Net-Zero America - Idaho data

October 29, 2021 (updated November 17, 2023)

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

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

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Table 1: *E+ scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		4.77	0.005	0.005	0.005	0.003	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		1.41	0.8	0.651	0.591	0.39	0.216
Premature deaths from air pollution - Mobile - On-Road (deaths)		14.1	13.5	10.5	6.15	2.81	1.06
Premature deaths from air pollution - Gas Stations (deaths)		2.74	2.6	2.03	1.23	0.617	0.3
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		2.49	2.22	1.63	0.955	0.473	0.188
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.136	0.124	0.087	0.046	0.022	0.01
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.29	0.275	0.224	0.156	0.091	0.047
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.043	0.041	0.04	0.038	0.036	0.034
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		1.7	1.58	1.24	0.806	0.448	0.213
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.257	0.209	0.166	0.128	0.092	0.06
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.201	0.173	0.144	0.114	0.085	0.057
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.111	0.013	0.012	0.011	0.01	0.009
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		8.7	8.29	7.62	6	4.5	2.81
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		42.3	0.049	0.049	0.042	0.027	0
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		12.5	7.09	5.76	5.23	3.46	1.91
Monetary damages from air pollution - Mobile - On-Road (million $2019)		125	120	93.3	54.7	25	9.4
Monetary damages from air pollution - Gas Stations (million $2019)		24.3	23	17.9	10.9	5.47	2.66
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		22.1	19.7	14.4	8.46	4.19	1.67
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		1.2	1.1	0.767	0.404	0.194	0.087
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		2.57	2.44	1.99	1.38	0.805	0.416
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		0.378	0.367	0.353	0.338	0.321	0.303
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		15.1	14	11	7.14	3.96	1.88

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)		2.27	1.85	1.47	1.13	0.817	0.533
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		1.78	1.53	1.27	1.01	0.754	0.503
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		0.98	0.118	0.108	0.095	0.086	0.083
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		77.3	73.6	67.6	53.3	39.9	25

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		143	185	130	77.8	26	64.7
By economic sector - Construction (jobs)		2,764	4,218	4,697	5,162	5,696	7,064
By economic sector - Manufacturing (jobs)		829	1,233	1,234	1,158	1,071	1,172
By economic sector - Mining (jobs)		581	414	265	155	83.3	39.4
By economic sector - Other (jobs)		316	454	546	676	810	1,246
By economic sector - Pipeline (jobs)		123	105	133	58.9	37.3	51.3
By economic sector - Professional (jobs)		1,446	2,404	2,739	3,337	3,950	5,122
By economic sector - Trade (jobs)		999	1,406	1,572	1,879	2,231	3,001
By economic sector - Utilities (jobs)		1,869	3,653	3,812	3,973	4,443	5,006
By resource sector - Biomass (jobs)		413	459	309	198	99.6	293
By resource sector - CO2 (jobs)		0	0	419	0	0	236
By resource sector - Coal (jobs)		2.46	0.823	0	0	0	0
By resource sector - Grid (jobs)		2,448	6,108	6,032	7,110	8,065	8,810
By resource sector - Natural Gas (jobs)		922	775	780	569	462	474
By resource sector - Nuclear (jobs)		303	298	173	0	0	0
By resource sector - Oil (jobs)		1,419	1,118	783	500	302	151
By resource sector - Solar (jobs)		1,863	1,783	2,063	2,260	2,450	4,426
By resource sector - Wind (jobs)		1,700	3,528	4,569	5,840	6,969	8,377
By education level - All sectors - High school diploma or less (jobs)		3,835	5,896	6,282	6,742	7,404	9,143
By education level - All sectors - Associates degree or some college (jobs)		2,795	4,443	4,840	5,301	5,933	7,360
By education level - All sectors - Bachelors degree (jobs)		1,893	2,883	3,086	3,397	3,826	4,768
By education level - All sectors - Masters or professional degree (jobs)		474	737	795	893	1,019	1,281
By education level - All sectors - Doctoral degree (jobs)		74.2	113	125	144	167	215
Related work experience - All sectors - None (jobs)		1,307	2,034	2,187	2,371	2,634	3,274
Related work experience - All sectors - Up to 1 year (jobs)		1,850	2,828	3,023	3,271	3,606	4,495
Related work experience - All sectors - 1 to 4 years (jobs)		3,255	5,056	5,431	5,931	6,624	8,218
Related work experience - All sectors - 4 to 10 years (jobs)		2,109	3,298	3,569	3,906	4,372	5,412
Related work experience - All sectors - Over 10 years (jobs)		550	855	917	998	1,112	1,369
On-the-Job Training - All sectors - None (jobs)		510	764	819	895	999	1,258
On-the-Job Training - All sectors - Up to 1 year (jobs)		5,960	9,182	9,809	10,665	11,852	14,720

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

Item	2020	2025	2030	2035	2040	2045	2050
On-the-Job Training - All sectors - 1 to 4 years (jobs)		1,889	2,992	3,251	3,548	3,964	4,891
On-the-Job Training - All sectors - 4 to 10 years (jobs)		623	1,002	1,105	1,215	1,365	1,690
On-the-Job Training - All sectors - Over 10 years (jobs)		88.6	132	143	153	168	208
On-Site or In-Plant Training - All sectors - None (jobs)		1,483	2,282	2,462	2,696	3,012	3,768
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		5,408	8,342	8,914	9,687	10,763	13,353
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		1,466	2,311	2,503	2,727	3,040	3,752
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		636	1,011	1,110	1,217	1,364	1,686
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		76.8	125	137	150	168	207
Wage income - All (million $2019)		468	739	801	883	999	1,250

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

Item	2020	2025	2030	2035	2040	2045	2050
Oil consumption - Annual (million bbls)		31.7	27.2	20.5	14.1	9.1	4.81
Oil consumption - Cumulative (million bbls)							629
Oil production - Annual (million bbls)		0.114	0.114	0.114	0.091	0.074	0.049
Natural gas consumption - Annual (tcf)		86.5	72.9	58.5	44	27.7	19.2
Natural gas consumption - Cumulative (tcf)							1,761
Natural gas production - Annual (tcf)		2.13	2.02	1.76	1.48	1.18	0.915

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	150	141	124	104	85.9	74.5	69.8
Final energy use - Residential (PJ)	71.3	68.1	65.2	58.8	51.1	45.3	41.4
Final energy use - Commercial (PJ)	49	49.1	48.2	46	43.3	41.4	40.7
Final energy use - Industry (PJ)	165	175	179	179	180	185	191

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)		1.28	1.35	2.22	2.38	2.18	2.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	10.1	164	317	854	1,392	1,821	2,250
Vehicle stocks - LDV – All others (1000 units)	1,876	1,787	1,697	1,237	776	439	102
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		361	924	1,498	2,269	2,469	2,354
Public EV charging plugs - DC Fast (1000 units)	0.066		0.688		3.02		4.88
Public EV charging plugs - L2 (1000 units)	0.128		16.6		72.7		118

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 (%)	9.46	20.4	40.3	80.7	88.3	89	88.8
Sales of space heating units - Electric Resistance (%)	10.7	17	13.5	5.83	4.48	4.43	4.48
Sales of space heating units - Gas (%)	73.4	52.1	37	7.24	1.97	1.65	1.64
Sales of space heating units - Fossil (%)	6.36	10.6	9.29	6.2	5.2	4.89	5.13
Sales of water heating units - Electric Heat Pump (%)	0	0.814	11.1	33.7	37.7	38	38
Sales of water heating units - Electric Resistance (%)	21.3	36.7	43.2	57.2	59.8	59.9	59.9
Sales of water heating units - Gas Furnace (%)	76.7	60.4	43.6	6.97	0.411	0	0
Sales of water heating units - Other (%)	1.97	2.09	2.1	2.1	2.1	2.1	2.1
Sales of cooking units - Electric Resistance (%)	61.7	69.9	94.8	99.7	100	100	100
Sales of cooking units - Gas (%)	38.3	30.1	5.15	0.259	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		1.25	1.37				

