	9,005	12,588	11,157	13,748	26,041
On-the-Job Training - All sectors - 1 to 4 years (jobs)		1,879	2,278	3,632	3,311	4,545	8,636
On-the-Job Training - All sectors - 4 to 10 years (jobs)		567	708	1,204	1,089	1,542	2,963
On-the-Job Training - All sectors - Over 10 years (jobs)		95	112	167	148	190	357
On-Site or In-Plant Training - All sectors - None (jobs)		1,735	2,029	2,948	2,681	3,421	6,479
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		7,085	8,110	11,391	10,087	12,489	23,651
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		1,532	1,834	2,855	2,585	3,492	6,627
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		606	745	1,238	1,115	1,553	2,988
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		92	109	169	148	195	376
Wage income - All (million \$2019)		552	656	986	905	1,192	2,296

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	91.5	86	78.8	73.1	68.9	64	58.1
Final energy use - Residential (PJ)	41.4	39.1	37.4	35.9	34.3	32.5	30.6
Final energy use - Commercial (PJ)	30.2	29.7	28.9	28.2	27.4	26.7	26
Final energy use - Industry (PJ)	163	171	174	176	179	181	183

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)		0.676	0.691	0.924	0.965	1.37	1.46

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	1.99	32.6	63.1	205	346	660	973
Vehicle stocks - LDV – All others (1000 units)	1,272	1,272	1,272	1,207	1,141	880	618
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		0	39.1	83.1	280	883	1,285
Public EV charging plugs - DC Fast (1000 units)	0.054		0.156		0.855		2.4
Public EV charging plugs - L2 (1000 units)	0.074		3.75		20.6		57.9

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 (%)	6.73	10.2	11.7	16.8	28.5	42.8	50.8
Sales of space heating units - Electric Resistance (%)	18.5	23.9	23.5	22.4	19.7	16.4	14.8
Sales of space heating units - Gas (%)	59.2	44.2	43.2	40.6	34.7	27.1	22.3
Sales of space heating units - Fossil (%)	15.6	21.7	21.5	20.2	17.1	13.7	12.1
Sales of water heating units - Electric Heat Pump (%)	0	0.211	0.789	2.72	7.4	13.3	16.8
Sales of water heating units - Electric Resistance (%)	41.1	57	57.1	57.5	59	60.8	61.9
Sales of water heating units - Gas Furnace (%)	58.8	42.8	42.1	39.7	33.6	25.8	21.3
Sales of water heating units - Other (%)	0.032	0.033	0.033	0.033	0.033	0.033	0.033
Sales of cooking units - Electric Resistance (%)	71.4	72.1	74.7	81.6	91.2	97.2	99.2
Sales of cooking units - Gas (%)	28.6	27.9	25.3	18.4	8.76	2.83	0.76
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		0.651	0.8				

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	4.48	6.34	7.8	12.5	23.6	37.7	45.9
Sales of space heating units - Electric Resistance (%)	7.28	5.52	5.66	6.19	7.32	8.52	9.17
Sales of space heating units - Gas Furnace (%)	82.1	85.6	84	79.1	67.3	52.4	43.6
Sales of space heating units - Fossil (%)	6.1	2.55	2.51	2.23	1.76	1.38	1.26
Sales of water heating units - Electric Heat Pump (%)	1.15	1.12	1.94	4.67	11.3	19.6	24.5
Sales of water heating units - Electric Resistance (%)	9.7	7.35	8.16	10.8	17.2	25.3	30

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Gas Furnace (%)	87.4	90.5	88.9	83.6	70.7	54.3	44.7
Sales of water heating units - Other (%)	1.76	0.994	0.977	0.938	0.876	0.841	0.828
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)		2,507	2,735				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	450	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	1,092	853	953	944	1,224	1,551	1,568
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)							-190
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-129
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-115
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-21.1
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-148
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-845
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-2,286
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-360
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-222
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-4,315
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-284
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-450
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-208
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-30.9
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-296
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,630
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-3,429
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,553
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-440
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-9,320

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-378
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-771
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-301
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-41.4
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-444
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-2,415
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-4,571
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-4,746
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-14,326
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-658
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							31
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							98
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							58.7
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							7.63
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)							121
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							151
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							23.4
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							132
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							622
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							46.4
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							101
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							106
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							11.5

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 - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							175
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							227
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							169
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							266
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,102
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							61.9
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							104
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							153
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							15.3
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)							229
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							302
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							135
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							218
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,219

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-1,155
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-3,896
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-215
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-5,266

Table 26: 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)							-1,155
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-7,394
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-431
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-8,980
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							699
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							3,484
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							358
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							4,540
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							699
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							6,610
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							716
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							8,024

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)		4.82	0.004	0.004	0.003	0.002	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		1.29	0.701	0.268	0.194	0.098	0.056
Premature deaths from air pollution - Mobile - On-Road (deaths)		4.26	3.93	2.95	1.67	0.744	0.282
Premature deaths from air pollution - Gas Stations (deaths)		0.378	0.344	0.258	0.152	0.075	0.036
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		0.843	0.713	0.499	0.284	0.138	0.056
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.049	0.041	0.028	0.016	0.007	0.002
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.244	0.232	0.187	0.126	0.066	0.027
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.208	0.198	0.187	0.176	0.165	0.153
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		0.734	0.647	0.491	0.318	0.183	0.095

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.138	0.111	0.086	0.063	0.043	0.028
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.063	0.052	0.042	0.033	0.024	0.015
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.37	0.038	0.034	0.029	0.026	0.007
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		11.9	11.2	9.75	6.98	4.32	0.689
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		42.7	0.034	0.033	0.024	0.015	0
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		11.4	6.21	2.38	1.72	0.867	0.496
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		37.9	34.9	26.2	14.9	6.62	2.51
Monetary damages from air pollution - Gas Stations (million \$2019)		3.34	3.05	2.28	1.35	0.662	0.322
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		7.47	6.32	4.42	2.52	1.23	0.497
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		0.437	0.361	0.247	0.141	0.058	0.018
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		2.16	2.05	1.66	1.12	0.588	0.236
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		1.84	1.75	1.66	1.56	1.46	1.35
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		6.5	5.73	4.35	2.81	1.62	0.84
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		1.22	0.981	0.758	0.555	0.385	0.244
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		0.557	0.462	0.373	0.288	0.209	0.136
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		3.26	0.339	0.302	0.258	0.232	0.06
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		106	99.5	86.5	62	38.4	6.12

