



## **Net-Zero America - Utah 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)		17.8	0.021	0.021	0.018	0.012	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		4.37	3.31	2.48	2.19	1.72	1.28
Premature deaths from air pollution - Mobile - On-Road (deaths)		83.8	81.5	64.3	38.3	18	7.23
Premature deaths from air pollution - Gas Stations (deaths)		3.94	3.78	3	1.9	1.04	0.599
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		16.6	15.9	12.3	7.43	3.73	1.49
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.075	0.068	0.054	0.039	0.028	0.019
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.626	0.623	0.533	0.39	0.241	0.134
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.053	0.053	0.052	0.051	0.05	0.048
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		5.19	4.84	3.82	2.47	1.34	0.6
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.423	0.351	0.286	0.224	0.165	0.11
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.842	0.734	0.62	0.499	0.376	0.253
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.188	0.025	0.024	0.022	0.021	0.02
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		21.4	20.7	19.3	15.4	11.7	7.37
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		158	0.183	0.183	0.163	0.107	0
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		38.7	29.3	22	19.4	15.2	11.3
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		745	724	572	341	160	64.3
Monetary damages from air pollution - Gas Stations (million \$2019)		34.9	33.5	26.6	16.8	9.17	5.31
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		147	141	109	65.8	33.1	13.2
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		0.668	0.6	0.479	0.347	0.244	0.165
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		5.55	5.52	4.73	3.46	2.13	1.19
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		0.473	0.47	0.463	0.453	0.439	0.422
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		46	42.9	33.8	21.9	11.9	5.31

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)		3.75	3.11	2.54	1.98	1.46	0.971
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		7.46	6.49	5.48	4.42	3.33	2.24
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		1.66	0.225	0.213	0.194	0.184	0.18
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		190	184	171	137	104	65.5

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		4.2	12.4	9.37	7.75	5.85	17.2
By economic sector - Construction (jobs)		4,780	6,666	6,701	6,082	5,857	7,255
By economic sector - Manufacturing (jobs)		3,781	4,984	5,212	4,443	3,713	3,718
By economic sector - Mining (jobs)		4,907	3,453	2,594	1,720	1,121	655
By economic sector - Other (jobs)		470	632	706	753	833	1,431
By economic sector - Pipeline (jobs)		401	356	302	229	161	108
By economic sector - Professional (jobs)		2,744	3,415	3,383	3,192	3,230	4,109
By economic sector - Trade (jobs)		2,770	2,739	2,610	2,334	2,251	2,822
By economic sector - Utilities (jobs)		3,968	6,953	6,608	5,595	5,294	5,494
By resource sector - Biomass (jobs)		18	34.3	26.7	23.3	21.4	73.6
By resource sector - CO2 (jobs)		0	0	0	0	0	29.4
By resource sector - Coal (jobs)		2,670	1,040	529	460	414	367
By resource sector - Grid (jobs)		4,821	11,903	11,865	9,886	9,238	9,960
By resource sector - Natural Gas (jobs)		4,855	4,123	3,305	2,617	2,125	1,389
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		6,802	5,928	5,041	3,591	2,603	1,588
By resource sector - Solar (jobs)		3,397	3,395	4,066	4,323	4,570	8,080
By resource sector - Wind (jobs)		1,263	2,786	3,292	3,458	3,496	4,124
By education level - All sectors - High school diploma or less (jobs)		9,977	12,266	11,877	10,277	9,440	10,743
By education level - All sectors - Associates degree or some college (jobs)		7,191	9,105	8,819	7,692	7,153	8,228
By education level - All sectors - Bachelors degree (jobs)		5,237	6,163	5,842	5,010	4,588	5,156
By education level - All sectors - Masters or professional degree (jobs)		1,244	1,476	1,397	1,209	1,125	1,290
By education level - All sectors - Doctoral degree (jobs)		176	199	189	168	161	193
Related work experience - All sectors - None (jobs)		3,349	4,178	4,029	3,496	3,235	3,705
Related work experience - All sectors - Up to 1 year (jobs)		4,656	5,695	5,534	4,819	4,453	5,155
Related work experience - All sectors - 1 to 4 years (jobs)		8,776	10,652	10,220	8,828	8,130	9,220
Related work experience - All sectors - 4 to 10 years (jobs)		5,535	6,833	6,562	5,683	5,251	5,964
Related work experience - All sectors - Over 10 years (jobs)		1,510	1,852	1,778	1,530	1,398	1,566
On-the-Job Training - All sectors - None (jobs)		1,307	1,554	1,490	1,293	1,195	1,391
On-the-Job Training - All sectors - Up to 1 year (jobs)		15,983	19,360	18,628	16,090	14,779	16,773

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)		4,868	6,139	5,919	5,141	4,767	5,439
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,441	1,881	1,818	1,599	1,512	1,763
On-the-Job Training - All sectors - Over 10 years (jobs)		226	275	268	233	213	245
On-Site or In-Plant Training - All sectors - None (jobs)		3,786	4,630	4,464	3,885	3,598	4,157
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		14,521	17,605	16,933	14,621	13,431	15,236
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		3,812	4,780	4,611	4,000	3,701	4,217
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,522	1,950	1,875	1,640	1,539	1,774
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		184	246	239	210	197	226
Wage income - All (million \$2019)		1,290	1,588	1,534	1,336	1,242	1,414

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

Item	2020	2025	2030	2035	2040	2045	2050
Oil consumption - Annual (million bbls)		53.1	45.7	34.9	24.7	16.6	10
Oil consumption - Cumulative (million bbls)							1,076
Oil production - Annual (million bbls)		48	48.2	48.1	38.1	31	20.6
Natural gas consumption - Annual (tcf)		189	159	128	96	60.4	41.9
Natural gas consumption - Cumulative (tcf)							3,842
Natural gas production - Annual (tcf)		348	329	287	242	192	149

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	304	290	260	223	188	168	161
Final energy use - Residential (PJ)	126	122	118	106	90.4	79.2	72.3
Final energy use - Commercial (PJ)	103	103	101	94.8	87.6	82.5	80.3
Final energy use - Industry (PJ)	86.5	89.3	90.2	96.9	111	116	122

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)		1.72	1.81	3.2	3.44	3.67	3.91

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	48.6	240	431	1,101	1,770	2,306	2,841
Vehicle stocks - LDV – All others (1000 units)	2,369	2,255	2,142	1,561	980	554	129
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		449	1,171	1,866	2,839	3,076	2,940
Public EV charging plugs - DC Fast (1000 units)	0.174		0.748		3.07		4.93
Public EV charging plugs - L2 (1000 units)	1.07		18		73.9		119

Table 7: *E+ scenario - PILLAR 1: Efficiency/Electrification - Residential*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	3.03	9.9	34.8	79.5	87.6	88.4	88.2
Sales of space heating units - Electric Resistance (%)	3.81	7.35	5.69	2.51	1.97	1.95	1.97
Sales of space heating units - Gas (%)	89.6	73.5	50.6	9.98	2.86	2.43	2.43
Sales of space heating units - Fossil (%)	3.57	9.24	8.91	8.06	7.57	7.25	7.38
Sales of water heating units - Electric Heat Pump (%)	0	1.51	15.7	41.6	46.2	46.5	46.5
Sales of water heating units - Electric Resistance (%)	7.01	15.7	26.3	48.5	52.5	52.7	52.7
Sales of water heating units - Gas Furnace (%)	92.3	82	57.3	9.09	0.535	0	0
Sales of water heating units - Other (%)	0.642	0.79	0.79	0.787	0.779	0.778	0.778
Sales of cooking units - Electric Resistance (%)	37.1	50.5	91.5	99.6	100	100	100
Sales of cooking units - Gas (%)	62.9	49.5	8.47	0.426	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		2.76	3.21				

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 (%)	0.749	8.98	33.5	81.9	90.4	91	91
Sales of space heating units - Electric Resistance (%)	0.855	3.41	4.83	7.94	8.5	8.54	8.55
Sales of space heating units - Gas (%)	98.4	87.4	61.6	10.2	1.06	0.491	0.49
Sales of space heating units - Fossil (%)	0	0.208	0.04	0.002	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.008	1.61	16.7	45	50	50.3	50.3
Sales of water heating units - Electric Resistance (%)	0.41	2.69	16.3	44.1	49	49.3	49.3
Sales of water heating units - Gas (%)	99.5	95.3	66.6	10.6	0.622	0	0
Sales of water heating units - Other (%)	0.1	0.381	0.381	0.382	0.381	0.381	0.381
Sales of cooking units - Electric Resistance (%)	41.9	54.6	83	88.6	88.9	88.9	88.9
Sales of cooking units - Gas (%)	58.1	45.4	17	11.4	11.1	11.1	11.1
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		7,533	8,381				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	4,894	3,250	0	0	0	0	0
Installed thermal - Natural gas (MW)	2,926	2,933	3,732	4,265	3,603	3,581	4,890
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	540	833	1,113	1,450	1,851	2,318	2,871
Installed renewables - Solar - Base land use assumptions (MW)	768	768	768	768	768	768	1,335
Installed renewables - Wind - Base land use assumptions (MW)	547	717	6,391	10,963	12,838	13,762	16,825
Installed renewables - Solar - Constrained land use assumptions (MW)	767	767	767	767	7,665	8,703	9,779
Installed renewables - Wind - Constrained land use assumptions (MW)	1,234	1,969	7,960	12,142	13,037	13,410	15,929
Capital invested - Solar PV - Base (billion \$2018)		0	0	0	0	0	0.525
Capital invested - Wind - Base (billion \$2018)		0.251	7.55	5.67	2.22	1.04	3.24