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 (%)	3.53	8.34	31.3	81.3	90.2	90.7	90.8
Sales of space heating units - Electric Resistance (%)	3.3	3.52	4.98	8.12	8.7	8.74	8.73
Sales of space heating units - Gas (%)	92.1	87.9	63.7	10.6	1.11	0.511	0.508
Sales of space heating units - Fossil (%)	1.07	0.221	0.042	0.002	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.03	1.08	14.4	43.7	48.9	49.2	49.2
Sales of water heating units - Electric Resistance (%)	1.46	2.52	15.8	44.9	50.1	50.4	50.4
Sales of water heating units - Gas (%)	98.1	96	69.4	11.1	0.657	0	0
Sales of water heating units - Other (%)	0.366	0.384	0.383	0.384	0.383	0.384	0.383
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)		4,239	4,716				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	6.2	6.2	0	0	0	0	0
Installed thermal - Natural gas (MW)	1,069	1,069	1,069	1,091	1,488	1,136	1,577
Installed thermal - Nuclear (MW)	600	600	600	0	0	0	0
Installed renewables - Rooftop PV (MW)	393	606	810	1,055	1,347	1,687	2,089
Installed renewables - Solar - Base land use assumptions (MW)	1.71	1.71	1.71	1.71	1.71	1.71	1.71
Installed renewables - Wind - Base land use assumptions (MW)	952	952	13,786	18,850	23,115	27,723	28,298
Installed renewables - Wind - Constrained land use assumptions (MW)	1,034	1,034	12,987	18,481	25,008	30,182	30,390
Capital invested - Solar PV - Base (billion $2018)		0	0	0	0	0	0
Capital invested - Wind - Base (billion $2018)		0	17.1	6.28	5.04	5.17	0.609
Capital invested - Solar PV - Constrained (billion $2018)		0.002	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Wind - Constrained (billion $2018)		0	14.8	7.01	7.45	5.78	0.297
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 10: *E+ scenario - PILLAR 2: Clean Electricity - Generation*

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	4.27	4.27	4.27	4.27	4.27	4.27	4.27
Wind - Base land use assumptions (GWh)	3,041	3,041	41,571	55,922	67,439	79,837	81,354
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0
Wind - Constrained land use assumptions (GWh)	3,306	3,306	37,783	52,357	68,321	80,402	80,877
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0
Biomass power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Power (quantity)	0	0	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	3
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	871
Biomass purchases (million $2018/y)		0	0	0	0	0	55.2

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	1.08
Annual - BECCS (MMT)		0	0	0	0	0	1.08
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	1.08
Cumulative - BECCS (MMT)		0	0	0	0	0	1.08
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	177	177	177	177
Spur (km)		0	0	0	0	0	332
All (km)		0	0	177	177	177	508
Cumulative investment - Trunk (million $2018)		0	0	423	423	423	423
Cumulative investment - Spur (million $2018)		0	0	0	0	0	183
Cumulative investment - All (million $2018)		0	0	423	423	423	606

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)							-2,216
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-132
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-1,790
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-148
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-1,420
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-284
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-2,977
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-233
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-2,279
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-11,479
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-3,320
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-463
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-3,224
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-217
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-2,839
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-548
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-4,465
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-1,656

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-4,520
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-21,253
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-4,423
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-793
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-4,659
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-290
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-4,259
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-812
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-5,953
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-3,080
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-31,032
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-6,761
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							362
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							101
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							910
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							53.5
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)							40.6
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							197
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							15.2
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,356
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,035
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							543
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							104
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							1,643

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							80.5
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							58.9
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							295
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							110
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,731
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							5,565
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							724
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							107
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							2,376
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							107
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)							77.2
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							394
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							87.5
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							2,241
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							6,113

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-972
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-31.4
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-1,003

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-1,914
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-62.8
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-1,976
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)							1,168
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							51.8
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,220
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)							2,284
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							104
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							2,387

Table 17: *E- scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		4.77	0.005	0.005	0.005	0.003	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		1.47	0.708	0.47	0.295	0.168	0.125
Premature deaths from air pollution - Mobile - On-Road (deaths)		14.3	14.8	14.7	13.5	10.9	7.6
Premature deaths from air pollution - Gas Stations (deaths)		2.79	2.88	2.84	2.61	2.12	1.51
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		2.5	2.39	2.23	1.99	1.62	1.18
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.138	0.144	0.13	0.105	0.083	0.06
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.292	0.297	0.302	0.29	0.247	0.192
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.043	0.041	0.04	0.038	0.036	0.034
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		1.71	1.73	1.7	1.58	1.34	1.05

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.257	0.224	0.196	0.17	0.145	0.123
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.201	0.185	0.169	0.151	0.133	0.116
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.105	0.014	0.013	0.012	0.01	0.006
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		8.68	7.98	7	6.19	5.53	3.91
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		42.3	0.049	0.049	0.042	0.027	0
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		13	6.27	4.16	2.62	1.49	1.11
Monetary damages from air pollution - Mobile - On-Road (million $2019)		127	131	131	120	97	67.5
Monetary damages from air pollution - Gas Stations (million $2019)		24.7	25.5	25.2	23.1	18.8	13.3
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		22.2	21.2	19.8	17.6	14.3	10.5
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		1.23	1.27	1.15	0.933	0.734	0.535
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		2.59	2.64	2.68	2.57	2.19	1.7
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		0.378	0.367	0.353	0.338	0.321	0.303
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		15.1	15.3	15.1	14	11.9	9.25
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		2.27	1.98	1.73	1.5	1.29	1.09
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		1.78	1.64	1.49	1.34	1.18	1.03
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		0.924	0.12	0.116	0.109	0.088	0.055
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		77.1	70.8	62.2	55	49.1	34.8

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		152	166	123	69	22.1	64.8
By economic sector - Construction (jobs)		2,751	4,286	4,527	4,930	6,275	8,122
By economic sector - Manufacturing (jobs)		836	1,264	1,141	1,134	1,321	1,413
By economic sector - Mining (jobs)		586	433	319	228	154	87
By economic sector - Other (jobs)		316	460	522	654	859	1,357
By economic sector - Pipeline (jobs)		124	104	174	73.1	59.5	90.7
By economic sector - Professional (jobs)		1,450	2,432	2,602	3,217	4,332	5,966