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		1,821	1,821	1,907	1,071	250	1,394
By economic sector - Construction (jobs)		1,971	2,783	4,366	6,102	8,283	14,674
By economic sector - Manufacturing (jobs)		1,901	2,109	2,482	2,281	2,313	4,158
By economic sector - Mining (jobs)		484	357	237	146	79	5.88
By economic sector - Other (jobs)		142	220	429	616	821	1,449
By economic sector - Pipeline (jobs)		101	86.5	64.8	45.5	28.6	7.33
By economic sector - Professional (jobs)		1,408	1,969	3,159	4,317	5,862	11,616

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Trade (jobs)		1,375	1,533	1,982	2,400	3,102	5,646
By economic sector - Utilities (jobs)		1,837	2,506	3,733	5,622	8,213	15,812
By resource sector - Biomass (jobs)		4,261	4,144	4,310	2,612	1,003	6,434
By resource sector - CO2 (jobs)		0	0	0	0	0.001	0
By resource sector - Coal (jobs)		60.9	0	0	0	0	0
By resource sector - Grid (jobs)		2,823	4,224	6,683	10,377	15,641	30,926
By resource sector - Natural Gas (jobs)		779	650	462	456	350	315
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		1,230	1,015	771	539	334	5.77
By resource sector - Solar (jobs)		112	181	823	892	694	814
By resource sector - Wind (jobs)		1,773	3,172	5,311	7,727	10,929	16,270
By education level - All sectors - High school diploma or less (jobs)		5,504	6,441	8,324	9,610	11,738	21,862
By education level - All sectors - Associates degree or some college (jobs)		2,911	3,698	5,295	6,967	9,308	17,198
By education level - All sectors - Bachelors degree (jobs)		2,043	2,514	3,531	4,538	5,993	11,334
By education level - All sectors - Masters or professional degree (jobs)		508	639	916	1,191	1,582	3,019
By education level - All sectors - Doctoral degree (jobs)		73.4	95.1	142	187	248	483
Related work experience - All sectors - None (jobs)		1,739	2,068	2,743	3,296	4,150	7,754
Related work experience - All sectors - Up to 1 year (jobs)		2,874	3,336	4,262	4,770	5,676	10,638
Related work experience - All sectors - 1 to 4 years (jobs)		3,633	4,475	6,225	7,935	10,407	19,444
Related work experience - All sectors - 4 to 10 years (jobs)		2,200	2,769	3,940	5,155	6,867	12,767
Related work experience - All sectors - Over 10 years (jobs)		592	738	1,038	1,338	1,769	3,292
On-the-Job Training - All sectors - None (jobs)		632	752	1,008	1,217	1,533	2,878
On-the-Job Training - All sectors - Up to 1 year (jobs)		7,869	9,360	12,444	14,904	18,740	35,225
On-the-Job Training - All sectors - 1 to 4 years (jobs)		1,876	2,405	3,473	4,628	6,228	11,464
On-the-Job Training - All sectors - 4 to 10 years (jobs)		566	752	1,120	1,544	2,110	3,863
On-the-Job Training - All sectors - Over 10 years (jobs)		95.2	118	163	202	258	465
On-Site or In-Plant Training - All sectors - None (jobs)		1,735	2,119	2,917	3,632	4,678	8,728
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		7,077	8,434	11,234	13,505	17,026	31,960
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		1,529	1,931	2,744	3,592	4,782	8,823
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		605	787	1,153	1,562	2,116	3,889
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		91.9	115	160	204	267	495
Wage income - All (million \$2019)		551	685	957	1,227	1,623	3,086

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	91.4	85.5	75.8	64.3	53.8	47.5	44.9
Final energy use - Residential (PJ)	41.4	39	36.9	32.9	28.4	24.9	22.5
Final energy use - Commercial (PJ)	30.2	29.7	28.5	26.9	25.1	23.7	22.9
Final energy use - Industry (PJ)	163	170	174	174	176	178	179

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)		0.836	0.87	1.6	1.72	1.54	1.62

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	2.57	107	210	574	938	1,229	1,520
Vehicle stocks - LDV – All others (1000 units)	1,267	1,207	1,146	835	524	297	68.9
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		244	624	1,015	1,535	1,673	1,594
Public EV charging plugs - DC Fast (1000 units)	0.054		0.519		2.31		3.75
Public EV charging plugs - L2 (1000 units)	0.074		12.5		55.8		90.3

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 (%)	6.73	12	35.6	81.1	89.5	90.1	89.6
Sales of space heating units - Electric Resistance (%)	18.5	23.6	18.7	8.06	6.1	6.05	6.33
Sales of space heating units - Gas (%)	59.2	43.3	30.6	5.66	1.24	0.955	0.922
Sales of space heating units - Fossil (%)	15.6	21.1	15.1	5.2	3.21	2.91	3.1
Sales of water heating units - Electric Heat Pump (%)	0	0.703	9.63	29.2	32.7	32.9	33
Sales of water heating units - Electric Resistance (%)	41.1	57.1	59.9	65.9	67	67.1	67
Sales of water heating units - Gas Furnace (%)	58.8	42.1	30.5	4.89	0.289	0	0
Sales of water heating units - Other (%)	0.032	0.033	0.033	0.033	0.033	0.033	0.033
Sales of cooking units - Electric Resistance (%)	71.5	77.5	96.2	99.8	100	100	100
Sales of cooking units - Gas (%)	28.5	22.5	3.84	0.193	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		0.653	0.813				

