



## **Net-Zero America - Nebraska data**

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

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)		14.1	0.014	0.013	0.01	0.007	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		8.31	4.94	2.09	1.32	0.806	0.395
Premature deaths from air pollution - Mobile - On-Road (deaths)		22	20.6	15.7	9.14	4.19	1.65
Premature deaths from air pollution - Gas Stations (deaths)		2.72	2.52	1.92	1.15	0.567	0.271
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		4.04	3.53	2.54	1.48	0.736	0.299
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.088	0.074	0.051	0.03	0.013	0.005
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.859	0.832	0.68	0.462	0.243	0.095
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.433	0.418	0.401	0.381	0.361	0.339
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		3.31	2.95	2.29	1.52	0.89	0.459
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.491	0.406	0.323	0.245	0.175	0.113
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		1.07	0.913	0.755	0.597	0.443	0.294
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.584	0.082	0.076	0.068	0.064	0.061
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		34.1	32.1	29.3	22.9	17.1	10.6
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		125	0.122	0.115	0.092	0.061	0.001
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		73.6	43.8	18.5	11.7	7.14	3.49
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		195	183	140	81.3	37.2	14.7
Monetary damages from air pollution - Gas Stations (million \$2019)		24	22.3	17	10.2	5.02	2.4
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		35.8	31.3	22.5	13.2	6.53	2.65
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		0.779	0.652	0.455	0.268	0.119	0.042
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		7.61	7.37	6.02	4.1	2.16	0.845
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		3.84	3.7	3.55	3.38	3.2	3
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		29.3	26.1	20.3	13.4	7.88	4.06

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)		4.35	3.59	2.86	2.17	1.55	0.998
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		9.48	8.08	6.68	5.28	3.92	2.61
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		5.16	0.726	0.672	0.601	0.561	0.54
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		303	285	260	204	152	94.3

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		3,679	3,685	3,648	2,123	1,167	3,867
By economic sector - Construction (jobs)		5,860	14,350	17,624	18,591	20,842	35,108
By economic sector - Manufacturing (jobs)		3,844	4,302	4,990	4,273	3,896	7,356
By economic sector - Mining (jobs)		1,054	702	481	303	184	105
By economic sector - Other (jobs)		601	2,160	2,611	2,880	3,237	5,925
By economic sector - Pipeline (jobs)		199	349	315	105	99.8	425
By economic sector - Professional (jobs)		3,674	6,957	9,044	10,230	12,534	23,786
By economic sector - Trade (jobs)		3,272	5,022	5,956	6,246	7,068	12,530
By economic sector - Utilities (jobs)		5,630	9,192	13,503	15,060	18,340	31,049
By resource sector - Biomass (jobs)		8,621	8,390	8,177	5,091	4,428	17,117
By resource sector - CO2 (jobs)		0	1,453	1,457	14.1	247	3,162
By resource sector - Coal (jobs)		1,025	257	0	0	0	0
By resource sector - Grid (jobs)		8,413	14,497	23,918	28,972	35,070	57,961
By resource sector - Natural Gas (jobs)		1,577	1,420	1,280	1,070	1,313	1,252
By resource sector - Nuclear (jobs)		404	398	231	0.007	0.015	0.026
By resource sector - Oil (jobs)		2,295	1,889	1,433	1,005	703	450
By resource sector - Solar (jobs)		2,444	12,932	13,310	12,969	12,885	24,319
By resource sector - Wind (jobs)		3,032	5,483	8,365	10,690	12,722	15,889
By education level - All sectors - High school diploma or less (jobs)		13,455	21,607	26,266	25,989	28,328	50,906
By education level - All sectors - Associates degree or some college (jobs)		7,673	13,913	17,748	18,788	21,562	37,765
By education level - All sectors - Bachelors degree (jobs)		5,193	8,654	10,923	11,565	13,409	24,084
By education level - All sectors - Masters or professional degree (jobs)		1,302	2,206	2,811	3,010	3,522	6,378
By education level - All sectors - Doctoral degree (jobs)		189	338	424	460	546	1,018
Related work experience - All sectors - None (jobs)		4,316	7,089	8,754	8,858	9,866	17,691
Related work experience - All sectors - Up to 1 year (jobs)		6,911	10,844	13,023	12,702	13,641	24,760
Related work experience - All sectors - 1 to 4 years (jobs)		9,326	16,005	20,169	21,111	24,160	43,013
Related work experience - All sectors - 4 to 10 years (jobs)		5,738	10,163	12,907	13,648	15,707	27,663
Related work experience - All sectors - Over 10 years (jobs)		1,521	2,617	3,319	3,492	3,994	7,023
On-the-Job Training - All sectors - None (jobs)		1,577	2,629	3,205	3,259	3,635	6,551
On-the-Job Training - All sectors - Up to 1 year (jobs)		19,419	31,309	38,637	39,201	43,773	78,930