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Solar PV - Constrained (billion \$2018)		1.09	0	0	2.18	2.6	1.2
Capital invested - Wind - Constrained (billion \$2018)		0.199	7.9	6.7	0.918	0.419	2.7
Capital invested - Biomass power plant (billion \$2018)	0	0.003	0.029	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	0	0	0	0	0.377

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	2,042	2,042	2,042	2,042	2,042	2,042	3,288
Wind - Base land use assumptions (GWh)	1,617	2,124	18,149	30,651	35,589	38,005	46,263
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	2,037	2,037	2,037	2,037	17,645	20,004	22,417
Wind - Constrained land use assumptions (GWh)	3,563	5,645	21,170	30,795	32,849	33,673	39,164
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0
Biomass power plant (GWh)	0	4.9	61.8	61.8	61.8	61.8	61.8
Biomass w/ccu power plant (GWh)	0	0	0	0	0	0	423
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	1	1	1	1	1	1
Number of facilities - Power ccu (quantity)	0	0	0	0	0	0	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	0	0	0	0
Number of facilities - Diesel (quantity)	0	0	0	1	1	1	1
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis (quantity)	0	0	0	1	1	1	1
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng (quantity)	0	1	1	1	1	1	1
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0
Conversion capital investment - Cumulative 5-yr (million \$2018)		2.83	32.3	18.6	2.91	0.542	346
Biomass purchases (million \$2018/y)		0.333	3.78	4.99	5.18	5.22	26.6

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	0	0	0	0.4
Annual - BECCS (MMT)		0	0	0	0	0	0.4
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	0	0	0	0.4
Cumulative - BECCS (MMT)		0	0	0	0	0	0.4
Cumulative - NGCC (MMT)		0	0	0	0	0	0
Cumulative - Cement and lime (MMT)		0	0	0	0	0	0



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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	0	0	0	0	0
Spur (km)		0	0	0	0	0	22.6
All (km)		0	0	0	0	0	22.6
Cumulative investment - Trunk (million \$2018)		0	0	0	0	0	0
Cumulative investment - Spur (million \$2018)		0	0	0	0	0	13.5
Cumulative investment - All (million \$2018)		0	0	0	0	0	13.5

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-707
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-140
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,919
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-5.38
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-9.92
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-116
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-1,189
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-101
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,568
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-6,755
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-1,060
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-489
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-5,260
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-7.89
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-19.8
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-224
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-1,783

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Reforest pasture (1000 tCO <sub>2</sub> e/y)							-715
Carbon sink potential - Mid - Restore productivity (1000 tCO <sub>2</sub> e/y)							-3,109
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)							-12,667
Carbon sink potential - High - Accelerate regeneration (1000 tCO <sub>2</sub> e/y)							-1,412
Carbon sink potential - High - Avoid deforestation (1000 tCO <sub>2</sub> e/y)							-838
Carbon sink potential - High - Extend rotation length (1000 tCO <sub>2</sub> e/y)							-7,600
Carbon sink potential - High - Improve plantations (1000 tCO <sub>2</sub> e/y)							-10.6
Carbon sink potential - High - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)							-29.8
Carbon sink potential - High - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)							-332
Carbon sink potential - High - Reforest cropland (1000 tCO <sub>2</sub> e/y)							-2,378
Carbon sink potential - High - Reforest pasture (1000 tCO <sub>2</sub> e/y)							-1,329
Carbon sink potential - High - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)							-18,580
Carbon sink potential - High - Restore productivity (1000 tCO <sub>2</sub> e/y)							-4,651
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							116
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							106
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,485
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							1.95
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)							16.6
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							78.6
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							6.55
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							933
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							2,743
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							173
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							110

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							2,680
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							2.93
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)							24.1
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							118
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							47.3
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,879
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							5,034
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							231
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							113
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							3,876
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							3.9
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)							31.5
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							157
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							37.8
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,542
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							5,992

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 <sub>2</sub> e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO <sub>2</sub> e/y)							-184

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO <sub>2</sub> e/y)							-7.84
Carbon sink potential - Moderate deployment - Total (1000 tCO <sub>2</sub> e/y)							-192
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO <sub>2</sub> e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO <sub>2</sub> e/y)							-360
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO <sub>2</sub> e/y)							-15.7
Carbon sink potential - Aggressive deployment - Total (1000 tCO <sub>2</sub> e/y)							-376
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							329
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							12.1
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							341
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							646
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							24.1
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							670

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)		17.8	0.021	0.021	0.018	0.012	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		4.79	2.42	1.68	0.983	0.467	0.563
Premature deaths from air pollution - Mobile - On-Road (deaths)		85.1	89.6	90.6	84.5	69.4	49.1
Premature deaths from air pollution - Gas Stations (deaths)		4.01	4.21	4.23	3.95	3.28	2.4
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		16.7	16.8	16.6	15.4	12.8	9.15
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.078	0.076	0.071	0.063	0.054	0.045
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.631	0.673	0.711	0.702	0.611	0.48

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)		0.053	0.053	0.052	0.051	0.05	0.048
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		5.21	5.24	5.16	4.79	4.06	3.09
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.423	0.377	0.337	0.299	0.261	0.224
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.842	0.787	0.727	0.66	0.588	0.516
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.178	0.026	0.026	0.025	0.021	0.014
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		21.4	19.9	17.7	15.9	14.3	10.3
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		158	0.183	0.183	0.163	0.107	0
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		42.5	21.4	14.9	8.71	4.13	4.99
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		757	796	806	751	617	436
Monetary damages from air pollution - Gas Stations (million \$2019)		35.5	37.3	37.5	34.9	29	21.3
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		148	149	147	137	113	81.1
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		0.691	0.676	0.629	0.555	0.48	0.402
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		5.59	5.96	6.3	6.22	5.41	4.25
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		0.473	0.47	0.463	0.453	0.439	0.422
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		46.1	46.4	45.6	42.4	35.9	27.4
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		3.75	3.34	2.99	2.64	2.31	1.98
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		7.46	6.96	6.43	5.84	5.21	4.56
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		1.57	0.228	0.228	0.219	0.186	0.128
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		190	177	157	141	127	91

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		5.12	22.7	13.9	11.1	7.08	17.3
By economic sector - Construction (jobs)		4,754	6,706	5,981	5,730	6,203	7,759

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Manufacturing (jobs)		3,824	5,086	4,694	4,383	4,625	4,495
By economic sector - Mining (jobs)		4,894	3,412	2,565	1,927	1,446	889
By economic sector - Other (jobs)		470	639	653	716	845	1,474
By economic sector - Pipeline (jobs)		402	348	299	261	225	166
By economic sector - Professional (jobs)		2,731	3,442	3,076	3,073	3,453	4,526
By economic sector - Trade (jobs)		2,766	2,764	2,491	2,387	2,517	3,149
By economic sector - Utilities (jobs)		3,880	6,933	5,327	4,760	5,292	5,618
By resource sector - Biomass (jobs)		19.4	61.1	46.1	46.7	30.1	71.2
By resource sector - CO2 (jobs)		0	0	0	0	0	50.5
By resource sector - Coal (jobs)		2,642	1,041	532	464	414	360
By resource sector - Grid (jobs)		4,635	12,021	9,474	8,253	9,314	10,134
By resource sector - Natural Gas (jobs)		4,844	3,805	2,742	2,284	2,007	1,473
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		6,829	6,068	5,411	4,704	3,990	2,535
By resource sector - Solar (jobs)		3,442	3,449	3,837	4,134	4,720	8,131
By resource sector - Wind (jobs)		1,316	2,909	3,058	3,364	4,140	5,339
By education level - All sectors - High school diploma or less (jobs)		9,933	12,340	10,601	9,805	10,355	11,758
By education level - All sectors - Associates degree or some college (jobs)		7,157	9,141	7,800	7,256	7,759	8,968
By education level - All sectors - Bachelors degree (jobs)		5,222	6,191	5,269	4,858	5,091	5,728
By education level - All sectors - Masters or professional degree (jobs)		1,239	1,481	1,257	1,166	1,233	1,425
By education level - All sectors - Doctoral degree (jobs)		175	200	174	165	176	215
Related work experience - All sectors - None (jobs)		3,334	4,198	3,585	3,324	3,529	4,048
Related work experience - All sectors - Up to 1 year (jobs)		4,638	5,736	4,952	4,604	4,884	5,644
Related work experience - All sectors - 1 to 4 years (jobs)		8,739	10,701	9,134	8,448	8,921	10,130
Related work experience - All sectors - 4 to 10 years (jobs)		5,511	6,859	5,843	5,413	5,739	6,543
Related work experience - All sectors - Over 10 years (jobs)		1,505	1,860	1,585	1,461	1,542	1,729
On-the-Job Training - All sectors - None (jobs)		1,304	1,563	1,344	1,248	1,316	1,529
On-the-Job Training - All sectors - Up to 1 year (jobs)		15,923	19,471	16,679	15,431	16,288	18,469
On-the-Job Training - All sectors - 1 to 4 years (jobs)		4,843	6,159	5,238	4,855	5,169	5,928
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,431	1,884	1,597	1,492	1,605	1,897
On-the-Job Training - All sectors - Over 10 years (jobs)		226	277	241	224	237	271
On-Site or In-Plant Training - All sectors - None (jobs)		3,774	4,655	3,995	3,717	3,946	4,566
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		14,464	17,701	15,151	14,009	14,786	16,760
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		3,793	4,798	4,089	3,788	4,025	4,603
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,513	1,952	1,655	1,541	1,647	1,920
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		183	247	210	196	212	245
Wage income - All (million \$2019)		1,284	1,594	1,368	1,276	1,361	1,553