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	4.48	7.71	30.2	77.8	86.2	86.8	86.8
Sales of space heating units - Electric Resistance (%)	7.28	5.82	8.4	12	12.7	12.7	12.7
Sales of space heating units - Gas Furnace (%)	82.1	84.3	61	10.1	1.04	0.469	0.47
Sales of space heating units - Fossil (%)	6.1	2.18	0.424	0.018	0	0	0
Sales of water heating units - Electric Heat Pump (%)	1.15	1.83	14.5	42	46.9	47.2	47.2
Sales of water heating units - Electric Resistance (%)	9.7	8.05	20.3	47	51.8	52.1	52.1
Sales of water heating units - Gas Furnace (%)	87.4	89.2	64.4	10.3	0.61	0	0
Sales of water heating units - Other (%)	1.76	0.95	0.735	0.688	0.684	0.687	0.687
Sales of cooking units - Electric Resistance (%)	44.8	57.1	84	89.3	89.6	89.6	89.6
Sales of cooking units - Gas (%)	55.2	42.9	16	10.7	10.4	10.4	10.4
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		2,507	2,731				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	450	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	1,092	853	1,207	1,198	1,674	1,591	1,568
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	1.38	2.45	3.13	4.18	5.55	7.15	9.05
Installed renewables - Solar - Base land use assumptions (MW)	0	0	0	471	845	845	1,066
Installed renewables - Wind - Base land use assumptions (MW)	2,594	3,333	7,095	10,464	17,508	38,712	94,427
Installed renewables - Solar - Constrained land use assumptions (MW)	0	0	0	394	1,298	1,298	2,269
Installed renewables - Wind - Constrained land use assumptions (MW)	2,722	3,759	7,347	16,548	49,523	99,115	119,510
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion \$2018)		0	0	0.519	0.39	0	0.205
Capital invested - Wind - Base (billion \$2018)		1.96	9.01	7.52	15	42.8	106

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	891	1,599	1,599	2,016
Wind - Base land use assumptions (GWh)	10,866	13,612	27,384	39,464	64,553	137,999	326,260
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	0	0	0	1,490	4,906	4,906	8,536
Wind - Constrained land use assumptions (GWh)	21,733	29,339	55,232	119,596	340,197	659,621	788,137
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)							-190
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-129
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-115
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-21.1
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-148
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-845
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-2,286
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-360
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-222
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-4,315

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO ₂ e/y)							-284
Carbon sink potential - Mid - Avoid deforestation (1000 tCO ₂ e/y)							-450
Carbon sink potential - Mid - Extend rotation length (1000 tCO ₂ e/y)							-208
Carbon sink potential - Mid - Improve plantations (1000 tCO ₂ e/y)							-30.9
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO ₂ e/y)							-296
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO ₂ e/y)							-1,630
Carbon sink potential - Mid - Reforest cropland (1000 tCO ₂ e/y)							-3,429
Carbon sink potential - Mid - Reforest pasture (1000 tCO ₂ e/y)							-2,553
Carbon sink potential - Mid - Restore productivity (1000 tCO ₂ e/y)							-440
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO ₂ e/y)							-9,320
Carbon sink potential - High - Accelerate regeneration (1000 tCO ₂ e/y)							-378
Carbon sink potential - High - Avoid deforestation (1000 tCO ₂ e/y)							-771
Carbon sink potential - High - Extend rotation length (1000 tCO ₂ e/y)							-301
Carbon sink potential - High - Improve plantations (1000 tCO ₂ e/y)							-41.4
Carbon sink potential - High - Increase retention of HWP (1000 tCO ₂ e/y)							-444
Carbon sink potential - High - Increase trees outside forests (1000 tCO ₂ e/y)							-2,415
Carbon sink potential - High - Reforest cropland (1000 tCO ₂ e/y)							-4,571
Carbon sink potential - High - Reforest pasture (1000 tCO ₂ e/y)							-4,746
Carbon sink potential - High - All (not counting overlap) (1000 tCO ₂ e/y)							-14,326
Carbon sink potential - High - Restore productivity (1000 tCO ₂ e/y)							-658
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							31
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							98
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							58.7
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							7.63
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)							121
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							151

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							23.4
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							132
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							622
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							46.4
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							101
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							106
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							11.5
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)							175
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							227
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							169
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							266
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,102
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							61.9
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							104
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							153
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							15.3
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)							229
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							302
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							135
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							218

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 - High - Total impacted (over 30 years) (1000 hectares)							1,219

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-1,155
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-3,896
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-215
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-5,266
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-1,155
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-7,394
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-431
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-8,980
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							699
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							3,484
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							358
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							4,540
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							699
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							6,610
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							716
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							8,024

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)		4.82	0.004	0.004	0.003	0.002	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		1.42	0.77	0.791	0.683	0.305	0.114
Premature deaths from air pollution - Mobile - On-Road (deaths)		4.26	3.93	2.95	1.67	0.744	0.282
Premature deaths from air pollution - Gas Stations (deaths)		0.378	0.344	0.258	0.152	0.075	0.036
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		0.843	0.713	0.499	0.284	0.138	0.056
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.049	0.041	0.028	0.016	0.007	0.002
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.244	0.232	0.187	0.126	0.066	0.027
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.208	0.198	0.187	0.176	0.165	0.153
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		0.734	0.647	0.491	0.318	0.183	0.095
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.138	0.111	0.086	0.063	0.043	0.028
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.063	0.052	0.042	0.033	0.024	0.015
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.275	0.038	0.034	0.029	0.027	0.007
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		12.2	11.8	11.4	9.48	7.82	5.74
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		42.7	0.034	0.033	0.024	0.015	0
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		12.6	6.82	7.01	6.05	2.7	1.01
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		37.9	34.9	26.2	14.9	6.62	2.51
Monetary damages from air pollution - Gas Stations (million \$2019)		3.34	3.05	2.28	1.35	0.662	0.322
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		7.47	6.32	4.42	2.52	1.23	0.497
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		0.437	0.361	0.247	0.141	0.058	0.018
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		2.16	2.05	1.66	1.12	0.588	0.236
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		1.84	1.75	1.66	1.56	1.46	1.35
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		6.5	5.73	4.35	2.81	1.62	0.84
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		1.22	0.981	0.758	0.555	0.385	0.244