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Trade (jobs)		1,001	1,443	1,542	1,866	2,477	3,486
By economic sector - Utilities (jobs)		1,809	3,670	3,472	3,562	4,952	5,794
By resource sector - Biomass (jobs)		426	403	300	190	94.1	284
By resource sector - CO2 (jobs)		0	0	719	0	0	405
By resource sector - Coal (jobs)		2.46	0.823	0	0	0	0
By resource sector - Grid (jobs)		2,314	6,161	5,080	6,266	9,012	10,130
By resource sector - Natural Gas (jobs)		922	727	715	557	523	469
By resource sector - Nuclear (jobs)		303	298	173	0	0	0
By resource sector - Oil (jobs)		1,435	1,205	1,015	815	615	380
By resource sector - Solar (jobs)		1,871	1,792	2,019	2,225	2,480	4,433
By resource sector - Wind (jobs)		1,750	3,671	4,402	5,679	7,729	10,278
By education level - All sectors - High school diploma or less (jobs)		3,816	5,969	5,990	6,431	8,264	10,569
By education level - All sectors - Associates degree or some college (jobs)		2,775	4,503	4,602	5,037	6,599	8,518
By education level - All sectors - Bachelors degree (jobs)		1,885	2,925	2,952	3,268	4,272	5,552
By education level - All sectors - Masters or professional degree (jobs)		472	746	758	857	1,132	1,490
By education level - All sectors - Doctoral degree (jobs)		74.3	115	120	140	185	250
Related work experience - All sectors - None (jobs)		1,300	2,060	2,085	2,260	2,935	3,787
Related work experience - All sectors - Up to 1 year (jobs)		1,844	2,864	2,881	3,126	4,015	5,192
Related work experience - All sectors - 1 to 4 years (jobs)		3,238	5,124	5,178	5,667	7,388	9,530
Related work experience - All sectors - 4 to 10 years (jobs)		2,096	3,344	3,404	3,727	4,872	6,281
Related work experience - All sectors - Over 10 years (jobs)		546	867	873	953	1,243	1,591
On-the-Job Training - All sectors - None (jobs)		508	775	785	861	1,112	1,455
On-the-Job Training - All sectors - Up to 1 year (jobs)		5,934	9,303	9,350	10,202	13,231	17,063
On-the-Job Training - All sectors - 1 to 4 years (jobs)		1,875	3,032	3,095	3,371	4,411	5,667
On-the-Job Training - All sectors - 4 to 10 years (jobs)		618	1,015	1,054	1,151	1,511	1,954
On-the-Job Training - All sectors - Over 10 years (jobs)		88.4	134	137	147	187	242
On-Site or In-Plant Training - All sectors - None (jobs)		1,478	2,312	2,351	2,580	3,352	4,364
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		5,382	8,453	8,496	9,262	12,015	15,477
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		1,456	2,342	2,383	2,593	3,386	4,346
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		631	1,025	1,061	1,156	1,513	1,953
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		76.1	127	130	142	187	240
Wage income - All (million $2019)		465	749	763	843	1,115	1,452

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	150	142	130	120	112	103	93
Final energy use - Residential (PJ)	71.3	68.1	66.1	64.1	61.5	57.8	53.1
Final energy use - Commercial (PJ)	49	49.1	48.9	48.7	48	47.1	46.1
Final energy use - Industry (PJ)	165	176	181	184	188	193	197

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)		1.09	1.13	1.39	1.45	2.09	2.22

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	7.84	52.9	98.1	307	516	979	1,441
Vehicle stocks - LDV – All others (1000 units)	1,884	1,884	1,884	1,787	1,690	1,302	915
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		0	58.3	123	414	1,303	1,898
Public EV charging plugs - DC Fast (1000 units)	0.066		0.213		1.12		3.13
Public EV charging plugs - L2 (1000 units)	0.128		5.12		27		75.3

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 (%)	9.46	19.2	21.1	27.7	43.3	62.6	73.4
Sales of space heating units - Electric Resistance (%)	10.7	17.2	16.8	15.7	12.9	9.42	7.34
Sales of space heating units - Gas (%)	73.4	53	51.3	46.6	35.6	21.5	13.1
Sales of space heating units - Fossil (%)	6.36	10.7	10.8	9.99	8.15	6.52	6.16
Sales of water heating units - Electric Heat Pump (%)	0	0.373	1.39	4.79	13	23.4	29.5
Sales of water heating units - Electric Resistance (%)	21.3	36.4	37.1	39.3	44.4	50.9	54.7
Sales of water heating units - Gas Furnace (%)	76.7	61.1	59.4	53.8	40.4	23.6	13.6
Sales of water heating units - Other (%)	1.97	2.1	2.1	2.11	2.11	2.11	2.11
Sales of cooking units - Electric Resistance (%)	61.6	62.6	66.1	75.4	88.3	96.2	99
Sales of cooking units - Gas (%)	38.4	37.4	33.9	24.6	11.7	3.79	1.02
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		1.25	1.37				

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 (%)	3.53	7.33	9.61	17.1	35.2	58.2	71.6
Sales of space heating units - Electric Resistance (%)	3.3	3.45	3.58	4.06	5.22	6.69	7.54
Sales of space heating units - Gas (%)	92.1	89	86.6	78.7	59.5	35.1	20.8
Sales of space heating units - Fossil (%)	1.07	0.256	0.242	0.19	0.113	0.063	0.046
Sales of water heating units - Electric Heat Pump (%)	0.03	0.512	1.83	6.23	16.9	30.4	38.3
Sales of water heating units - Electric Resistance (%)	1.46	1.95	3.27	7.65	18.2	31.6	39.5
Sales of water heating units - Gas (%)	98.1	97.2	94.5	85.7	64.5	37.6	21.8
Sales of water heating units - Other (%)	0.366	0.384	0.383	0.384	0.383	0.384	0.383
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)		4,239	4,714				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	6.2	6.2	0	0	0	0	0
Installed thermal - Natural gas (MW)	1,069	1,069	1,069	1,063	1,484	1,136	1,176
Installed thermal - Nuclear (MW)	600	600	600	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)							-2,216
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-132
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-1,790
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-148
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-1,420
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-284
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-2,977
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-233
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-2,279
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-11,479
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-3,320
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-463
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-3,224
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-217
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-2,839
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-548
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-4,465
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-1,656
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-4,520
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-21,253
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-4,423
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-793
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-4,659
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-290
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-4,259
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-812
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-5,953

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-3,080
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-31,032
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-6,761
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							362
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							101
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							910
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							53.5
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)							40.6
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							197
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							15.2
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,356
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,035
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							543
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							104
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							1,643
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							80.5
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							58.9
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							295
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							110
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,731
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							5,565

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							724
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							107
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							2,376
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							107
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)							77.2
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							394
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							87.5
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							2,241
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							6,113

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)							-972
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-31.4
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-1,003
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-1,914
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-62.8
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-1,976
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)							1,168

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							51.8
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,220
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)							2,284
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							104
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							2,387

Table 27: *E+RE+ scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		4.77	0.005	0.005	0.005	0.003	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		1.28	0.659	0.364	0.285	0.169	0.088
Premature deaths from air pollution - Mobile - On-Road (deaths)		14.1	13.5	10.5	6.15	2.81	1.06
Premature deaths from air pollution - Gas Stations (deaths)		2.74	2.6	2.03	1.23	0.617	0.3
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		2.49	2.22	1.63	0.955	0.473	0.188
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.136	0.124	0.087	0.046	0.022	0.01
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.29	0.275	0.224	0.156	0.091	0.047
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.043	0.041	0.04	0.038	0.036	0.034
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		1.7	1.58	1.24	0.806	0.448	0.213
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.257	0.209	0.166	0.128	0.092	0.06
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.201	0.173	0.144	0.114	0.085	0.057
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.127	0.013	0.012	0.011	0.01	0.002
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		8.55	8.16	7.12	5.19	3.2	0.478
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		42.3	0.049	0.049	0.042	0.027	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		11.3	5.84	3.23	2.52	1.5	0.779
Monetary damages from air pollution - Mobile - On-Road (million $2019)		125	120	93.3	54.7	25	9.4
Monetary damages from air pollution - Gas Stations (million $2019)		24.3	23	17.9	10.9	5.47	2.66
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		22.1	19.7	14.4	8.46	4.19	1.67
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		1.2	1.1	0.767	0.404	0.194	0.087
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		2.57	2.44	1.99	1.38	0.805	0.416
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		0.378	0.367	0.353	0.338	0.321	0.303
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		15.1	14	11	7.14	3.96	1.88
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		2.27	1.85	1.47	1.13	0.817	0.533
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		1.78	1.53	1.27	1.01	0.754	0.503
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		1.12	0.118	0.107	0.093	0.085	0.02
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		76	72.5	63.2	46	28.4	4.25