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	304	292	270	253	241	225	207
Final energy use - Residential (PJ)	126	122	121	118	114	105	94.6
Final energy use - Commercial (PJ)	103	103	103	102	99.5	96.4	92.8
Final energy use - Industry (PJ)	86.5	89.4	90.4	97.9	112	117	124

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)		1.43	1.48	1.97	2.07	2.75	2.92

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	37.7	93.7	150	410	669	1,244	1,819
Vehicle stocks - LDV – All others (1000 units)	2,378	2,378	2,378	2,256	2,134	1,644	1,155
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		0	76.1	152	522	1,618	2,366
Public EV charging plugs - DC Fast (1000 units)	0.174		0.26		1.16		3.16
Public EV charging plugs - L2 (1000 units)	1.07		6.25		27.9		75.9

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 (%)	3.03	8.14	10.8	19.7	39.7	63.6	77.1
Sales of space heating units - Electric Resistance (%)	3.81	7.45	7.24	6.69	5.41	3.74	2.75
Sales of space heating units - Gas (%)	89.6	75.1	72.6	64.6	46.5	25	12.6
Sales of space heating units - Fossil (%)	3.57	9.27	9.34	9.11	8.39	7.66	7.61
Sales of water heating units - Electric Heat Pump (%)	0	0.562	2.11	7.14	18.6	32.3	40.2
Sales of water heating units - Electric Resistance (%)	7.01	15.2	16.4	20.2	29.3	40.6	47.3
Sales of water heating units - Gas Furnace (%)	92.3	83.4	80.7	71.9	51.3	26.3	11.8
Sales of water heating units - Other (%)	0.642	0.79	0.789	0.787	0.783	0.781	0.778
Sales of cooking units - Electric Resistance (%)	36.9	38.5	44.3	59.5	80.7	93.8	98.3
Sales of cooking units - Gas (%)	63.1	61.5	55.7	40.5	19.3	6.23	1.68
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		2.75	3.16				

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 (%)	0.749	7.59	10.3	19	39.5	64.5	79
Sales of space heating units - Electric Resistance (%)	0.855	3.35	3.5	4.01	5.26	6.85	7.79
Sales of space heating units - Gas (%)	98.4	88.8	86	76.8	55.2	28.6	13.2
Sales of space heating units - Fossil (%)	0	0.241	0.225	0.172	0.092	0.04	0.021
Sales of water heating units - Electric Heat Pump (%)	0.008	0.63	2.29	7.68	20	34.8	43.4
Sales of water heating units - Electric Resistance (%)	0.41	2	3.48	8.38	19.9	34.2	42.5
Sales of water heating units - Gas (%)	99.5	97	93.8	83.6	59.7	30.6	13.7
Sales of water heating units - Other (%)	0.1	0.381	0.381	0.382	0.381	0.381	0.381

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of cooking units - Electric Resistance (%)	41.9	46.2	50.2	60.8	75.4	84.6	87.8
Sales of cooking units - Gas (%)	58.1	53.8	49.8	39.2	24.6	15.4	12.2
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		7,532	8,365				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	4,894	3,250	0	0	0	0	0
Installed thermal - Natural gas (MW)	2,926	2,930	3,451	3,446	3,032	2,376	3,645
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)							-707
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-140
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,919
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-5.38
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-9.92
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-116
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-1,189
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-101
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,568
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-6,755
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-1,060
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-489
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-5,260
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-7.89
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-19.8
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-224
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-1,783
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-715
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-3,109
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-12,667
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-1,412
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-838



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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-7,600
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-10.6
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-29.8
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-332
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-2,378
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-1,329
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-18,580
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-4,651
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							116
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							106
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,485
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							1.95
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)							16.6
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							78.6
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							6.55
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							933
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							2,743
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							173
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							110
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							2,680
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							2.93
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)							24.1

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							118
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							47.3
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,879
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							5,034
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							231
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							113
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							3,876
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							3.9
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)							31.5
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							157
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							37.8
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,542
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							5,992

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-184
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-7.84
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-192
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-360

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO <sub>2</sub> e/y)							-15.7
Carbon sink potential - Aggressive deployment - Total (1000 tCO <sub>2</sub> e/y)							-376
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							329
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							12.1
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							341
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							646
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							24.1
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							670

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)		17.8	0.021	0.021	0.018	0.012	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		4.2	2.57	1.46	1.08	0.496	0.392
Premature deaths from air pollution - Mobile - On-Road (deaths)		83.8	81.5	64.3	38.3	18	7.23
Premature deaths from air pollution - Gas Stations (deaths)		3.94	3.78	3	1.9	1.04	0.599
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		16.6	15.9	12.3	7.43	3.73	1.49
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.075	0.068	0.054	0.039	0.028	0.019
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.626	0.623	0.533	0.39	0.241	0.134
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.053	0.053	0.052	0.051	0.05	0.048
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		5.19	4.84	3.82	2.47	1.34	0.6
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.423	0.351	0.286	0.224	0.165	0.11
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.842	0.734	0.62	0.499	0.376	0.253

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.216	0.025	0.024	0.022	0.021	0.007
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		21	20.4	18	13.3	8.3	1.25
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		158	0.183	0.183	0.163	0.107	0
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		37.2	22.7	13	9.6	4.4	3.47
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		745	724	572	341	160	64.3
Monetary damages from air pollution - Gas Stations (million \$2019)		34.9	33.5	26.6	16.8	9.17	5.31
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		147	141	109	65.8	33.1	13.2
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		0.668	0.6	0.479	0.347	0.244	0.165
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		5.55	5.52	4.73	3.46	2.13	1.19
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		0.473	0.47	0.463	0.453	0.439	0.422
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		46	42.9	33.8	21.9	11.9	5.31
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		3.75	3.11	2.54	1.98	1.46	0.971
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		7.46	6.49	5.48	4.42	3.33	2.24
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		1.9	0.225	0.212	0.191	0.181	0.063
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		187	181	160	118	73.7	11.1

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		4.23	8.78	8.83	6.88	5.07	17.1
By economic sector - Construction (jobs)		4,929	5,915	6,605	6,774	6,759	14,336
By economic sector - Manufacturing (jobs)		4,238	5,146	6,118	5,949	5,218	8,750
By economic sector - Mining (jobs)		4,959	3,408	2,454	1,521	857	256
By economic sector - Other (jobs)		485	587	715	829	948	2,836
By economic sector - Pipeline (jobs)		393	346	272	186	110	30.2
By economic sector - Professional (jobs)		2,861	3,163	3,436	3,670	3,948	7,682
By economic sector - Trade (jobs)		2,883	2,595	2,601	2,522	2,538	5,007
By economic sector - Utilities (jobs)		4,231	5,617	6,228	6,355	6,153	11,893
By resource sector - Biomass (jobs)		16.5	24.8	23.8	22.5	18.8	75.5
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Coal (jobs)		3,022	1,182	528	459	414	351
By resource sector - Grid (jobs)		5,281	8,968	11,313	11,693	11,230	23,448