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		0.557	0.462	0.373	0.288	0.209	0.136
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		2.43	0.335	0.304	0.26	0.236	0.059
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		108	104	101	84.2	69.4	50.9

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		1,821	1,829	2,066	1,141	284	1,384
By economic sector - Construction (jobs)		1,801	2,052	4,058	2,879	3,232	6,944
By economic sector - Manufacturing (jobs)		1,795	1,764	1,892	1,376	844	1,654
By economic sector - Mining (jobs)		506	433	387	308	309	282
By economic sector - Other (jobs)		127	154	205	221	249	335
By economic sector - Pipeline (jobs)		105	93.6	530	131	195	954
By economic sector - Professional (jobs)		1,289	1,469	2,119	2,009	1,994	4,349
By economic sector - Trade (jobs)		1,322	1,300	1,417	1,194	1,073	1,740
By economic sector - Utilities (jobs)		1,716	1,918	4,375	2,954	3,280	7,532
By resource sector - Biomass (jobs)		4,261	4,164	4,965	2,930	1,157	6,051
By resource sector - CO2 (jobs)		24.2	105	3,863	698	1,442	7,919
By resource sector - Coal (jobs)		60.9	0	0	0	0	0
By resource sector - Grid (jobs)		2,572	3,108	4,599	4,743	4,827	7,253
By resource sector - Natural Gas (jobs)		829	707	648	650	574	553
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		1,229	1,023	789	581	440	352
By resource sector - Solar (jobs)		79.9	70.5	61.2	60.5	117	68.3
By resource sector - Wind (jobs)		1,425	1,836	2,122	2,552	2,902	2,978
By education level - All sectors - High school diploma or less (jobs)		5,275	5,471	7,882	5,423	4,724	10,138
By education level - All sectors - Associates degree or some college (jobs)		2,730	2,923	4,924	3,572	3,628	7,771
By education level - All sectors - Bachelors degree (jobs)		1,928	2,025	3,093	2,367	2,320	4,939
By education level - All sectors - Masters or professional degree (jobs)		479	512	775	613	599	1,268
By education level - All sectors - Doctoral degree (jobs)		68.6	74.6	108	92.8	91	196
Related work experience - All sectors - None (jobs)		1,660	1,730	2,599	1,815	1,658	3,587
Related work experience - All sectors - Up to 1 year (jobs)		2,761	2,860	3,914	2,719	2,251	4,799
Related work experience - All sectors - 1 to 4 years (jobs)		3,434	3,623	5,700	4,174	4,077	8,698
Related work experience - All sectors - 4 to 10 years (jobs)		2,068	2,202	3,628	2,662	2,686	5,767
Related work experience - All sectors - Over 10 years (jobs)		557	591	941	697	690	1,461
On-the-Job Training - All sectors - None (jobs)		602	625	902	656	601	1,278
On-the-Job Training - All sectors - Up to 1 year (jobs)		7,504	7,814	11,367	8,165	7,380	15,758
On-the-Job Training - All sectors - 1 to 4 years (jobs)		1,757	1,891	3,271	2,365	2,445	5,237
On-the-Job Training - All sectors - 4 to 10 years (jobs)		528	581	1,093	775	834	1,820

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

Item	2020	2025	2030	2035	2040	2045	2050
On-the-Job Training - All sectors - Over 10 years (jobs)		89.6	94.5	149	106	102	219
On-Site or In-Plant Training - All sectors - None (jobs)		1,643	1,726	2,627	1,918	1,823	3,904
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		6,747	7,034	10,300	7,388	6,712	14,318
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		1,437	1,536	2,577	1,857	1,880	4,018
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		567	617	1,124	797	842	1,842
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		86.9	93.1	155	108	106	231
Wage income - All (million \$2019)		522	560	890	657	642	1,391

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	91.4	85.5	75.8	64.3	53.8	47.5	44.9
Final energy use - Residential (PJ)	41.4	39	36.9	32.9	28.4	24.9	22.5
Final energy use - Commercial (PJ)	30.2	29.7	28.5	26.9	25.1	23.7	22.9
Final energy use - Industry (PJ)	163	170	174	174	176	178	179

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)		0.836	0.87	1.6	1.72	1.54	1.62

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	2.57	107	210	574	938	1,229	1,520
Vehicle stocks - LDV – All others (1000 units)	1,267	1,207	1,146	835	524	297	68.9
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		244	624	1,015	1,535	1,673	1,594
Public EV charging plugs - DC Fast (1000 units)	0.054		0.519		2.31		3.75
Public EV charging plugs - L2 (1000 units)	0.074		12.5		55.8		90.3

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 (%)	6.73	12	35.6	81.1	89.5	90.1	89.6
Sales of space heating units - Electric Resistance (%)	18.5	23.6	18.7	8.06	6.1	6.05	6.33
Sales of space heating units - Gas (%)	59.2	43.3	30.6	5.66	1.24	0.955	0.922
Sales of space heating units - Fossil (%)	15.6	21.1	15.1	5.2	3.21	2.91	3.1
Sales of water heating units - Electric Heat Pump (%)	0	0.703	9.63	29.2	32.7	32.9	33
Sales of water heating units - Electric Resistance (%)	41.1	57.1	59.9	65.9	67	67.1	67
Sales of water heating units - Gas Furnace (%)	58.8	42.1	30.5	4.89	0.289	0	0
Sales of water heating units - Other (%)	0.032	0.033	0.033	0.033	0.033	0.033	0.033
Sales of cooking units - Electric Resistance (%)	71.5	77.5	96.2	99.8	100	100	100
Sales of cooking units - Gas (%)	28.5	22.5	3.84	0.193	0	0	0

Table 43: E+RE- scenario - PILLAR 1: Efficiency/Electrification - Residential (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		0.653	0.813				