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		143	187	130	73.4	24.1	63.3
By economic sector - Construction (jobs)		2,829	4,369	5,391	7,178	8,263	11,953
By economic sector - Manufacturing (jobs)		913	1,313	1,528	1,726	1,652	2,688
By economic sector - Mining (jobs)		576	406	246	129	46.1	6.33
By economic sector - Other (jobs)		322	469	627	866	1,087	1,783
By economic sector - Pipeline (jobs)		121	101	71	44.8	21.9	8.7
By economic sector - Professional (jobs)		1,488	2,526	3,332	4,712	5,985	8,934
By economic sector - Trade (jobs)		1,017	1,460	1,863	2,572	3,277	5,050
By economic sector - Utilities (jobs)		1,901	3,656	4,262	6,052	6,717	9,774
By resource sector - Biomass (jobs)		398	471	304	190	93.9	295
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Coal (jobs)		2.46	0.823	0	0	0	0
By resource sector - Grid (jobs)		2,519	6,244	7,596	11,269	12,420	18,412
By resource sector - Natural Gas (jobs)		891	780	665	452	379	338
By resource sector - Nuclear (jobs)		303	176	0	0	0	0
By resource sector - Oil (jobs)		1,420	1,106	755	437	160	0.805
By resource sector - Solar (jobs)		1,911	1,844	2,097	2,356	2,582	4,717
By resource sector - Wind (jobs)		1,864	3,867	6,034	8,650	11,439	16,497
By education level - All sectors - High school diploma or less (jobs)		3,934	6,066	7,213	9,529	10,854	16,123

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

Item	2020	2025	2030	2035	2040	2045	2050
By education level - All sectors - Associates degree or some college (jobs)		2,873	4,582	5,588	7,542	8,766	13,035
By education level - All sectors - Bachelors degree (jobs)		1,941	2,965	3,575	4,814	5,683	8,464
By education level - All sectors - Masters or professional degree (jobs)		486	758	927	1,267	1,520	2,266
By education level - All sectors - Doctoral degree (jobs)		76	117	147	202	250	373
Related work experience - All sectors - None (jobs)		1,340	2,094	2,514	3,357	3,873	5,766
Related work experience - All sectors - Up to 1 year (jobs)		1,900	2,913	3,488	4,611	5,299	7,896
Related work experience - All sectors - 1 to 4 years (jobs)		3,340	5,204	6,268	8,413	9,780	14,547
Related work experience - All sectors - 4 to 10 years (jobs)		2,165	3,397	4,120	5,550	6,471	9,600
Related work experience - All sectors - Over 10 years (jobs)		565	879	1,060	1,422	1,649	2,451
On-the-Job Training - All sectors - None (jobs)		522	785	944	1,257	1,468	2,190
On-the-Job Training - All sectors - Up to 1 year (jobs)		6,118	9,452	11,330	15,107	17,491	26,072
On-the-Job Training - All sectors - 1 to 4 years (jobs)		1,939	3,082	3,744	5,049	5,856	8,673
On-the-Job Training - All sectors - 4 to 10 years (jobs)		638	1,033	1,269	1,725	2,012	2,962
On-the-Job Training - All sectors - Over 10 years (jobs)		91.3	136	164	214	246	364
On-Site or In-Plant Training - All sectors - None (jobs)		1,524	2,352	2,845	3,808	4,449	6,626
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		5,551	8,584	10,291	13,728	15,878	23,656
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		1,505	2,380	2,882	3,877	4,486	6,650
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		651	1,042	1,274	1,726	2,011	2,960
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		78.9	129	159	215	249	369
Wage income - All (million $2019)		480	760	923	1,256	1,478	2,225

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	150	141	124	104	85.9	74.5	69.8
Final energy use - Residential (PJ)	71.3	68.1	65.2	58.8	51.1	45.3	41.4
Final energy use - Commercial (PJ)	49	49.1	48.2	46	43.3	41.4	40.7
Final energy use - Industry (PJ)	165	175	179	179	180	185	191

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)		1.28	1.35	2.22	2.38	2.18	2.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	10.1	164	317	854	1,392	1,821	2,250
Vehicle stocks - LDV – All others (1000 units)	1,876	1,787	1,697	1,237	776	439	102

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		361	924	1,498	2,269	2,469	2,354
Public EV charging plugs - DC Fast (1000 units)	0.066		0.688		3.02		4.88
Public EV charging plugs - L2 (1000 units)	0.128		16.6		72.7		118

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 (%)	9.46	20.4	40.3	80.7	88.3	89	88.8
Sales of space heating units - Electric Resistance (%)	10.7	17	13.5	5.83	4.48	4.43	4.48
Sales of space heating units - Gas (%)	73.4	52.1	37	7.24	1.97	1.65	1.64
Sales of space heating units - Fossil (%)	6.36	10.6	9.29	6.2	5.2	4.89	5.13
Sales of water heating units - Electric Heat Pump (%)	0	0.814	11.1	33.7	37.7	38	38
Sales of water heating units - Electric Resistance (%)	21.3	36.7	43.2	57.2	59.8	59.9	59.9
Sales of water heating units - Gas Furnace (%)	76.7	60.4	43.6	6.97	0.411	0	0
Sales of water heating units - Other (%)	1.97	2.09	2.1	2.1	2.1	2.1	2.1
Sales of cooking units - Electric Resistance (%)	61.7	69.9	94.8	99.7	100	100	100
Sales of cooking units - Gas (%)	38.3	30.1	5.15	0.259	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		1.25	1.37				

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 (%)	3.53	8.34	31.3	81.3	90.2	90.7	90.8
Sales of space heating units - Electric Resistance (%)	3.3	3.52	4.98	8.12	8.7	8.74	8.73
Sales of space heating units - Gas (%)	92.1	87.9	63.7	10.6	1.11	0.511	0.508
Sales of space heating units - Fossil (%)	1.07	0.221	0.042	0.002	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.03	1.08	14.4	43.7	48.9	49.2	49.2
Sales of water heating units - Electric Resistance (%)	1.46	2.52	15.8	44.9	50.1	50.4	50.4
Sales of water heating units - Gas (%)	98.1	96	69.4	11.1	0.657	0	0
Sales of water heating units - Other (%)	0.366	0.384	0.383	0.384	0.383	0.384	0.383
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)		4,239	4,716				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	6.2	6.2	0	0	0	0	0
Installed thermal - Natural gas (MW)	1,069	1,069	1,290	1,091	1,488	1,143	1,176
Installed thermal - Nuclear (MW)	600	600	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	393	606	810	1,055	1,347	1,687	2,089
Installed renewables - Solar - Base land use assumptions (MW)	1.71	1.71	1.71	1.71	1.71	1.71	1.71
Installed renewables - Wind - Base land use assumptions (MW)	952	952	14,294	22,314	34,448	42,003	55,310

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed renewables - Solar - Constrained land use assumptions (MW)	1.71	1.71	1.71	1.71	1.71	1.71	5,579
Installed renewables - Wind - Constrained land use assumptions (MW)	1,456	1,456	13,618	23,353	33,346	39,640	58,104
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Capital invested - Wind - Base (billion $2018)		0	17.8	9.95	14.3	8.47	14.1

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	4.27	4.27	4.27	4.27	4.27	4.27	4.27
Wind - Base land use assumptions (GWh)	3,041	3,041	43,012	65,295	97,655	117,079	150,061
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	8.54	8.54	8.54	8.54	8.54	8.54	23,418
Wind - Constrained land use assumptions (GWh)	8,434	8,434	78,211	128,207	174,357	201,000	269,797
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)							-2,216
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-132
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-1,790
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-148
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-1,420
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-284
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-2,977
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-233
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-2,279
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-11,479
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-3,320
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-463
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-3,224
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-217
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-2,839
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-548
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-4,465