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

Item	2020	2025	2030	2035	2040	2045	2050
By resource sector - Natural Gas (jobs)		4,700	3,973	2,796	2,051	1,495	742
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		6,802	5,905	4,898	3,260	1,961	335
By resource sector - Solar (jobs)		3,646	3,710	4,241	4,813	5,245	15,801
By resource sector - Wind (jobs)		1,515	3,023	4,637	5,515	6,175	10,056
By education level - All sectors - High school diploma or less (jobs)		10,491	11,223	12,019	11,742	11,123	21,462
By education level - All sectors - Associates degree or some college (jobs)		7,558	8,299	8,913	8,827	8,501	16,510
By education level - All sectors - Bachelors degree (jobs)		5,460	5,717	5,912	5,690	5,402	9,999
By education level - All sectors - Masters or professional degree (jobs)		1,292	1,360	1,403	1,366	1,323	2,482
By education level - All sectors - Doctoral degree (jobs)		181	187	191	189	189	357
Related work experience - All sectors - None (jobs)		3,510	3,811	4,059	3,982	3,805	7,366
Related work experience - All sectors - Up to 1 year (jobs)		4,904	5,241	5,641	5,551	5,308	10,339
Related work experience - All sectors - 1 to 4 years (jobs)		9,193	9,770	10,310	10,042	9,561	18,176
Related work experience - All sectors - 4 to 10 years (jobs)		5,793	6,256	6,619	6,480	6,200	11,802
Related work experience - All sectors - Over 10 years (jobs)		1,583	1,708	1,809	1,759	1,665	3,126
On-the-Job Training - All sectors - None (jobs)		1,366	1,438	1,510	1,471	1,408	2,734
On-the-Job Training - All sectors - Up to 1 year (jobs)		16,780	17,832	18,908	18,419	17,494	33,254
On-the-Job Training - All sectors - 1 to 4 years (jobs)		5,099	5,580	5,951	5,861	5,623	10,849
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,500	1,678	1,792	1,793	1,756	3,480
On-the-Job Training - All sectors - Over 10 years (jobs)		237	258	277	271	257	492
On-Site or In-Plant Training - All sectors - None (jobs)		3,969	4,273	4,541	4,461	4,285	8,257
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		15,243	16,190	17,164	16,717	15,875	30,210
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		3,995	4,352	4,642	4,561	4,363	8,408
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,583	1,749	1,852	1,835	1,782	3,480
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		193	221	240	240	233	454
Wage income - All (million \$2019)		1,348	1,452	1,540	1,512	1,453	2,774

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	304	290	260	223	188	168	161
Final energy use - Residential (PJ)	126	122	118	106	90.4	79.2	72.3
Final energy use - Commercial (PJ)	103	103	101	94.8	87.6	82.5	80.3
Final energy use - Industry (PJ)	86.5	89.3	90.2	96.9	111	116	122

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)		1.72	1.81	3.2	3.44	3.67	3.91

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	48.6	240	431	1,101	1,770	2,306	2,841
Vehicle stocks - LDV – All others (1000 units)	2,369	2,255	2,142	1,561	980	554	129
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		449	1,171	1,866	2,839	3,076	2,940
Public EV charging plugs - DC Fast (1000 units)	0.174		0.748		3.07		4.93
Public EV charging plugs - L2 (1000 units)	1.07		18		73.9		119

Table 32: *E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Residential*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	3.03	9.9	34.8	79.5	87.6	88.4	88.2
Sales of space heating units - Electric Resistance (%)	3.81	7.35	5.69	2.51	1.97	1.95	1.97
Sales of space heating units - Gas (%)	89.6	73.5	50.6	9.98	2.86	2.43	2.43
Sales of space heating units - Fossil (%)	3.57	9.24	8.91	8.06	7.57	7.25	7.38
Sales of water heating units - Electric Heat Pump (%)	0	1.51	15.7	41.6	46.2	46.5	46.5
Sales of water heating units - Electric Resistance (%)	7.01	15.7	26.3	48.5	52.5	52.7	52.7
Sales of water heating units - Gas Furnace (%)	92.3	82	57.3	9.09	0.535	0	0
Sales of water heating units - Other (%)	0.642	0.79	0.79	0.787	0.779	0.778	0.778
Sales of cooking units - Electric Resistance (%)	37.1	50.5	91.5	99.6	100	100	100
Sales of cooking units - Gas (%)	62.9	49.5	8.47	0.426	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		2.76	3.21				

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 (%)	0.749	8.98	33.5	81.9	90.4	91	91
Sales of space heating units - Electric Resistance (%)	0.855	3.41	4.83	7.94	8.5	8.54	8.55
Sales of space heating units - Gas (%)	98.4	87.4	61.6	10.2	1.06	0.491	0.49
Sales of space heating units - Fossil (%)	0	0.208	0.04	0.002	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.008	1.61	16.7	45	50	50.3	50.3
Sales of water heating units - Electric Resistance (%)	0.41	2.69	16.3	44.1	49	49.3	49.3
Sales of water heating units - Gas (%)	99.5	95.3	66.6	10.6	0.622	0	0
Sales of water heating units - Other (%)	0.1	0.381	0.381	0.382	0.381	0.381	0.381
Sales of cooking units - Electric Resistance (%)	41.9	54.6	83	88.6	88.9	88.9	88.9
Sales of cooking units - Gas (%)	58.1	45.4	17	11.4	11.1	11.1	11.1
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		7,533	8,381				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	4,894	4,316	0	0	0	0	0
Installed thermal - Natural gas (MW)	2,926	2,940	3,700	3,726	3,038	2,564	3,833

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	540	833	1,113	1,450	1,851	2,318	2,871
Installed renewables - Solar - Base land use assumptions (MW)	768	768	768	768	768	768	8,483
Installed renewables - Wind - Base land use assumptions (MW)	547	1,001	7,535	12,685	16,824	19,028	22,089
Installed renewables - Solar - Constrained land use assumptions (MW)	769	769	769	5,567	7,586	9,769	17,297
Installed renewables - Wind - Constrained land use assumptions (MW)	1,291	2,730	9,634	13,133	15,301	16,157	18,496
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	7.15
Capital invested - Wind - Base (billion \$2018)		0.668	8.7	6.39	4.89	2.47	3.24

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	2,042	2,042	2,042	2,042	2,042	2,042	18,184
Wind - Base land use assumptions (GWh)	1,617	2,948	21,310	35,224	46,069	51,530	59,186
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	4,085	4,085	4,085	25,752	34,830	44,503	76,079
Wind - Constrained land use assumptions (GWh)	7,126	15,214	49,826	65,862	75,327	78,528	87,375
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)							-707
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-140
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,919
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-5.38
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-9.92
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-116
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-1,189
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-101
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,568
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-6,755
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-1,060
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-489
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-5,260

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Improve plantations (1000 tCO <sub>2</sub> e/y)							-7.89
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)							-19.8
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)							-224
Carbon sink potential - Mid - Reforest cropland (1000 tCO <sub>2</sub> e/y)							-1,783
Carbon sink potential - Mid - Reforest pasture (1000 tCO <sub>2</sub> e/y)							-715
Carbon sink potential - Mid - Restore productivity (1000 tCO <sub>2</sub> e/y)							-3,109
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)							-12,667
Carbon sink potential - High - Accelerate regeneration (1000 tCO <sub>2</sub> e/y)							-1,412
Carbon sink potential - High - Avoid deforestation (1000 tCO <sub>2</sub> e/y)							-838
Carbon sink potential - High - Extend rotation length (1000 tCO <sub>2</sub> e/y)							-7,600
Carbon sink potential - High - Improve plantations (1000 tCO <sub>2</sub> e/y)							-10.6
Carbon sink potential - High - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)							-29.8
Carbon sink potential - High - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)							-332
Carbon sink potential - High - Reforest cropland (1000 tCO <sub>2</sub> e/y)							-2,378
Carbon sink potential - High - Reforest pasture (1000 tCO <sub>2</sub> e/y)							-1,329
Carbon sink potential - High - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)							-18,580
Carbon sink potential - High - Restore productivity (1000 tCO <sub>2</sub> e/y)							-4,651
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							116
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							106
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,485
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							1.95
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)							16.6
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							78.6
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							6.55
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							933



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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							2,743
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							173
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							110
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							2,680
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							2.93
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)							24.1
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							118
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							47.3
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,879
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							5,034
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							231
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							113
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							3,876
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							3.9
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)							31.5
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							157
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							37.8
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,542
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							5,992

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO <sub>2</sub> e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO <sub>2</sub> e/y)							-184
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO <sub>2</sub> e/y)							-7.84
Carbon sink potential - Moderate deployment - Total (1000 tCO <sub>2</sub> e/y)							-192
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO <sub>2</sub> e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO <sub>2</sub> e/y)							-360
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO <sub>2</sub> e/y)							-15.7
Carbon sink potential - Aggressive deployment - Total (1000 tCO <sub>2</sub> e/y)							-376
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							329
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							12.1
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							341
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							646
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							24.1
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							670