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	4.48	7.71	30.2	77.8	86.2	86.8	86.8
Sales of space heating units - Electric Resistance (%)	7.28	5.82	8.4	12	12.7	12.7	12.7
Sales of space heating units - Gas Furnace (%)	82.1	84.3	61	10.1	1.04	0.469	0.47
Sales of space heating units - Fossil (%)	6.1	2.18	0.424	0.018	0	0	0
Sales of water heating units - Electric Heat Pump (%)	1.15	1.83	14.5	42	46.9	47.2	47.2
Sales of water heating units - Electric Resistance (%)	9.7	8.05	20.3	47	51.8	52.1	52.1
Sales of water heating units - Gas Furnace (%)	87.4	89.2	64.4	10.3	0.61	0	0
Sales of water heating units - Other (%)	1.76	0.95	0.735	0.688	0.684	0.687	0.687
Sales of cooking units - Electric Resistance (%)	44.8	57.1	84	89.3	89.6	89.6	89.6
Sales of cooking units - Gas (%)	55.2	42.9	16	10.7	10.4	10.4	10.4
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		2,507	2,731				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	450	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	1,092	853	1,098	1,107	1,287	1,287	1,531
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	1.38	2.45	3.13	4.18	5.55	7.15	9.05
Installed renewables - Solar - Base land use assumptions (MW)	0	0	0	0	0	76.9	76.9
Installed renewables - Wind - Base land use assumptions (MW)	2,594	2,594	3,613	6,703	8,623	10,505	10,578
Installed renewables - Solar - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - Wind - Constrained land use assumptions (MW)	2,594	2,985	3,745	6,173	10,407	15,879	16,106
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion \$2018)		0	0	0	0	0.075	0
Capital invested - Wind - Base (billion \$2018)		0	1.36	3.83	2.22	1.94	0.034
Capital invested - Wind - Constrained (billion \$2018)		0.574	1.01	3.01	5	6.14	0.24

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	146	146
Wind - Base land use assumptions (GWh)	10,866	10,866	14,642	25,959	32,751	38,916	39,030
Offshore Wind - 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

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

Item	2020	2025	2030	2035	2040	2045	2050
Wind - Constrained land use assumptions (GWh)	10,866	12,309	15,073	23,841	39,056	57,935	58,698
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)							-190
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-129
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-115
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-21.1
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-148
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-845
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-2,286
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-360
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-222
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-4,315
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-284
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-450
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-208
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-30.9
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-296
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,630
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-3,429
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,553
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-440
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-9,320
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-378
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-771
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-301
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-41.4
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-444
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-2,415

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-4,571
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-4,746
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-14,326
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-658
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							31
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							98
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							58.7
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							7.63
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)							121
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							151
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							23.4
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							132
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							622
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							46.4
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							101
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							106
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							11.5
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)							175
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							227
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							169
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							266

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 - Mid - Total impacted (over 30 years) (1000 hectares)							1,102
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							61.9
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							104
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							153
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							15.3
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)							229
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							302
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							135
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							218
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,219

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-1,155
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-3,896
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-215
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-5,266
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-1,155
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-7,394
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-431
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-8,980
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							699

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							3,484
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							358
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							4,540
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							699
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							6,610
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							716
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							8,024

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)		4.82	0.004	0.004	0.003	0.002	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		1.35	0.642	0.401	0.286	0.148	0.066
Premature deaths from air pollution - Mobile - On-Road (deaths)		4.32	4.3	4.14	3.68	2.9	1.96
Premature deaths from air pollution - Gas Stations (deaths)		0.385	0.382	0.365	0.323	0.255	0.175
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		0.848	0.772	0.692	0.591	0.467	0.338
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.05	0.049	0.047	0.043	0.036	0.028
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.246	0.248	0.25	0.237	0.201	0.156
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.208	0.198	0.187	0.176	0.165	0.153
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		0.737	0.708	0.669	0.599	0.501	0.394
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.138	0.12	0.103	0.087	0.072	0.059
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.063	0.056	0.049	0.043	0.037	0.031
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.32	0.039	0.037	0.034	0.031	0.028
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		12.1	11	9.65	8.5	7.54	5.2

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		42.7	0.034	0.033	0.024	0.015	0
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		12	5.69	3.56	2.53	1.31	0.584
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		38.4	38.2	36.8	32.7	25.7	17.4
Monetary damages from air pollution - Gas Stations (million \$2019)		3.41	3.39	3.23	2.86	2.26	1.55
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		7.51	6.85	6.13	5.24	4.14	2.99
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		0.445	0.433	0.417	0.379	0.315	0.248
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		2.18	2.2	2.21	2.1	1.78	1.38
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		1.84	1.75	1.66	1.56	1.46	1.35
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		6.52	6.27	5.92	5.3	4.44	3.49
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		1.22	1.06	0.913	0.77	0.641	0.526
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		0.557	0.496	0.438	0.381	0.327	0.277
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		2.82	0.344	0.328	0.303	0.274	0.244
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		107	97.5	85.7	75.5	67	46.2

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		1,821	1,825	2,025	1,209	1,401	1,652
By economic sector - Construction (jobs)		1,975	2,644	4,495	3,580	5,738	10,055
By economic sector - Manufacturing (jobs)		1,896	2,034	2,135	1,599	2,182	2,872
By economic sector - Mining (jobs)		504	425	392	348	337	263
By economic sector - Other (jobs)		141	209	269	302	483	671
By economic sector - Pipeline (jobs)		102	88.2	481	121	180	865
By economic sector - Professional (jobs)		1,401	1,903	2,616	2,798	5,578	7,469
By economic sector - Trade (jobs)		1,376	1,515	1,694	1,599	2,475	3,251
By economic sector - Utilities (jobs)		1,881	2,305	4,349	3,277	5,863	10,803
By resource sector - Biomass (jobs)		4,261	4,154	4,815	3,303	6,428	8,085
By resource sector - CO2 (jobs)		23.9	82.6	3,499	654	1,330	7,172
By resource sector - Coal (jobs)		60.9	0	0	0	0	0
By resource sector - Grid (jobs)		2,914	3,874	4,825	5,406	9,935	14,449
By resource sector - Natural Gas (jobs)		795	592	473	464	489	407
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		1,240	1,081	942	819	656	467
By resource sector - Solar (jobs)		102	126	119	105	188	213
By resource sector - Wind (jobs)		1,701	3,038	3,783	4,083	5,211	7,108