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-1,656
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-4,520
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-21,253
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-4,423
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-793
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-4,659
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-290
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-4,259
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-812
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-5,953
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-3,080
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-31,032
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-6,761
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							362
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							101
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							910
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							53.5
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)							40.6
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							197
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							15.2
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,356
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,035
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							543
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							104

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							1,643
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							80.5
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							58.9
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							295
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							110
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,731
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							5,565
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							724
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							107
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							2,376
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							107
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)							77.2
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							394
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							87.5
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							2,241
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							6,113

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-972

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-31.4
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-1,003
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-1,914
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-62.8
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-1,976
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)							1,168
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							51.8
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,220
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)							2,284
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							104
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							2,387

Table 38: *E+RE- scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		4.77	0.005	0.005	0.005	0.003	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		1.45	0.77	0.794	0.919	0.48	0.151
Premature deaths from air pollution - Mobile - On-Road (deaths)		14.1	13.5	10.5	6.15	2.81	1.06
Premature deaths from air pollution - Gas Stations (deaths)		2.74	2.6	2.03	1.23	0.617	0.3
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		2.49	2.22	1.63	0.955	0.473	0.188
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.136	0.124	0.087	0.046	0.022	0.01
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.29	0.275	0.224	0.156	0.091	0.047

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.043	0.041	0.04	0.038	0.036	0.034
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		1.7	1.58	1.24	0.806	0.448	0.213
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.257	0.209	0.166	0.128	0.092	0.06
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.201	0.173	0.144	0.114	0.085	0.057
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.095	0.013	0.012	0.011	0.01	0.002
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		8.81	8.64	8.55	7.32	6.17	4.63
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		42.3	0.049	0.049	0.042	0.027	0
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		12.8	6.82	7.04	8.14	4.25	1.34
Monetary damages from air pollution - Mobile - On-Road (million $2019)		125	120	93.3	54.7	25	9.4
Monetary damages from air pollution - Gas Stations (million $2019)		24.3	23	17.9	10.9	5.47	2.66
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		22.1	19.7	14.4	8.46	4.19	1.67
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		1.2	1.1	0.767	0.404	0.194	0.087
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		2.57	2.44	1.99	1.38	0.805	0.416
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		0.378	0.367	0.353	0.338	0.321	0.303
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		15.1	14	11	7.14	3.96	1.88
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		2.27	1.85	1.47	1.13	0.817	0.533
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		1.78	1.53	1.27	1.01	0.754	0.503
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		0.837	0.116	0.108	0.094	0.087	0.02
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		78.2	76.7	75.9	65	54.8	41.1

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		149	169	121	71.7	24.9	65.8
By economic sector - Construction (jobs)		2,771	3,442	3,657	3,775	3,581	4,532

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Manufacturing (jobs)		887	990	961	929	674	741
By economic sector - Mining (jobs)		586	422	283	176	106	66.2
By economic sector - Other (jobs)		314	386	428	520	574	926
By economic sector - Pipeline (jobs)		126	110	194	78.6	60.5	102
By economic sector - Professional (jobs)		1,428	1,868	1,830	2,138	2,212	2,794
By economic sector - Trade (jobs)		989	1,160	1,133	1,280	1,327	1,756
By economic sector - Utilities (jobs)		1,938	2,918	3,033	3,044	2,659	2,954
By resource sector - Biomass (jobs)		402	403	296	193	100	290
By resource sector - CO2 (jobs)		0	0	813	0	0	458
By resource sector - Coal (jobs)		2.46	0.823	0	0	0	0
By resource sector - Grid (jobs)		2,568	4,639	4,215	5,383	4,596	4,737
By resource sector - Natural Gas (jobs)		966	844	869	744	664	622
By resource sector - Nuclear (jobs)		303	298	173	0	0	0
By resource sector - Oil (jobs)		1,419	1,118	783	500	316	209
By resource sector - Solar (jobs)		1,915	1,757	1,961	2,161	2,320	4,332
By resource sector - Wind (jobs)		1,614	2,404	2,531	3,030	3,222	3,289
By education level - All sectors - High school diploma or less (jobs)		3,891	4,833	4,909	5,007	4,600	5,731
By education level - All sectors - Associates degree or some college (jobs)		2,836	3,602	3,728	3,867	3,628	4,513
By education level - All sectors - Bachelors degree (jobs)		1,910	2,344	2,326	2,419	2,292	2,825
By education level - All sectors - Masters or professional degree (jobs)		477	595	588	624	602	745
By education level - All sectors - Doctoral degree (jobs)		73.8	90.6	88.3	96.4	96.8	122
Related work experience - All sectors - None (jobs)		1,325	1,662	1,699	1,745	1,624	2,029
Related work experience - All sectors - Up to 1 year (jobs)		1,873	2,314	2,333	2,400	2,223	2,790
Related work experience - All sectors - 1 to 4 years (jobs)		3,297	4,117	4,169	4,314	4,041	5,010
Related work experience - All sectors - 4 to 10 years (jobs)		2,135	2,678	2,736	2,828	2,656	3,280
Related work experience - All sectors - Over 10 years (jobs)		557	694	703	725	675	827
On-the-Job Training - All sectors - None (jobs)		514	626	628	649	613	774
On-the-Job Training - All sectors - Up to 1 year (jobs)		6,038	7,490	7,533	7,776	7,240	8,995
On-the-Job Training - All sectors - 1 to 4 years (jobs)		1,916	2,429	2,512	2,591	2,425	2,997
On-the-Job Training - All sectors - 4 to 10 years (jobs)		630	812	856	885	836	1,040
On-the-Job Training - All sectors - Over 10 years (jobs)		89.7	108	111	112	104	130
On-Site or In-Plant Training - All sectors - None (jobs)		1,500	1,857	1,881	1,946	1,835	2,298
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		5,479	6,806	6,857	7,075	6,582	8,172
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		1,487	1,879	1,935	1,996	1,863	2,306
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		643	821	861	885	835	1,035
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		78	101	106	110	103	127
Wage income - All (million $2019)		474	602	615	642	607	757

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	150	141	124	104	85.9	74.5	69.8
Final energy use - Residential (PJ)	71.3	68.1	65.2	58.8	51.1	45.3	41.4
Final energy use - Commercial (PJ)	49	49.1	48.2	46	43.3	41.4	40.7
Final energy use - Industry (PJ)	165	175	179	179	180	185	191

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)		1.28	1.35	2.22	2.38	2.18	2.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	10.1	164	317	854	1,392	1,821	2,250
Vehicle stocks - LDV – All others (1000 units)	1,876	1,787	1,697	1,237	776	439	102
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		361	924	1,498	2,269	2,469	2,354
Public EV charging plugs - DC Fast (1000 units)	0.066		0.688		3.02		4.88
Public EV charging plugs - L2 (1000 units)	0.128		16.6		72.7		118

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 (%)	9.46	20.4	40.3	80.7	88.3	89	88.8
Sales of space heating units - Electric Resistance (%)	10.7	17	13.5	5.83	4.48	4.43	4.48
Sales of space heating units - Gas (%)	73.4	52.1	37	7.24	1.97	1.65	1.64
Sales of space heating units - Fossil (%)	6.36	10.6	9.29	6.2	5.2	4.89	5.13
Sales of water heating units - Electric Heat Pump (%)	0	0.814	11.1	33.7	37.7	38	38
Sales of water heating units - Electric Resistance (%)	21.3	36.7	43.2	57.2	59.8	59.9	59.9
Sales of water heating units - Gas Furnace (%)	76.7	60.4	43.6	6.97	0.411	0	0
Sales of water heating units - Other (%)	1.97	2.09	2.1	2.1	2.1	2.1	2.1
Sales of cooking units - Electric Resistance (%)	61.7	69.9	94.8	99.7	100	100	100
Sales of cooking units - Gas (%)	38.3	30.1	5.15	0.259	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		1.25	1.37				