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)		17.8	0.021	0.021	0.018	0.012	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		4.69	3.19	2.81	3.24	2.4	0.758
Premature deaths from air pollution - Mobile - On-Road (deaths)		83.8	81.5	64.3	38.3	18	7.23
Premature deaths from air pollution - Gas Stations (deaths)		3.94	3.78	3	1.9	1.04	0.599

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		16.6	15.9	12.3	7.43	3.73	1.49
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.075	0.068	0.054	0.039	0.028	0.019
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.626	0.623	0.533	0.39	0.241	0.134
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.053	0.053	0.052	0.051	0.05	0.048
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		5.19	4.84	3.82	2.47	1.34	0.6
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.423	0.351	0.286	0.224	0.165	0.11
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.842	0.734	0.62	0.499	0.376	0.253
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.161	0.025	0.024	0.022	0.021	0.007
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		21.7	21.5	21.7	18.8	16	12.1
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		158	0.183	0.183	0.163	0.107	0
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		41.6	28.3	24.9	28.7	21.3	6.72
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		745	724	572	341	160	64.3
Monetary damages from air pollution - Gas Stations (million \$2019)		34.9	33.5	26.6	16.8	9.17	5.31
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		147	141	109	65.8	33.1	13.2
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		0.668	0.6	0.479	0.347	0.244	0.165
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		5.55	5.52	4.73	3.46	2.13	1.19
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		0.473	0.47	0.463	0.453	0.439	0.422
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		46	42.9	33.8	21.9	11.9	5.31
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		3.75	3.11	2.54	1.98	1.46	0.971
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		7.46	6.49	5.48	4.42	3.33	2.24
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		1.42	0.223	0.213	0.193	0.184	0.062

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		192	191	192	167	142	108

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		4.81	24.3	13.9	9.5	6.25	17.3
By economic sector - Construction (jobs)		6,154	6,789	7,149	7,840	7,038	6,871
By economic sector - Manufacturing (jobs)		4,165	4,200	4,551	4,308	3,193	3,010
By economic sector - Mining (jobs)		4,911	3,555	2,810	1,969	1,387	903
By economic sector - Other (jobs)		690	764	832	973	1,045	1,374
By economic sector - Pipeline (jobs)		409	372	345	289	233	187
By economic sector - Professional (jobs)		3,227	3,363	3,429	3,675	3,402	3,451
By economic sector - Trade (jobs)		3,059	2,781	2,718	2,701	2,492	2,562
By economic sector - Utilities (jobs)		4,885	6,161	6,798	8,134	6,777	5,354
By resource sector - Biomass (jobs)		16.8	62.4	47.5	35.5	24.5	72
By resource sector - CO2 (jobs)		0	0	0	0	0	57
By resource sector - Coal (jobs)		2,598	1,040	528	459	414	351
By resource sector - Grid (jobs)		6,654	9,922	11,799	14,331	11,520	9,275
By resource sector - Natural Gas (jobs)		5,007	4,626	4,268	4,170	3,706	2,540
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		6,801	5,928	5,041	3,591	2,673	1,833
By resource sector - Solar (jobs)		5,299	4,782	4,742	5,096	5,441	7,977
By resource sector - Wind (jobs)		1,129	1,652	2,217	2,215	1,794	1,625
By education level - All sectors - High school diploma or less (jobs)		11,573	11,774	12,110	12,672	10,815	10,045
By education level - All sectors - Associates degree or some college (jobs)		8,394	8,704	8,993	9,540	8,196	7,623
By education level - All sectors - Bachelors degree (jobs)		5,924	5,912	5,922	6,025	5,125	4,719
By education level - All sectors - Masters or professional degree (jobs)		1,414	1,424	1,425	1,464	1,261	1,172
By education level - All sectors - Doctoral degree (jobs)		200	198	194	197	175	170
Related work experience - All sectors - None (jobs)		3,890	4,011	4,122	4,339	3,723	3,459
Related work experience - All sectors - Up to 1 year (jobs)		5,411	5,473	5,619	5,868	5,029	4,750
Related work experience - All sectors - 1 to 4 years (jobs)		10,081	10,218	10,416	10,836	9,262	8,558
Related work experience - All sectors - 4 to 10 years (jobs)		6,392	6,548	6,689	6,996	5,985	5,519
Related work experience - All sectors - Over 10 years (jobs)		1,731	1,762	1,797	1,859	1,573	1,443
On-the-Job Training - All sectors - None (jobs)		1,507	1,509	1,524	1,569	1,352	1,284
On-the-Job Training - All sectors - Up to 1 year (jobs)		18,340	18,523	18,894	19,583	16,690	15,493
On-the-Job Training - All sectors - 1 to 4 years (jobs)		5,676	5,884	6,058	6,411	5,498	5,067
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,719	1,830	1,897	2,057	1,796	1,662
On-the-Job Training - All sectors - Over 10 years (jobs)		263	266	271	278	237	225
On-Site or In-Plant Training - All sectors - None (jobs)		4,382	4,454	4,538	4,719	4,052	3,813
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		16,673	16,848	17,194	17,846	15,212	14,101

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

Item	2020	2025	2030	2035	2040	2045	2050
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		4,436	4,582	4,714	4,974	4,261	3,931
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,798	1,894	1,952	2,093	1,819	1,674
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		218	234	245	265	229	211
Wage income - All (million \$2019)		1,479	1,522	1,567	1,650	1,424	1,318

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	304	290	260	223	188	168	161
Final energy use - Residential (PJ)	126	122	118	106	90.4	79.2	72.3
Final energy use - Commercial (PJ)	103	103	101	94.8	87.6	82.5	80.3
Final energy use - Industry (PJ)	86.5	89.3	90.2	96.9	111	116	122

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)		1.72	1.81	3.2	3.44	3.67	3.91

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	48.6	240	431	1,101	1,770	2,306	2,841
Vehicle stocks - LDV – All others (1000 units)	2,369	2,255	2,142	1,561	980	554	129
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		449	1,171	1,866	2,839	3,076	2,940
Public EV charging plugs - DC Fast (1000 units)	0.174		0.748		3.07		4.93
Public EV charging plugs - L2 (1000 units)	1.07		18		73.9		119

Table 43: *E+RE- scenario - PILLAR 1: Efficiency/Electrification - Residential*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	3.03	9.9	34.8	79.5	87.6	88.4	88.2
Sales of space heating units - Electric Resistance (%)	3.81	7.35	5.69	2.51	1.97	1.95	1.97
Sales of space heating units - Gas (%)	89.6	73.5	50.6	9.98	2.86	2.43	2.43
Sales of space heating units - Fossil (%)	3.57	9.24	8.91	8.06	7.57	7.25	7.38
Sales of water heating units - Electric Heat Pump (%)	0	1.51	15.7	41.6	46.2	46.5	46.5
Sales of water heating units - Electric Resistance (%)	7.01	15.7	26.3	48.5	52.5	52.7	52.7
Sales of water heating units - Gas Furnace (%)	92.3	82	57.3	9.09	0.535	0	0
Sales of water heating units - Other (%)	0.642	0.79	0.79	0.787	0.779	0.778	0.778
Sales of cooking units - Electric Resistance (%)	37.1	50.5	91.5	99.6	100	100	100
Sales of cooking units - Gas (%)	62.9	49.5	8.47	0.426	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		2.76	3.21				

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 (%)	0.749	8.98	33.5	81.9	90.4	91	91
Sales of space heating units - Electric Resistance (%)	0.855	3.41	4.83	7.94	8.5	8.54	8.55
Sales of space heating units - Gas (%)	98.4	87.4	61.6	10.2	1.06	0.491	0.49
Sales of space heating units - Fossil (%)	0	0.208	0.04	0.002	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.008	1.61	16.7	45	50	50.3	50.3
Sales of water heating units - Electric Resistance (%)	0.41	2.69	16.3	44.1	49	49.3	49.3
Sales of water heating units - Gas (%)	99.5	95.3	66.6	10.6	0.622	0	0
Sales of water heating units - Other (%)	0.1	0.381	0.381	0.382	0.381	0.381	0.381
Sales of cooking units - Electric Resistance (%)	41.9	54.6	83	88.6	88.9	88.9	88.9
Sales of cooking units - Gas (%)	58.1	45.4	17	11.4	11.1	11.1	11.1
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		7,533	8,381				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	4,894	3,250	0	0	0	0	0
Installed thermal - Natural gas (MW)	2,926	2,933	4,654	5,524	6,790	6,910	6,101
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	540	833	1,113	1,450	1,851	2,318	2,871
Installed renewables - Solar - Base land use assumptions (MW)	2,257	3,429	4,275	4,632	5,170	6,025	6,025
Installed renewables - Wind - Base land use assumptions (MW)	547	648	2,256	6,188	9,180	10,692	12,254
Installed renewables - Solar - Constrained land use assumptions (MW)	846	1,192	1,192	1,192	3,836	6,047	6,047
Installed renewables - Wind - Constrained land use assumptions (MW)	1,102	1,672	3,024	7,459	10,294	11,835	12,748
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion \$2018)		1.57	1.01	0.394	0.559	0.839	0
Capital invested - Wind - Base (billion \$2018)		0.149	2.14	4.88	3.54	1.7	1.52
Capital invested - Solar PV - Constrained (billion \$2018)		0.463	0	0	2.75	2.17	0
Capital invested - Wind - Constrained (billion \$2018)		0.838	1.8	5.5	3.35	1.73	0.966