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

Item	2020	2025	2030	2035	2040	2045	2050
By education level - All sectors - High school diploma or less (jobs)		5,529	6,252	8,424	6,430	9,624	15,317
By education level - All sectors - Associates degree or some college (jobs)		2,930	3,543	5,364	4,357	7,203	11,716
By education level - All sectors - Bachelors degree (jobs)		2,054	2,436	3,439	2,971	5,116	7,706
By education level - All sectors - Masters or professional degree (jobs)		511	619	871	778	1,365	2,014
By education level - All sectors - Doctoral degree (jobs)		73.5	92.7	128	124	232	322
Related work experience - All sectors - None (jobs)		1,748	2,002	2,789	2,175	3,399	5,417
Related work experience - All sectors - Up to 1 year (jobs)		2,884	3,248	4,210	3,242	4,802	7,400
Related work experience - All sectors - 1 to 4 years (jobs)		3,656	4,319	6,222	5,112	8,439	13,281
Related work experience - All sectors - 4 to 10 years (jobs)		2,214	2,663	3,972	3,275	5,482	8,742
Related work experience - All sectors - Over 10 years (jobs)		596	711	1,032	855	1,419	2,235
On-the-Job Training - All sectors - None (jobs)		635	731	988	808	1,300	1,981
On-the-Job Training - All sectors - Up to 1 year (jobs)		7,907	9,080	12,333	9,897	15,706	24,266
On-the-Job Training - All sectors - 1 to 4 years (jobs)		1,889	2,303	3,558	2,882	4,761	7,832
On-the-Job Training - All sectors - 4 to 10 years (jobs)		571	717	1,182	945	1,570	2,670
On-the-Job Training - All sectors - Over 10 years (jobs)		95.5	114	164	129	202	327
On-Site or In-Plant Training - All sectors - None (jobs)		1,743	2,049	2,884	2,360	3,857	5,996
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		7,113	8,178	11,163	8,942	14,174	22,000
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		1,539	1,853	2,798	2,257	3,692	6,029
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		610	754	1,215	971	1,610	2,706
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		92.5	110	166	130	208	344
Wage income - All (million \$2019)		554	662	965	798	1,325	2,118

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	91.5	86	78.8	73.1	68.9	64	58.1
Final energy use - Residential (PJ)	41.4	39.1	37.4	35.9	34.3	32.5	30.6
Final energy use - Commercial (PJ)	30.2	29.7	28.9	28.2	27.4	26.7	26
Final energy use - Industry (PJ)	163	171	174	176	179	181	183

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)		0.676	0.691	0.924	0.965	1.37	1.46

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	1.99	32.6	63.1	205	346	660	973

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – All others (1000 units)	1,272	1,272	1,272	1,207	1,141	880	618
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		0	39.1	83.1	280	883	1,285
Public EV charging plugs - DC Fast (1000 units)	0.054		0.156		0.855		2.4
Public EV charging plugs - L2 (1000 units)	0.074		3.75		20.6		57.9

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 (%)	6.73	10.2	11.7	16.8	28.5	42.8	50.8
Sales of space heating units - Electric Resistance (%)	18.5	23.9	23.5	22.4	19.7	16.4	14.8
Sales of space heating units - Gas (%)	59.2	44.2	43.2	40.6	34.7	27.1	22.3
Sales of space heating units - Fossil (%)	15.6	21.7	21.5	20.2	17.1	13.7	12.1
Sales of water heating units - Electric Heat Pump (%)	0	0.211	0.789	2.72	7.4	13.3	16.8
Sales of water heating units - Electric Resistance (%)	41.1	57	57.1	57.5	59	60.8	61.9
Sales of water heating units - Gas Furnace (%)	58.8	42.8	42.1	39.7	33.6	25.8	21.3
Sales of water heating units - Other (%)	0.032	0.033	0.033	0.033	0.033	0.033	0.033
Sales of cooking units - Electric Resistance (%)	71.4	72.1	74.7	81.6	91.2	97.2	99.2
Sales of cooking units - Gas (%)	28.6	27.9	25.3	18.4	8.76	2.83	0.76
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		0.651	0.8				

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	4.48	6.34	7.8	12.5	23.6	37.7	45.9
Sales of space heating units - Electric Resistance (%)	7.28	5.52	5.66	6.19	7.32	8.52	9.17
Sales of space heating units - Gas Furnace (%)	82.1	85.6	84	79.1	67.3	52.4	43.6
Sales of space heating units - Fossil (%)	6.1	2.55	2.51	2.23	1.76	1.38	1.26
Sales of water heating units - Electric Heat Pump (%)	1.15	1.12	1.94	4.67	11.3	19.6	24.5
Sales of water heating units - Electric Resistance (%)	9.7	7.35	8.16	10.8	17.2	25.3	30
Sales of water heating units - Gas Furnace (%)	87.4	90.5	88.9	83.6	70.7	54.3	44.7
Sales of water heating units - Other (%)	1.76	0.994	0.977	0.938	0.876	0.841	0.828
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)		2,507	2,735				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	450	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	1,092	853	953	944	1,140	1,591	1,568
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Biomass power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	0.03	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	34	34	34	34	34
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Power (quantity)	0	0	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	0	0	0	0
Number of facilities - Beccs hydrogen (quantity)	0	0	0	3	4	19	19
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	1	1
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	8
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	0	1	1
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	1	1	1	2	2
Conversion capital investment - Cumulative 5-yr (million \$2018)		0	28	2,268	651	14,187	7,387
Biomass purchases (million \$2018/y)		0	2.19	190	243	1,415	1,991