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 (%)	3.53	8.34	31.3	81.3	90.2	90.7	90.8
Sales of space heating units - Electric Resistance (%)	3.3	3.52	4.98	8.12	8.7	8.74	8.73
Sales of space heating units - Gas (%)	92.1	87.9	63.7	10.6	1.11	0.511	0.508
Sales of space heating units - Fossil (%)	1.07	0.221	0.042	0.002	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.03	1.08	14.4	43.7	48.9	49.2	49.2
Sales of water heating units - Electric Resistance (%)	1.46	2.52	15.8	44.9	50.1	50.4	50.4
Sales of water heating units - Gas (%)	98.1	96	69.4	11.1	0.657	0	0
Sales of water heating units - Other (%)	0.366	0.384	0.383	0.384	0.383	0.384	0.383

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

Item	2020	2025	2030	2035	2040	2045	2050
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)		4,239	4,716				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	6.2	6.2	0	0	0	0	0
Installed thermal - Natural gas (MW)	1,170	1,170	1,170	789	1,189	837	1,057
Installed thermal - Nuclear (MW)	600	600	600	0	0	0	0
Installed renewables - Rooftop PV (MW)	393	606	810	1,055	1,347	1,687	2,089
Installed renewables - Solar - Base land use assumptions (MW)	1.71	1.71	1.71	1.71	1.71	1.71	1.71
Installed renewables - Wind - Base land use assumptions (MW)	952	1,820	10,104	13,951	19,089	20,990	20,990
Installed renewables - Solar - Constrained land use assumptions (MW)	1.71	1.71	1.71	1.71	1.71	223	838
Installed renewables - Wind - Constrained land use assumptions (MW)	1,317	2,486	11,110	13,021	18,974	22,030	22,030
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion $2018)		0	0	0	0	0	0
Capital invested - Wind - Base (billion $2018)		1.28	11	4.77	6.07	2.13	0
Capital invested - Solar PV - Constrained (billion $2018)		0	0	0	0	0.217	0.57
Capital invested - Wind - Constrained (billion $2018)		1.72	11.5	2.37	7.03	3.43	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	4.27	4.27	4.27	4.27	4.27	4.27	4.27
Wind - Base land use assumptions (GWh)	3,041	5,811	30,893	42,045	56,581	61,738	61,738
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	4.27	4.27	4.27	4.27	4.27	470	1,775
Wind - Constrained land use assumptions (GWh)	4,217	7,876	32,710	37,875	53,612	61,273	61,273
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-2,216
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-132
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-1,790
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-148
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-1,420

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-284
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-2,977
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-233
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-2,279
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-11,479
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-3,320
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-463
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-3,224
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-217
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-2,839
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-548
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-4,465
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-1,656
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-4,520
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-21,253
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-4,423
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-793
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-4,659
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-290
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-4,259
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-812
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-5,953
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-3,080
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-31,032
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-6,761
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							362
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							101
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							910

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							53.5
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)							40.6
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							197
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							15.2
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,356
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,035
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							543
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							104
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							1,643
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							80.5
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							58.9
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							295
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							110
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,731
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							5,565
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							724
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							107
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							2,376
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							107
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							77.2
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							394
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							87.5
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							2,241
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							6,113

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-972
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-31.4
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-1,003
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-1,914
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-62.8
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-1,976
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)							1,168
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							51.8
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,220
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)							2,284
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							104

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							2,387

Table 49: *E-B+ scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		4.77	0.005	0.005	0.005	0.003	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		1.39	0.682	0.497	0.416	0.267	0.174
Premature deaths from air pollution - Mobile - On-Road (deaths)		14.3	14.8	14.7	13.5	10.9	7.6
Premature deaths from air pollution - Gas Stations (deaths)		2.79	2.88	2.84	2.61	2.12	1.51
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		2.5	2.39	2.23	1.99	1.62	1.18
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.138	0.144	0.13	0.105	0.083	0.06
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.292	0.297	0.302	0.29	0.247	0.192
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.043	0.041	0.04	0.038	0.036	0.034
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		1.71	1.73	1.7	1.58	1.34	1.05
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.257	0.224	0.196	0.17	0.145	0.123
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.201	0.185	0.169	0.151	0.133	0.116
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.11	0.014	0.013	0.012	0.011	0.01
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		8.68	7.98	7	6.19	5.53	3.91
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		42.3	0.049	0.049	0.042	0.027	0
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		12.3	6.04	4.41	3.69	2.37	1.54
Monetary damages from air pollution - Mobile - On-Road (million $2019)		127	131	131	120	97	67.5
Monetary damages from air pollution - Gas Stations (million $2019)		24.7	25.5	25.2	23.1	18.8	13.3
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		22.2	21.2	19.8	17.6	14.3	10.5
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		1.23	1.27	1.15	0.933	0.734	0.535
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		2.59	2.64	2.68	2.57	2.19	1.7

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		0.378	0.367	0.353	0.338	0.321	0.303
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		15.1	15.3	15.1	14	11.9	9.25
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		2.27	1.98	1.73	1.5	1.29	1.09
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		1.78	1.64	1.49	1.34	1.18	1.03
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		0.973	0.119	0.116	0.11	0.101	0.092
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		77.1	70.8	62.2	55	49.1	34.8

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		147	166	122	70.9	22.6	73.9
By economic sector - Construction (jobs)		2,765	4,329	4,391	4,271	5,054	6,679
By economic sector - Manufacturing (jobs)		839	1,275	1,062	903	1,001	1,200
By economic sector - Mining (jobs)		584	433	320	237	154	82.3
By economic sector - Other (jobs)		317	464	509	587	729	1,180
By economic sector - Pipeline (jobs)		123	104	177	75.4	58.5	89.6
By economic sector - Professional (jobs)		1,460	2,469	2,505	2,725	3,387	4,687
By economic sector - Trade (jobs)		1,007	1,461	1,494	1,620	1,981	2,787
By economic sector - Utilities (jobs)		1,815	3,694	3,322	2,993	3,880	4,736
By resource sector - Biomass (jobs)		419	403	300	198	101	365
By resource sector - CO2 (jobs)		0	0	738	0	0	416
By resource sector - Coal (jobs)		2.46	0.823	0	0	0	0
By resource sector - Grid (jobs)		2,330	6,163	4,816	5,192	6,994	8,138
By resource sector - Natural Gas (jobs)		911	757	674	564	509	536
By resource sector - Nuclear (jobs)		303	298	173	0	0	0
By resource sector - Oil (jobs)		1,436	1,205	1,015	849	619	360
By resource sector - Solar (jobs)		1,869	1,790	1,991	2,164	2,383	4,417
By resource sector - Wind (jobs)		1,789	3,778	4,196	4,515	5,662	7,284
By education level - All sectors - High school diploma or less (jobs)		3,828	6,021	5,780	5,531	6,602	8,693
By education level - All sectors - Associates degree or some college (jobs)		2,787	4,547	4,433	4,306	5,243	6,946
By education level - All sectors - Bachelors degree (jobs)		1,893	2,955	2,845	2,794	3,383	4,482
By education level - All sectors - Masters or professional degree (jobs)		474	755	731	732	894	1,196
By education level - All sectors - Doctoral degree (jobs)		74.7	116	115	120	146	199
Related work experience - All sectors - None (jobs)		1,304	2,079	2,011	1,941	2,340	3,102
Related work experience - All sectors - Up to 1 year (jobs)		1,850	2,890	2,780	2,685	3,203	4,258
Related work experience - All sectors - 1 to 4 years (jobs)		3,250	5,173	4,991	4,855	5,874	7,761
Related work experience - All sectors - 4 to 10 years (jobs)		2,105	3,377	3,281	3,188	3,866	5,103