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	5,120	7,580	9,365	10,069	11,200	12,995	12,995
Wind - Base land use assumptions (GWh)	1,617	1,915	6,527	17,598	25,700	29,753	33,712
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	2,203	2,914	2,914	2,914	8,694	13,579	13,579
Wind - Constrained land use assumptions (GWh)	3,189	4,803	8,587	19,993	26,629	30,153	32,202
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 tCO <sub>2</sub> e/y)							-707
Carbon sink potential - Low - Avoid deforestation (1000 tCO <sub>2</sub> e/y)							-140
Carbon sink potential - Low - Extend rotation length (1000 tCO <sub>2</sub> e/y)							-2,919
Carbon sink potential - Low - Improve plantations (1000 tCO <sub>2</sub> e/y)							-5.38
Carbon sink potential - Low - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)							-9.92
Carbon sink potential - Low - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)							-116
Carbon sink potential - Low - Reforest cropland (1000 tCO <sub>2</sub> e/y)							-1,189
Carbon sink potential - Low - Reforest pasture (1000 tCO <sub>2</sub> e/y)							-101
Carbon sink potential - Low - Restore productivity (1000 tCO <sub>2</sub> e/y)							-1,568
Carbon sink potential - Low - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)							-6,755
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO <sub>2</sub> e/y)							-1,060
Carbon sink potential - Mid - Avoid deforestation (1000 tCO <sub>2</sub> e/y)							-489
Carbon sink potential - Mid - Extend rotation length (1000 tCO <sub>2</sub> e/y)							-5,260
Carbon sink potential - Mid - Improve plantations (1000 tCO <sub>2</sub> e/y)							-7.89
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)							-19.8
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)							-224
Carbon sink potential - Mid - Reforest cropland (1000 tCO <sub>2</sub> e/y)							-1,783
Carbon sink potential - Mid - Reforest pasture (1000 tCO <sub>2</sub> e/y)							-715
Carbon sink potential - Mid - Restore productivity (1000 tCO <sub>2</sub> e/y)							-3,109
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)							-12,667
Carbon sink potential - High - Accelerate regeneration (1000 tCO <sub>2</sub> e/y)							-1,412
Carbon sink potential - High - Avoid deforestation (1000 tCO <sub>2</sub> e/y)							-838
Carbon sink potential - High - Extend rotation length (1000 tCO <sub>2</sub> e/y)							-7,600
Carbon sink potential - High - Improve plantations (1000 tCO <sub>2</sub> e/y)							-10.6
Carbon sink potential - High - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)							-29.8
Carbon sink potential - High - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)							-332
Carbon sink potential - High - Reforest cropland (1000 tCO <sub>2</sub> e/y)							-2,378
Carbon sink potential - High - Reforest pasture (1000 tCO <sub>2</sub> e/y)							-1,329
Carbon sink potential - High - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)							-18,580
Carbon sink potential - High - Restore productivity (1000 tCO <sub>2</sub> e/y)							-4,651

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							116
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							106
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,485
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							1.95
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)							16.6
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							78.6
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							6.55
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							933
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							2,743
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							173
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							110
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							2,680
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							2.93
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)							24.1
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							118
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							47.3
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,879
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							5,034
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							231
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							113



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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							3,876
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							3.9
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)							31.5
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							157
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							37.8
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,542
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							5,992

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO <sub>2</sub> e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO <sub>2</sub> e/y)							-184
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO <sub>2</sub> e/y)							-7.84
Carbon sink potential - Moderate deployment - Total (1000 tCO <sub>2</sub> e/y)							-192
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO <sub>2</sub> e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO <sub>2</sub> e/y)							-360
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO <sub>2</sub> e/y)							-15.7
Carbon sink potential - Aggressive deployment - Total (1000 tCO <sub>2</sub> e/y)							-376
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							329
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							12.1
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							341

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							646
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							24.1
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							670

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)		17.8	0.021	0.021	0.018	0.012	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		4.53	2.69	1.98	1.59	1	0.951
Premature deaths from air pollution - Mobile - On-Road (deaths)		85.1	89.6	90.6	84.5	69.4	49.1
Premature deaths from air pollution - Gas Stations (deaths)		4.01	4.21	4.23	3.95	3.28	2.4
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		16.7	16.8	16.6	15.4	12.8	9.15
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.078	0.076	0.071	0.063	0.054	0.045
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.631	0.673	0.711	0.702	0.611	0.48
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.053	0.053	0.052	0.051	0.05	0.048
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		5.21	5.24	5.16	4.79	4.06	3.09
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.423	0.377	0.337	0.299	0.261	0.224
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.842	0.787	0.727	0.66	0.588	0.516
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.187	0.026	0.026	0.025	0.024	0.022
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		21.4	19.9	17.7	15.9	14.3	10.3
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		158	0.183	0.183	0.163	0.107	0
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		40.1	23.8	17.5	14.1	8.86	8.42
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		757	796	806	751	617	436
Monetary damages from air pollution - Gas Stations (million \$2019)		35.5	37.3	37.5	34.9	29	21.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		148	149	147	137	113	81.1
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		0.691	0.676	0.629	0.555	0.48	0.402
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		5.59	5.96	6.3	6.22	5.41	4.25
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		0.473	0.47	0.463	0.453	0.439	0.422
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		46.1	46.4	45.6	42.4	35.9	27.4
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		3.75	3.34	2.99	2.64	2.31	1.98
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		7.46	6.96	6.43	5.84	5.21	4.56
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		1.65	0.228	0.228	0.221	0.21	0.196
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		190	177	157	141	127	91

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		4.69	6.56	2.45	1.81	1.51	1.33
By economic sector - Construction (jobs)		4,748	6,728	5,694	5,098	5,338	6,838
By economic sector - Manufacturing (jobs)		3,843	5,127	4,339	3,445	3,570	3,890
By economic sector - Mining (jobs)		4,891	3,407	2,581	1,959	1,454	862
By economic sector - Other (jobs)		470	640	629	658	760	1,367
By economic sector - Pipeline (jobs)		399	348	302	267	224	159
By economic sector - Professional (jobs)		2,733	3,440	2,934	2,731	2,939	3,834
By economic sector - Trade (jobs)		2,767	2,768	2,423	2,222	2,244	2,763
By economic sector - Utilities (jobs)		3,872	6,954	4,905	3,957	4,300	4,763
By resource sector - Biomass (jobs)		18.6	17.7	8.3	7.61	6.97	6.28
By resource sector - CO2 (jobs)		0	0	0	0	0	51.8
By resource sector - Coal (jobs)		2,667	1,041	532	465	418	369
By resource sector - Grid (jobs)		4,640	12,081	8,577	6,510	7,295	8,514
By resource sector - Natural Gas (jobs)		4,790	3,776	2,791	2,413	2,018	1,403
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		6,829	6,068	5,411	4,764	4,011	2,432
By resource sector - Solar (jobs)		3,430	3,435	3,688	3,806	4,202	7,982
By resource sector - Wind (jobs)		1,356	3,000	2,802	2,372	2,880	3,719
By education level - All sectors - High school diploma or less (jobs)		9,939	12,365	10,043	8,560	8,762	10,286
By education level - All sectors - Associates degree or some college (jobs)		7,157	9,167	7,380	6,309	6,531	7,808
By education level - All sectors - Bachelors degree (jobs)		5,220	6,203	5,020	4,288	4,334	4,968
By education level - All sectors - Masters or professional degree (jobs)		1,239	1,483	1,198	1,033	1,052	1,231
By education level - All sectors - Doctoral degree (jobs)		175	200	167	149	152	184