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)		5,002	9,221	11,790	12,522	14,407	25,081
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,572	3,121	4,006	4,287	4,953	8,544
On-the-Job Training - All sectors - Over 10 years (jobs)		242	439	534	543	599	1,045
On-Site or In-Plant Training - All sectors - None (jobs)		4,387	7,500	9,310	9,618	10,901	19,573
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		17,522	28,388	35,081	35,640	39,795	71,519
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		4,021	7,258	9,223	9,720	11,119	19,434
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,646	3,160	4,032	4,287	4,938	8,549
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		236	414	526	546	616	1,076
Wage income - All (million \$2019)		1,408	2,398	3,061	3,223	3,718	6,710

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

Item	2020	2025	2030	2035	2040	2045	2050
Oil consumption - Annual (million bbls)		46.1	40.8	32.6	24.4	18	12.3
Oil consumption - Cumulative (million bbls)							991
Oil production - Annual (million bbls)		2.66	2.67	2.67	2.12	1.72	1.14
Natural gas consumption - Annual (tcf)		144	121	97.3	73.2	46.1	32
Natural gas consumption - Cumulative (tcf)							2,931
Natural gas production - Annual (tcf)		0.529	0.5	0.435	0.368	0.292	0.227

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	182	170	150	125	103	89.2	83.4
Final energy use - Residential (PJ)	86.4	81.9	77.8	69.7	60.5	53.3	48.7
Final energy use - Commercial (PJ)	70.8	69.4	66.6	62.4	57.8	54.2	52.1
Final energy use - Industry (PJ)	281	293	298	298	301	304	307

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)		1.62	1.68	2.88	3.08	2.81	2.96

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	7.42	168	328	889	1,451	1,899	2,348
Vehicle stocks - LDV – All others (1000 units)	1,958	1,864	1,771	1,290	810	458	107
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		377	964	1,565	2,370	2,580	2,460
Public EV charging plugs - DC Fast (1000 units)	0.061		0.695		3.07		4.98
Public EV charging plugs - L2 (1000 units)	0.164		16.7		74		120

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	6.37	12.2	35.2	81.9	90.3	90.9	90.6
Sales of space heating units - Electric Resistance (%)	16.5	22	17.4	7.5	5.7	5.65	5.9
Sales of space heating units - Gas (%)	71.3	55.9	39.7	7.36	1.62	1.25	1.22
Sales of space heating units - Fossil (%)	5.83	9.86	7.69	3.24	2.34	2.21	2.25
Sales of water heating units - Electric Heat Pump (%)	0	0.739	10.1	30.7	34.4	34.6	34.6
Sales of water heating units - Electric Resistance (%)	35.5	51.5	55.3	63.7	65.3	65.4	65.3
Sales of water heating units - Gas Furnace (%)	64.5	47.7	34.5	5.53	0.326	0	0
Sales of water heating units - Other (%)	0.03	0.032	0.032	0.032	0.032	0.032	0.032
Sales of cooking units - Electric Resistance (%)	74.2	79.7	96.5	99.8	100	100	100
Sales of cooking units - Gas (%)	25.8	20.3	3.47	0.175	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		1.79	2.3				

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 (%)	3.92	7.61	30.1	78	86.6	87.1	87.1
Sales of space heating units - Electric Resistance (%)	6.31	5.8	8.21	11.8	12.4	12.4	12.4
Sales of space heating units - Gas (%)	89.8	84.8	61.3	10.2	1.03	0.454	0.456
Sales of space heating units - Fossil (%)	0	1.82	0.351	0.015	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.944	1.84	14.5	42	47	47.3	47.3
Sales of water heating units - Electric Resistance (%)	8.03	8	20.3	47	51.8	52.1	52.1
Sales of water heating units - Gas (%)	90.2	89.2	64.5	10.3	0.61	0	0
Sales of water heating units - Other (%)	0.788	0.941	0.732	0.684	0.681	0.683	0.683
Sales of cooking units - Electric Resistance (%)	44.8	57.1	84	89.3	89.6	89.6	89.6
Sales of cooking units - Gas (%)	55.2	42.9	16	10.7	10.4	10.4	10.4
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		5,541	6,031				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	3,836	1,938	0	0	0	0	0
Installed thermal - Natural gas (MW)	1,866	1,575	2,508	3,050	2,783	4,299	7,196
Installed thermal - Nuclear (MW)	801	801	801	0.004	0.006	0.011	0.021
Installed renewables - Rooftop PV (MW)	15.1	27	34.4	46	61	78.7	99.6
Installed renewables - Solar - Base land use assumptions (MW)	1.28	1,519	10,666	19,219	25,781	31,834	48,387
Installed renewables - Wind - Base land use assumptions (MW)	2,267	3,568	12,188	31,309	53,212	78,726	113,660
Installed renewables - Solar - Constrained land use assumptions (MW)	0	2,892	9,886	15,924	21,871	30,162	44,813
Installed renewables - Wind - Constrained land use assumptions (MW)	3,194	8,791	19,997	39,271	57,525	81,044	107,406
Capital invested - Solar PV - Base (billion \$2018)		2.03	11	9.43	6.82	5.94	15.3
Capital invested - Wind - Base (billion \$2018)		0.55	11.5	23.7	25.9	28.6	37