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0.03	2.95	3.79	22	22.3
Annual - BECCS (MMT)		0	0.03	2.95	3.79	22	22.3
Annual - NGCC (MMT)		0	0	0	0	0	0
Annual - Cement and lime (MMT)		0	0	0	0	0	0
Cumulative - All (MMT)		0	0.03	2.98	6.77	28.8	51.1
Cumulative - BECCS (MMT)		0	0.03	2.98	6.77	28.8	51.1
Cumulative - NGCC (MMT)		0	0	0	0	0	0
Cumulative - Cement and lime (MMT)		0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	0	335	335	335	335
Spur (km)		0	125	372	511	2,157	2,087
All (km)		0	125	707	845	2,492	2,422
Cumulative investment - Trunk (million \$2018)		0	0	1,766	1,766	1,766	1,766
Cumulative investment - Spur (million \$2018)		0	64	295	373	1,866	1,845
Cumulative investment - All (million \$2018)		0	64	2,061	2,139	3,632	3,611

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual (MMT)		0	1.85	6.42	13.1	18.7	19.2
Injection wells (wells)		0	3	12	22	37	46
Resource characterization, appraisal, permitting costs (million \$2020)		44.3	204	319	319	319	319
Wells and facilities construction costs (million \$2020)		0	95.8	373	666	1,113	1,382

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)							-190
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-129
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-115
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-21.1
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-148
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-845
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-2,286
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-360
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-222
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-4,315
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-284
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-450
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-208
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-30.9
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-296
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,630
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-3,429
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,553
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-440
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-9,320
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-378
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-771
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-301
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-41.4

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Increase retention of HWP (1000 tCO ₂ e/y)							-444
Carbon sink potential - High - Increase trees outside forests (1000 tCO ₂ e/y)							-2,415
Carbon sink potential - High - Reforest cropland (1000 tCO ₂ e/y)							-4,571
Carbon sink potential - High - Reforest pasture (1000 tCO ₂ e/y)							-4,746
Carbon sink potential - High - All (not counting overlap) (1000 tCO ₂ e/y)							-14,326
Carbon sink potential - High - Restore productivity (1000 tCO ₂ e/y)							-658
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							31
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							98
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							58.7
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							7.63
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)							121
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							151
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							23.4
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							132
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							622
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							46.4
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							101
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							106
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							11.5
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)							175
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							227
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							169

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 - Mid - Restore productivity (1000 hectares)							266
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,102
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							61.9
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							104
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							153
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							15.3
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)							229
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							302
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							135
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							218
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,219

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)							-1,508
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-3,715
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-203
Carbon sink potential - Moderate deployment - Cropland to woody energy crops (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Pasture to energy crops (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-5,426
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-1,508
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-7,051

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-406
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)							-8,966
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							1,080
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							3,295
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							338
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)							16.4
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)							84.8
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							4,814
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							1,080
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							15,438
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							676
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)							16.4
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)							84.8
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							17,295

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)		14.8	7.2	4.6	3.61	3.14	3.02
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		1.57	1.46	1.54	1.06	0.865	0.751
Premature deaths from air pollution - Mobile - On-Road (deaths)		4.33	4.37	4.41	4.48	4.54	4.61
Premature deaths from air pollution - Gas Stations (deaths)		0.384	0.386	0.387	0.39	0.393	0.394

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		0.841	0.771	0.713	0.676	0.658	0.643
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.049	0.043	0.031	0.019	0.01	0.005
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.238	0.239	0.243	0.248	0.245	0.239
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.218	0.217	0.215	0.213	0.21	0.206
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		0.745	0.722	0.659	0.586	0.543	0.534
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.144	0.139	0.134	0.128	0.124	0.121
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.066	0.066	0.067	0.068	0.068	0.069
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.866	0.551	0.412	0.376	0.349	0.314
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		12.1	12.6	12.7	12.1	11.8	10.9
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		131	63.8	40.8	32	27.8	26.8
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		13.9	13	13.6	9.39	7.66	6.66
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		38.5	38.8	39.2	39.8	40.4	41
Monetary damages from air pollution - Gas Stations (million \$2019)		3.4	3.42	3.43	3.46	3.48	3.49
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		7.45	6.84	6.32	5.99	5.83	5.7
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		0.435	0.377	0.275	0.172	0.091	0.045
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		2.11	2.11	2.16	2.2	2.17	2.12
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		1.93	1.92	1.91	1.88	1.86	1.82
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		6.59	6.4	5.83	5.19	4.8	4.73
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		1.27	1.23	1.18	1.13	1.09	1.07
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		0.582	0.588	0.595	0.6	0.605	0.611
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		7.64	4.86	3.63	3.32	3.08	2.77