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

Item	2020	2025	2030	2035	2040	2045	2050
Related work experience - All sectors - None (jobs)		3,334	4,206	3,397	2,907	2,988	3,532
Related work experience - All sectors - Up to 1 year (jobs)		4,642	5,747	4,689	4,006	4,118	4,928
Related work experience - All sectors - 1 to 4 years (jobs)		8,740	10,724	8,674	7,413	7,570	8,826
Related work experience - All sectors - 4 to 10 years (jobs)		5,510	6,876	5,545	4,739	4,856	5,688
Related work experience - All sectors - Over 10 years (jobs)		1,505	1,865	1,503	1,272	1,298	1,502
On-the-Job Training - All sectors - None (jobs)		1,304	1,567	1,279	1,100	1,120	1,336
On-the-Job Training - All sectors - Up to 1 year (jobs)		15,928	19,510	15,822	13,490	13,780	16,090
On-the-Job Training - All sectors - 1 to 4 years (jobs)		4,843	6,175	4,963	4,239	4,366	5,161
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,430	1,888	1,515	1,313	1,366	1,652
On-the-Job Training - All sectors - Over 10 years (jobs)		226	278	229	195	199	237
On-Site or In-Plant Training - All sectors - None (jobs)		3,774	4,665	3,790	3,247	3,333	3,973
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		14,469	17,738	14,373	12,252	12,514	14,607
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		3,793	4,811	3,875	3,308	3,402	4,011
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,511	1,957	1,572	1,360	1,404	1,672
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		183	247	198	170	178	213
Wage income - All (million \$2019)		1,284	1,597	1,300	1,122	1,156	1,351

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	304	292	270	253	241	225	207
Final energy use - Residential (PJ)	126	122	121	118	114	105	94.6
Final energy use - Commercial (PJ)	103	103	103	102	99.5	96.4	92.8
Final energy use - Industry (PJ)	86.5	89.4	90.4	97.9	112	117	124

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)		1.43	1.48	1.97	2.07	2.75	2.92

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	37.7	93.7	150	410	669	1,244	1,819
Vehicle stocks - LDV – All others (1000 units)	2,378	2,378	2,378	2,256	2,134	1,644	1,155
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		0	76.1	152	522	1,618	2,366
Public EV charging plugs - DC Fast (1000 units)	0.174		0.26		1.16		3.16
Public EV charging plugs - L2 (1000 units)	1.07		6.25		27.9		75.9

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 (%)	3.03	8.14	10.8	19.7	39.7	63.6	77.1
Sales of space heating units - Electric Resistance (%)	3.81	7.45	7.24	6.69	5.41	3.74	2.75
Sales of space heating units - Gas (%)	89.6	75.1	72.6	64.6	46.5	25	12.6
Sales of space heating units - Fossil (%)	3.57	9.27	9.34	9.11	8.39	7.66	7.61
Sales of water heating units - Electric Heat Pump (%)	0	0.562	2.11	7.14	18.6	32.3	40.2
Sales of water heating units - Electric Resistance (%)	7.01	15.2	16.4	20.2	29.3	40.6	47.3
Sales of water heating units - Gas Furnace (%)	92.3	83.4	80.7	71.9	51.3	26.3	11.8
Sales of water heating units - Other (%)	0.642	0.79	0.789	0.787	0.783	0.781	0.778
Sales of cooking units - Electric Resistance (%)	36.9	38.5	44.3	59.5	80.7	93.8	98.3
Sales of cooking units - Gas (%)	63.1	61.5	55.7	40.5	19.3	6.23	1.68
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		2.75	3.16				

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 (%)	0.749	7.59	10.3	19	39.5	64.5	79
Sales of space heating units - Electric Resistance (%)	0.855	3.35	3.5	4.01	5.26	6.85	7.79
Sales of space heating units - Gas (%)	98.4	88.8	86	76.8	55.2	28.6	13.2
Sales of space heating units - Fossil (%)	0	0.241	0.225	0.172	0.092	0.04	0.021
Sales of water heating units - Electric Heat Pump (%)	0.008	0.63	2.29	7.68	20	34.8	43.4
Sales of water heating units - Electric Resistance (%)	0.41	2	3.48	8.38	19.9	34.2	42.5
Sales of water heating units - Gas (%)	99.5	97	93.8	83.6	59.7	30.6	13.7
Sales of water heating units - Other (%)	0.1	0.381	0.381	0.382	0.381	0.381	0.381
Sales of cooking units - Electric Resistance (%)	41.9	46.2	50.2	60.8	75.4	84.6	87.8
Sales of cooking units - Gas (%)	58.1	53.8	49.8	39.2	24.6	15.4	12.2
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		7,532	8,365				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	4,894	3,250	0	0	0	0	0
Installed thermal - Natural gas (MW)	2,926	2,930	3,381	3,375	3,378	2,661	3,645
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Capital invested - Biomass power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	0	0	0	0	0

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel (quantity)	0	0	0	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	0
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0
Conversion capital investment - Cumulative 5-yr (million \$2018)		0	0	0	0	0	0
Biomass purchases (million \$2018/y)		0	0	0	0	0	0

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

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

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

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

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO <sub>2</sub> e/y)							-707
Carbon sink potential - Low - Avoid deforestation (1000 tCO <sub>2</sub> e/y)							-140
Carbon sink potential - Low - Extend rotation length (1000 tCO <sub>2</sub> e/y)							-2,919
Carbon sink potential - Low - Improve plantations (1000 tCO <sub>2</sub> e/y)							-5.38
Carbon sink potential - Low - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)							-9.92
Carbon sink potential - Low - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)							-116
Carbon sink potential - Low - Reforest cropland (1000 tCO <sub>2</sub> e/y)							-1,189
Carbon sink potential - Low - Reforest pasture (1000 tCO <sub>2</sub> e/y)							-101
Carbon sink potential - Low - Restore productivity (1000 tCO <sub>2</sub> e/y)							-1,568
Carbon sink potential - Low - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)							-6,755
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO <sub>2</sub> e/y)							-1,060
Carbon sink potential - Mid - Avoid deforestation (1000 tCO <sub>2</sub> e/y)							-489
Carbon sink potential - Mid - Extend rotation length (1000 tCO <sub>2</sub> e/y)							-5,260
Carbon sink potential - Mid - Improve plantations (1000 tCO <sub>2</sub> e/y)							-7.89
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)							-19.8
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)							-224
Carbon sink potential - Mid - Reforest cropland (1000 tCO <sub>2</sub> e/y)							-1,783
Carbon sink potential - Mid - Reforest pasture (1000 tCO <sub>2</sub> e/y)							-715
Carbon sink potential - Mid - Restore productivity (1000 tCO <sub>2</sub> e/y)							-3,109
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)							-12,667
Carbon sink potential - High - Accelerate regeneration (1000 tCO <sub>2</sub> e/y)							-1,412
Carbon sink potential - High - Avoid deforestation (1000 tCO <sub>2</sub> e/y)							-838
Carbon sink potential - High - Extend rotation length (1000 tCO <sub>2</sub> e/y)							-7,600
Carbon sink potential - High - Improve plantations (1000 tCO <sub>2</sub> e/y)							-10.6
Carbon sink potential - High - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)							-29.8
Carbon sink potential - High - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)							-332
Carbon sink potential - High - Reforest cropland (1000 tCO <sub>2</sub> e/y)							-2,378
Carbon sink potential - High - Reforest pasture (1000 tCO <sub>2</sub> e/y)							-1,329
Carbon sink potential - High - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)							-18,580
Carbon sink potential - High - Restore productivity (1000 tCO <sub>2</sub> e/y)							-4,651

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							116
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							106
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,485
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							1.95
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)							16.6
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							78.6
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							6.55
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							933
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							2,743
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							173
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							110
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							2,680
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							2.93
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)							24.1
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							118
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							47.3
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,879
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							5,034
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							231
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							113



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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							3,876
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							3.9
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)							31.5
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							157
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							37.8
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,542
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							5,992

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO <sub>2</sub> e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO <sub>2</sub> e/y)							-184
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO <sub>2</sub> e/y)							-7.84
Carbon sink potential - Moderate deployment - Cropland to woody energy crops (1000 tCO <sub>2</sub> e/y)							0
Carbon sink potential - Moderate deployment - Pasture to energy crops (1000 tCO <sub>2</sub> e/y)							0
Carbon sink potential - Moderate deployment - Total (1000 tCO <sub>2</sub> e/y)							-192
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO <sub>2</sub> e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO <sub>2</sub> e/y)							-360
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO <sub>2</sub> e/y)							-15.7
Carbon sink potential - Aggressive deployment - Cropland to woody energy crops (1000 tCO <sub>2</sub> e/y)							0
Carbon sink potential - Aggressive deployment - Pasture to energy crops (1000 tCO <sub>2</sub> e/y)							0
Carbon sink potential - Aggressive deployment - Total (1000 tCO <sub>2</sub> e/y)							-376

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							329
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							12.1
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)							0.002
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)							1.05
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							342
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							1,595
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							24.1
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)							0.002
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)							1.05
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							1,620

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)		22.9	17.5	8.4	6.75	6.34	5.97
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		4.17	3.81	6.36	4.38	6.11	5.78
Premature deaths from air pollution - Mobile - On-Road (deaths)		85.1	90.8	96.6	103	109	115
Premature deaths from air pollution - Gas Stations (deaths)		4	4.25	4.49	4.76	5.03	5.28
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		16.6	16.9	17.3	17.8	18.4	19.1
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.082	0.081	0.075	0.068	0.064	0.062
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.623	0.676	0.743	0.81	0.857	0.9
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.056	0.058	0.06	0.062	0.063	0.064