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

Item	2020	2025	2030	2035	2040	2045	2050
Related work experience - All sectors - Over 10 years (jobs)		549	875	841	813	985	1,292
On-the-Job Training - All sectors - None (jobs)		510	783	758	741	888	1,188
On-the-Job Training - All sectors - Up to 1 year (jobs)		5,955	9,390	9,012	8,744	10,522	13,920
On-the-Job Training - All sectors - 1 to 4 years (jobs)		1,883	3,062	2,983	2,884	3,505	4,617
On-the-Job Training - All sectors - 4 to 10 years (jobs)		621	1,025	1,018	988	1,203	1,592
On-the-Job Training - All sectors - Over 10 years (jobs)		88.7	135	132	126	149	198
On-Site or In-Plant Training - All sectors - None (jobs)		1,484	2,336	2,267	2,209	2,664	3,553
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		5,402	8,532	8,190	7,940	9,558	12,631
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		1,462	2,365	2,297	2,220	2,692	3,546
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		634	1,035	1,024	992	1,205	1,590
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		76.5	128	126	122	148	196
Wage income - All (million $2019)		467	756	735	722	885	1,180

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	150	142	130	120	112	103	93
Final energy use - Residential (PJ)	71.3	68.1	66.1	64.1	61.5	57.8	53.1
Final energy use - Commercial (PJ)	49	49.1	48.9	48.7	48	47.1	46.1
Final energy use - Industry (PJ)	165	176	181	184	188	193	197

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)		1.09	1.13	1.39	1.45	2.09	2.22

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	7.84	52.9	98.1	307	516	979	1,441
Vehicle stocks - LDV – All others (1000 units)	1,884	1,884	1,884	1,787	1,690	1,302	915
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		0	58.3	123	414	1,303	1,898
Public EV charging plugs - DC Fast (1000 units)	0.066		0.213		1.12		3.13
Public EV charging plugs - L2 (1000 units)	0.128		5.12		27		75.3

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 (%)	9.46	19.2	21.1	27.7	43.3	62.6	73.4
Sales of space heating units - Electric Resistance (%)	10.7	17.2	16.8	15.7	12.9	9.42	7.34
Sales of space heating units - Gas (%)	73.4	53	51.3	46.6	35.6	21.5	13.1
Sales of space heating units - Fossil (%)	6.36	10.7	10.8	9.99	8.15	6.52	6.16

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Electric Heat Pump (%)	0	0.373	1.39	4.79	13	23.4	29.5
Sales of water heating units - Electric Resistance (%)	21.3	36.4	37.1	39.3	44.4	50.9	54.7
Sales of water heating units - Gas Furnace (%)	76.7	61.1	59.4	53.8	40.4	23.6	13.6
Sales of water heating units - Other (%)	1.97	2.1	2.1	2.11	2.11	2.11	2.11
Sales of cooking units - Electric Resistance (%)	61.6	62.6	66.1	75.4	88.3	96.2	99
Sales of cooking units - Gas (%)	38.4	37.4	33.9	24.6	11.7	3.79	1.02
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		1.25	1.37				

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 (%)	3.53	7.33	9.61	17.1	35.2	58.2	71.6
Sales of space heating units - Electric Resistance (%)	3.3	3.45	3.58	4.06	5.22	6.69	7.54
Sales of space heating units - Gas (%)	92.1	89	86.6	78.7	59.5	35.1	20.8
Sales of space heating units - Fossil (%)	1.07	0.256	0.242	0.19	0.113	0.063	0.046
Sales of water heating units - Electric Heat Pump (%)	0.03	0.512	1.83	6.23	16.9	30.4	38.3
Sales of water heating units - Electric Resistance (%)	1.46	1.95	3.27	7.65	18.2	31.6	39.5
Sales of water heating units - Gas (%)	98.1	97.2	94.5	85.7	64.5	37.6	21.8
Sales of water heating units - Other (%)	0.366	0.384	0.383	0.384	0.383	0.384	0.383
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)		4,239	4,714				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	6.2	6.2	0	0	0	0	0
Installed thermal - Natural gas (MW)	1,069	1,069	901	1,063	1,484	1,132	1,627
Installed thermal - Nuclear (MW)	600	600	600	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	0.041
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	0	0	0	0	0.096

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	107
Biomass w/ccu allam power plant (GWh)		0	0	0	0	0	40.5

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	1

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

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	0	0	1
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	0	0	2
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	1
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	1,084
Biomass purchases (million $2018/y)		0	0	0	0	0	78.2

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	1.16
Annual - BECCS (MMT)		0	0	0	0	0	1.16
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	1.16
Cumulative - BECCS (MMT)		0	0	0	0	0	1.16
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	177	177	177	177
Spur (km)		0	0	0	0	0	262
All (km)		0	0	177	177	177	439
Cumulative investment - Trunk (million $2018)		0	0	423	423	423	423
Cumulative investment - Spur (million $2018)		0	0	0	0	0	150
Cumulative investment - All (million $2018)		0	0	423	423	423	573

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-2,216
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-132
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-1,790

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-148
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-1,420
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-284
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-2,977
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-233
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-2,279
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-11,479
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-3,320
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-463
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-3,224
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-217
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-2,839
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-548
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-4,465
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-1,656
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-4,520
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-21,253
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-4,423
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-793
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-4,659
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-290
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-4,259
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-812
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-5,953
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-3,080
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-31,032
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-6,761
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							362
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							101

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							910
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							53.5
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)							40.6
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							197
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							15.2
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,356
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,035
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							543
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							104
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							1,643
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							80.5
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							58.9
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							295
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							110
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,731
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							5,565
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							724
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							107
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							2,376
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							107

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							77.2
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							394
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							87.5
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							2,241
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							6,113

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-972
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-31.4
Carbon sink potential - Moderate deployment - Cropland to woody energy crops (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Pasture to energy crops (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-1,003
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-1,913
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-62.8
Carbon sink potential - Aggressive deployment - Cropland to woody energy crops (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Pasture to energy crops (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-1,976
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)							1,168

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							51.8
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)							0.25
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)							4.37
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,224
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							5,638
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							104
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)							0.25
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)							4.37
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							5,746

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)		7.93	5.22	2.58	2.03	1.87	1.75
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		1.56	1.42	1.63	1.2	1.13	0.961
Premature deaths from air pollution - Mobile - On-Road (deaths)		14.3	15	15.6	16.3	17.1	17.8
Premature deaths from air pollution - Gas Stations (deaths)		2.78	2.91	3.02	3.15	3.26	3.38
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		2.49	2.4	2.33	2.31	2.33	2.37
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.138	0.134	0.103	0.067	0.047	0.037
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.288	0.296	0.31	0.327	0.335	0.343
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.045	0.045	0.046	0.046	0.046	0.046
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		1.72	1.75	1.67	1.57	1.53	1.58
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.268	0.264	0.264	0.264	0.266	0.269

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.21	0.22	0.229	0.238	0.247	0.255
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.299	0.195	0.15	0.14	0.133	0.122
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		8.73	9.33	9.67	9.36	9.39	8.89
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		70.3	46.3	22.9	18	16.5	15.5
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		13.8	12.6	14.5	10.6	10	8.51
Monetary damages from air pollution - Mobile - On-Road (million $2019)		127	133	139	145	152	158
Monetary damages from air pollution - Gas Stations (million $2019)		24.6	25.7	26.7	27.8	28.9	29.9
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		22.1	21.3	20.6	20.4	20.7	21
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		1.22	1.19	0.914	0.595	0.416	0.324
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		2.55	2.62	2.75	2.89	2.97	3.04
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		0.395	0.401	0.405	0.408	0.409	0.409
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		15.3	15.5	14.8	13.9	13.6	14
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		2.37	2.34	2.34	2.34	2.35	2.38
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		1.86	1.95	2.03	2.11	2.18	2.26
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		2.64	1.72	1.32	1.24	1.17	1.08
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		77.5	82.8	85.8	83.1	83.4	78.9