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		108	112	113	107	105	96.6

Table 65: REF scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		1,821	1,821	1,821	1,821	1,821	1,821
By economic sector - Construction (jobs)		1,531	1,582	1,642	1,912	2,111	2,172
By economic sector - Manufacturing (jobs)		1,592	1,609	1,610	1,662	1,643	1,632
By economic sector - Mining (jobs)		521	409	338	278	236	200
By economic sector - Other (jobs)		103	109	115	146	169	182
By economic sector - Pipeline (jobs)		105	109	110	105	107	107
By economic sector - Professional (jobs)		1,106	1,100	1,107	1,304	1,433	1,489
By economic sector - Trade (jobs)		1,263	1,135	1,059	1,092	1,111	1,105
By economic sector - Utilities (jobs)		1,611	1,608	1,631	1,866	2,074	2,140
By resource sector - Biomass (jobs)		4,262	4,144	4,037	3,942	3,855	3,777
By resource sector - CO2 (jobs)		0	0.028	0.036	0.038	0.043	0.045
By resource sector - Coal (jobs)		178	59.7	0	0	0	0
By resource sector - Grid (jobs)		2,370	2,392	2,513	2,970	3,386	3,434
By resource sector - Natural Gas (jobs)		823	852	840	806	807	878
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		1,248	1,101	992	926	882	847
By resource sector - Solar (jobs)			23.6	35.2	29.4	30.1	50.3
By resource sector - Wind (jobs)		772	910	1,017	1,512	1,745	1,862
By education level - All sectors - High school diploma or less (jobs)		4,944	4,865	4,844	5,136	5,338	5,382
By education level - All sectors - Associates degree or some college (jobs)		2,463	2,435	2,439	2,699	2,883	2,943
By education level - All sectors - Bachelors degree (jobs)		1,752	1,698	1,671	1,821	1,920	1,947
By education level - All sectors - Masters or professional degree (jobs)		433	424	420	464	494	504
By education level - All sectors - Doctoral degree (jobs)		60.7	59.4	58.8	66	70.8	72.5
Related work experience - All sectors - None (jobs)		1,545	1,518	1,507	1,612	1,685	1,703
Related work experience - All sectors - Up to 1 year (jobs)		2,594	2,558	2,548	2,693	2,790	2,813
Related work experience - All sectors - 1 to 4 years (jobs)		3,142	3,074	3,054	3,325	3,513	3,565
Related work experience - All sectors - 4 to 10 years (jobs)		1,870	1,837	1,830	2,015	2,145	2,184
Related work experience - All sectors - Over 10 years (jobs)		503	495	494	541	573	583
On-the-Job Training - All sectors - None (jobs)		557	542	534	570	594	599
On-the-Job Training - All sectors - Up to 1 year (jobs)		6,966	6,823	6,771	7,240	7,557	7,635
On-the-Job Training - All sectors - 1 to 4 years (jobs)		1,579	1,565	1,571	1,747	1,874	1,915
On-the-Job Training - All sectors - 4 to 10 years (jobs)		471	472	478	541	589	606
On-the-Job Training - All sectors - Over 10 years (jobs)		80.2	79.9	80.1	87.3	91.8	93.2
On-Site or In-Plant Training - All sectors - None (jobs)		1,500	1,471	1,461	1,582	1,663	1,686
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		6,263	6,137	6,093	6,522	6,814	6,887

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

Item	2020	2025	2030	2035	2040	2045	2050
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		1,301	1,287	1,289	1,421	1,516	1,546
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		510	507	511	573	619	634
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		79.5	79.5	80.1	87.9	93.7	95.7
Wage income - All (million \$2019)		480	478	484	534	573	592

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	91.4	86.1	79.4	75.5	75.4	77.5	80.1
Final energy use - Residential (PJ)	41.4	39.2	38.1	37.3	36.9	36.9	36.9
Final energy use - Commercial (PJ)	30.2	30.3	30.4	30.1	29.9	30.1	31
Final energy use - Industry (PJ)	163	172	176	178	183	186	191

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)		0.688	0.705	0.782	0.806	0.832	0.856

Table 68: REF scenario - PILLAR 1: Efficiency/Electrification - Residential

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	5.86	14.1	14.5	15	15.7	16.5	17.4
Sales of space heating units - Electric Resistance (%)	18.7	23	22.7	22.5	21.9	21.1	20.3
Sales of space heating units - Gas (%)	59.7	42.8	43.5	43.8	44.2	44.4	44
Sales of space heating units - Fossil (%)	15.7	20.1	19.3	18.7	18.3	18	18.2
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	41.1	56.9	56.9	56.7	56.6	56.6	56.5
Sales of water heating units - Gas Furnace (%)	58.8	43.1	43.1	43.3	43.4	43.4	43.5
Sales of water heating units - Other (%)	0.032	0.033	0.033	0.033	0.033	0.033	0.034
Sales of cooking units - Electric Resistance (%)	71.1	71.1	71.1	71.1	71.1	71.1	71.1
Sales of cooking units - Gas (%)	28.9	28.9	28.9	28.9	28.9	28.9	28.9
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		0.63	0.659				

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	4.48	13.1	44.5	70.3	74.5	75	75
Sales of space heating units - Electric Resistance (%)	7.28	6.37	10.8	18.4	23.7	24.5	24.5
Sales of space heating units - Gas Furnace (%)	82.1	78.1	42.8	10.4	1.7	0.533	0.471
Sales of space heating units - Fossil (%)	6.1	2.47	1.92	0.869	0.131	0.011	0
Sales of water heating units - Electric Heat Pump (%)	1.15	0.821	0.819	0.82	0.818	0.815	0.812
Sales of water heating units - Electric Resistance (%)	9.7	7.06	7.08	7.05	7.05	7.05	7.05
Sales of water heating units - Gas Furnace (%)	87.4	91.1	91.1	91.1	91.1	91.1	91.1

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Other (%)	1.76	0.999	0.996	0.994	0.992	0.996	0.997
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)		2,478	2,548				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	450	450	0	0	0	0	0
Installed thermal - Natural gas (MW)	1,092	868	1,207	1,198	1,224	1,101	1,551
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	1.38	2.45	3.13	4.18	5.55	7.15	9.05
Installed renewables - Wind - Base land use assumptions (MW)	2,594	2,594	2,594	2,594	3,613	6,304	6,829

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)	10,866	10,866	10,866	10,866	14,642	24,494	26,276
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)	-2.82		0.391				0.112
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-0.121		-0.251				-0.264
Business-as-usual carbon sink - Total (Mt CO2e/y)	-2.94		0.14				-0.152

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)							-190
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-129
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-115
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-21.1
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-148
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-845
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-2,286
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-360
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-222
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-4,315
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-284

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-450
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-208
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-30.9
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-296
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,630
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-3,429
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,553
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-440
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-9,320
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-378
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-771
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-301
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-41.4
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-444
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-2,415
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-4,571
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-4,746
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-14,326
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-658
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							31
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							98
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							58.7
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							7.63
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)							121
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							151
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							23.4

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							132
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							622
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							46.4
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							101
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							106
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							11.5
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)							175
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							227
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							169
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							266
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,102
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							61.9
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							104
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							153
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							15.3
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)							229
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							302
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							135
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							218
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,219