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		5.26	5.35	5.12	4.79	4.65	4.77
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.442	0.445	0.455	0.465	0.476	0.488
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.88	0.933	0.988	1.04	1.09	1.14
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.502	0.337	0.265	0.253	0.245	0.23
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		21.5	23.3	24.5	24	24.4	23.3
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		203	155	74.5	59.9	56.2	52.9
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		36.9	33.8	56.3	38.8	54.1	51.2
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		757	808	859	914	969	1,026
Monetary damages from air pollution - Gas Stations (million \$2019)		35.4	37.6	39.8	42.2	44.5	46.8
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		147	150	153	158	163	169
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		0.722	0.722	0.669	0.603	0.565	0.548
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		5.52	5.99	6.58	7.18	7.59	7.98
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		0.494	0.514	0.532	0.547	0.56	0.569
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		46.6	47.4	45.3	42.4	41.2	42.2
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		3.91	3.94	4.03	4.12	4.22	4.32
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		7.79	8.26	8.75	9.2	9.63	10.1
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		4.43	2.97	2.33	2.24	2.17	2.03
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		191	207	217	213	217	207

Table 65: REF scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		4.45	3.98	3.94	3.21	3.2	3.47
By economic sector - Construction (jobs)		3,139	4,488	4,568	5,817	5,430	6,200
By economic sector - Manufacturing (jobs)		2,632	3,249	3,750	3,910	3,134	3,141
By economic sector - Mining (jobs)		5,534	4,363	3,505	2,796	2,330	1,855

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Other (jobs)		135	436	500	647	683	1,134
By economic sector - Pipeline (jobs)		409	423	429	409	411	399
By economic sector - Professional (jobs)		2,271	2,575	2,473	2,876	2,714	3,154
By economic sector - Trade (jobs)		2,601	2,560	2,341	2,467	2,352	2,683
By economic sector - Utilities (jobs)		3,929	3,932	3,626	5,451	4,705	4,180
By resource sector - Biomass (jobs)		17.1	16	14.9	13.3	13.6	13.9
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Coal (jobs)		3,785	2,533	1,533	945	727	621
By resource sector - Grid (jobs)		4,677	4,727	4,402	8,652	6,908	6,186
By resource sector - Natural Gas (jobs)		4,962	5,100	5,104	4,747	4,869	4,280
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		6,856	6,133	5,554	5,052	4,669	4,081
By resource sector - Solar (jobs)			2,624	3,194	3,380	3,533	6,498
By resource sector - Wind (jobs)		356	897	1,393	1,588	1,043	1,067
By education level - All sectors - High school diploma or less (jobs)		8,651	9,248	8,916	10,321	9,202	9,630
By education level - All sectors - Associates degree or some college (jobs)		6,129	6,675	6,476	7,597	6,790	7,144
By education level - All sectors - Bachelors degree (jobs)		4,621	4,800	4,568	5,077	4,527	4,669
By education level - All sectors - Masters or professional degree (jobs)		1,101	1,145	1,082	1,214	1,090	1,138
By education level - All sectors - Doctoral degree (jobs)		151	162	153	167	154	168
Related work experience - All sectors - None (jobs)		2,881	3,110	3,007	3,503	3,139	3,295
Related work experience - All sectors - Up to 1 year (jobs)		3,974	4,280	4,130	4,754	4,228	4,492
Related work experience - All sectors - 1 to 4 years (jobs)		7,714	8,129	7,783	8,905	7,959	8,279
Related work experience - All sectors - 4 to 10 years (jobs)		4,780	5,122	4,933	5,685	5,082	5,288
Related work experience - All sectors - Over 10 years (jobs)		1,304	1,389	1,343	1,529	1,354	1,395
On-the-Job Training - All sectors - None (jobs)		1,113	1,195	1,146	1,293	1,158	1,236
On-the-Job Training - All sectors - Up to 1 year (jobs)		13,970	14,742	14,159	16,135	14,365	14,978
On-the-Job Training - All sectors - 1 to 4 years (jobs)		4,177	4,527	4,373	5,126	4,585	4,782
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,213	1,360	1,314	1,594	1,451	1,536
On-the-Job Training - All sectors - Over 10 years (jobs)		180	205	203	228	203	217
On-Site or In-Plant Training - All sectors - None (jobs)		3,199	3,473	3,361	3,837	3,426	3,629
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		12,724	13,407	12,863	14,685	13,077	13,622
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		3,280	3,542	3,420	3,996	3,572	3,726
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,296	1,434	1,382	1,651	1,501	1,576
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		154	173	170	206	186	195
Wage income - All (million \$2019)		1,141	1,212	1,172	1,358	1,230	1,282

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	304	294	276	267	271	282	297

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Residential (PJ)	126	123	123	125	127	130	132
Final energy use - Commercial (PJ)	103	105	107	106	106	108	113
Final energy use - Industry (PJ)	86.4	92	95.3	99.3	105	112	121

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)		1.54	1.6	1.88	1.97	2.43	2.57

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	2.42	11.3	11.7	12.3	12.7	13	13.3
Sales of space heating units - Electric Resistance (%)	3.86	7.17	7.1	7.05	7.03	6.83	6.47
Sales of space heating units - Gas (%)	90.1	72.4	72	71.5	71.5	71.7	71.5
Sales of space heating units - Fossil (%)	3.61	9.13	9.24	9.18	8.79	8.45	8.65
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	7.01	14.8	14.8	14.8	14.9	14.9	14.9
Sales of water heating units - Gas Furnace (%)	92.3	84.4	84.4	84.4	84.4	84.4	84.3
Sales of water heating units - Other (%)	0.642	0.79	0.789	0.787	0.784	0.782	0.78
Sales of cooking units - Electric Resistance (%)	36.3	36.3	36.3	36.3	36.3	36.3	36.3
Sales of cooking units - Gas (%)	63.7	63.7	63.7	63.7	63.7	63.7	63.7
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		2.68	2.8				

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 (%)	0.749	14.6	48.1	74.1	78.4	78.8	78.8
Sales of space heating units - Electric Resistance (%)	0.855	4.29	8.82	15.6	19.9	20.6	20.7
Sales of space heating units - Gas (%)	98.4	80.9	43	10.2	1.68	0.552	0.49
Sales of space heating units - Fossil (%)	0	0.225	0.13	0.037	0.005	0	0
Sales of water heating units - Electric Heat Pump (%)	0.008	0.03	0.03	0.03	0.03	0.03	0.03
Sales of water heating units - Electric Resistance (%)	0.41	1.46	1.46	1.47	1.46	1.47	1.46
Sales of water heating units - Gas (%)	99.5	98.1	98.1	98.1	98.1	98.1	98.1
Sales of water heating units - Other (%)	0.1	0.381	0.381	0.382	0.381	0.381	0.381
Sales of cooking units - Electric Resistance (%)	41.9	44.7	44.7	44.6	44.4	44.5	44.6
Sales of cooking units - Gas (%)	58.1	55.3	55.3	55.4	55.6	55.5	55.4
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		7,440	7,806				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	4,894	4,316	2,725	878	0	0	0
Installed thermal - Natural gas (MW)	2,926	2,926	3,150	3,726	3,414	3,432	3,955
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	540	833	1,113	1,450	1,851	2,318	2,871

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed renewables - Solar - Base land use assumptions (MW)	768	768	768	768	768	768	768
Installed renewables - Wind - Base land use assumptions (MW)	648	648	1,672	2,726	5,124	6,076	8,504

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	2,042	2,042	2,042	2,042	2,042	2,042	2,042
Wind - Base land use assumptions (GWh)	1,915	1,915	4,866	7,868	14,699	17,313	24,028
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)	-0.72		2.42				0.695
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-0.008		-0.017				-0.018
Business-as-usual carbon sink - Total (Mt CO2e/y)	-0.728		2.41				0.677

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)							-707
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-140
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,919
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-5.38
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-9.92
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-116
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-1,189
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-101
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,568
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-6,755
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-1,060
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-489
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-5,260
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-7.89
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-19.8
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-224
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-1,783

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-715
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-3,109
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-12,667
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-1,412
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-838
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-7,600
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-10.6
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-29.8
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-332
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-2,378
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-1,329
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-18,580
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-4,651
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							116
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							106
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,485
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							1.95
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)							16.6
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							78.6
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							6.55
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							933
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							2,743
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							173
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							110

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							2,680
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							2.93
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)							24.1
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							118
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							47.3
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,879
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							5,034
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							231
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							113
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							3,876
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							3.9
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)							31.5
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							157
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							37.8
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,542
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							5,992