Table 65: *REF scenario - IMPACTS - Jobs*

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		145	141	140	133	133	136
By economic sector - Construction (jobs)		1,372	2,312	2,543	3,337	3,189	3,845
By economic sector - Manufacturing (jobs)		544	676	814	912	745	761
By economic sector - Mining (jobs)		593	478	389	318	271	230
By economic sector - Other (jobs)		74.1	287	346	461	502	841
By economic sector - Pipeline (jobs)		126	129	130	124	126	126
By economic sector - Professional (jobs)		828	1,176	1,320	1,823	1,801	2,241
By economic sector - Trade (jobs)		649	842	907	1,178	1,195	1,563
By economic sector - Utilities (jobs)		1,554	1,688	1,969	2,700	2,321	2,149
By resource sector - Biomass (jobs)		405	387	370	350	348	346

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

Item	2020	2025	2030	2035	2040	2045	2050
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Coal (jobs)		2.46	2.32	0.808	0	0	0
By resource sector - Grid (jobs)		1,931	2,109	2,472	4,329	3,737	3,339
By resource sector - Natural Gas (jobs)		943	995	1,192	952	1,008	1,003
By resource sector - Nuclear (jobs)		303	298	293	180	14	0
By resource sector - Oil (jobs)		1,448	1,235	1,088	1,008	963	931
By resource sector - Solar (jobs)			1,648	1,901	2,083	2,254	4,232
By resource sector - Wind (jobs)		854	1,056	1,240	2,082	1,960	2,039
By education level - All sectors - High school diploma or less (jobs)		2,466	3,283	3,625	4,625	4,323	4,979
By education level - All sectors - Associates degree or some college (jobs)		1,770	2,383	2,671	3,476	3,261	3,781
By education level - All sectors - Bachelors degree (jobs)		1,284	1,602	1,754	2,230	2,082	2,403
By education level - All sectors - Masters or professional degree (jobs)		318	400	440	568	535	624
By education level - All sectors - Doctoral degree (jobs)		46.5	61.6	67.2	86.8	83.5	102
Related work experience - All sectors - None (jobs)		851	1,121	1,245	1,599	1,502	1,740
Related work experience - All sectors - Up to 1 year (jobs)		1,171	1,575	1,737	2,214	2,075	2,424
Related work experience - All sectors - 1 to 4 years (jobs)		2,133	2,775	3,070	3,945	3,693	4,265
Related work experience - All sectors - 4 to 10 years (jobs)		1,369	1,792	1,989	2,565	2,400	2,762
Related work experience - All sectors - Over 10 years (jobs)		362	466	517	662	613	699
On-the-Job Training - All sectors - None (jobs)		326	433	474	600	564	670
On-the-Job Training - All sectors - Up to 1 year (jobs)		3,920	5,080	5,608	7,162	6,697	7,737
On-the-Job Training - All sectors - 1 to 4 years (jobs)		1,204	1,610	1,798	2,334	2,184	2,510
On-the-Job Training - All sectors - 4 to 10 years (jobs)		382	532	596	786	743	861
On-the-Job Training - All sectors - Over 10 years (jobs)		53.4	74.6	82.3	103	95.6	112
On-Site or In-Plant Training - All sectors - None (jobs)		946	1,257	1,391	1,776	1,666	1,954
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		3,555	4,613	5,093	6,512	6,087	7,025
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		937	1,251	1,393	1,805	1,689	1,942
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		398	544	606	793	748	863
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		48.6	65.8	74.3	98	92.3	106
Wage income - All (million $2019)		314	405	453	589	557	643

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	150	142	131	124	124	127	132
Final energy use - Residential (PJ)	71.3	68.6	67.8	67.5	68	68.9	69.7
Final energy use - Commercial (PJ)	49	50.1	51.1	51.5	51.9	53.3	55.8
Final energy use - Industry (PJ)	165	182	194	206	220	239	257

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)		1.18	1.23	1.36	1.42	1.52	1.58

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	8.94	22	22.3	22.8	23.5	24.2	24.8
Sales of space heating units - Electric Resistance (%)	10.9	16.6	16.4	16.3	16.1	15.6	14.8
Sales of space heating units - Gas (%)	73.8	51.2	50.9	50.7	51.1	51.4	51
Sales of space heating units - Fossil (%)	6.39	10.3	10.4	10.2	9.34	8.82	9.31
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	21.3	36.2	36.3	36.3	36.4	36.4	36.5
Sales of water heating units - Gas Furnace (%)	76.7	61.7	61.6	61.6	61.5	61.4	61.4
Sales of water heating units - Other (%)	1.97	2.1	2.11	2.11	2.12	2.12	2.12
Sales of cooking units - Electric Resistance (%)	61.2	61.2	61.2	61.2	61.2	61.2	61.2
Sales of cooking units - Gas (%)	38.8	38.8	38.8	38.8	38.8	38.8	38.8
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		1.22	1.24				

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 (%)	3.53	14.1	47	73.9	78.3	78.8	78.8
Sales of space heating units - Electric Resistance (%)	3.3	4.34	8.76	15.7	20	20.6	20.7
Sales of space heating units - Gas (%)	92.1	81.3	44.1	10.4	1.72	0.57	0.509
Sales of space heating units - Fossil (%)	1.07	0.24	0.141	0.039	0.005	0	0
Sales of water heating units - Electric Heat Pump (%)	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Sales of water heating units - Electric Resistance (%)	1.46	1.47	1.47	1.48	1.47	1.48	1.47
Sales of water heating units - Gas (%)	98.1	98.1	98.1	98.1	98.1	98.1	98.1
Sales of water heating units - Other (%)	0.366	0.384	0.383	0.384	0.383	0.384	0.383
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)		4,185	4,377				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	6.2	6.2	6.2	0	0	0	0
Installed thermal - Natural gas (MW)	1,069	1,069	1,069	1,283	1,303	952	1,034
Installed thermal - Nuclear (MW)	600	600	600	600	50	0	0
Installed renewables - Rooftop PV (MW)	393	606	810	1,055	1,347	1,687	2,089
Installed renewables - Solar - Base land use assumptions (MW)	1.71	1.71	1.71	1.71	1.71	1.71	1.71
Installed renewables - Wind - Base land use assumptions (MW)	952	952	952	952	8,628	12,410	12,410
Installed renewables - Wind - Constrained land use assumptions (MW)	0	0	0	0	0	40.5	40.5

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	4.27	4.27	4.27	4.27	4.27	4.27	4.27
Wind - Base land use assumptions (GWh)	3,041	3,041	3,041	3,041	26,585	37,730	37,730
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)	-22		4.29				1.23
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-1.16		-2.41				-2.53
Business-as-usual carbon sink - Total (Mt CO2e/y)	-23.1		1.88				-1.3

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)							-2,216
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-132
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-1,790
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-148
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-1,420
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-284
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-2,977
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-233
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-2,279
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-11,479
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-3,320
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-463
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-3,224
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-217
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-2,839
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-548
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-4,465
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-1,656
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-4,520

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-21,253
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-4,423
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-793
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-4,659
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-290
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-4,259
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-812
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-5,953
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-3,080
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-31,032
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-6,761
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							362
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							101
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							910
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							53.5
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)							40.6
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							197
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							15.2
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,356
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,035
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							543
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							104
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							1,643
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							80.5

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							58.9
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							295
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							110
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,731
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							5,565
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							724
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							107
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							2,376
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							107
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)							77.2
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							394
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							87.5
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							2,241
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							6,113