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Solar PV - Constrained (billion \$2018)		3.44	13.4	6.07	7	7.8	11.1
Capital invested - Wind - Constrained (billion \$2018)		17	13.9	23.4	20.3	25.7	27.6
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	0.013	0.004	0	0
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	0	0	0.005	0	0.597

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	3.05	2,889	20,389	36,900	49,574	61,323	93,358
Wind - Base land use assumptions (GWh)	13,033	14,343	44,430	110,489	184,905	270,650	387,982
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	0	5,512	18,933	30,594	42,027	58,159	86,542
Wind - Constrained land use assumptions (GWh)	13,033	32,477	70,737	135,918	196,735	274,397	357,973
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	5.71	5.71	676
Biomass w/ccu allam power plant (GWh)	0	0	0	13.1	17.1	17.1	17.1

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	1	1	2
Number of facilities - Allam power w ccu (quantity)	0	0	0	1	1	1	1
Number of facilities - Beccs hydrogen (quantity)	0	0	0	1	2	11	29
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	1	1	1	1
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	1	1	1	33
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	687	1,056	8,178	62,939
Biomass purchases (million \$2018/y)		0	0	47.4	122	699	3,814

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	0.86	2.21	12.7	56.8
Annual - BECCS (MMT)		0	0	0.86	2.21	12.7	56.8
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	0.86	3.07	15.8	72.6
Cumulative - BECCS (MMT)		0	0	0.86	3.07	15.8	72.6
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	276	552	552	552	552
Spur (km)		0	0	126	21.5	675	4,416
All (km)		0	276	678	573	1,227	4,968
Cumulative investment - Trunk (million \$2018)		0	1,459	2,919	2,919	2,919	2,919
Cumulative investment - Spur (million \$2018)		0	0	72.9	19.6	775	3,732
Cumulative investment - All (million \$2018)		0	1,459	2,992	2,939	3,694	6,651

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)							-124
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-158
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-164
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-23.8
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-95
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-951
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-3,928
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-317
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-145
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-5,906
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-186
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-553
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-296
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-34.9
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-190
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,834
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-5,891

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Reforest pasture (1000 tCO <sub>2</sub> e/y)							-2,253
Carbon sink potential - Mid - Restore productivity (1000 tCO <sub>2</sub> e/y)							-288
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)							-11,526
Carbon sink potential - High - Accelerate regeneration (1000 tCO <sub>2</sub> e/y)							-248
Carbon sink potential - High - Avoid deforestation (1000 tCO <sub>2</sub> e/y)							-947
Carbon sink potential - High - Extend rotation length (1000 tCO <sub>2</sub> e/y)							-427
Carbon sink potential - High - Improve plantations (1000 tCO <sub>2</sub> e/y)							-46.9
Carbon sink potential - High - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)							-285
Carbon sink potential - High - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)							-2,717
Carbon sink potential - High - Reforest cropland (1000 tCO <sub>2</sub> e/y)							-7,855
Carbon sink potential - High - Reforest pasture (1000 tCO <sub>2</sub> e/y)							-4,189
Carbon sink potential - High - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)							-17,146
Carbon sink potential - High - Restore productivity (1000 tCO <sub>2</sub> e/y)							-431
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							20.2
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							120
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							83.4
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							8.63
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							136
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							260
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							20.6
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							86.4
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							735
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							30.4
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							124

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							151
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							13
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)							197
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							390
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							149
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							174
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,228
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							40.5
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							128
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							218
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							17.3
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							258
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							519
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							119
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							143
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,443

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO <sub>2</sub> e/y)							-2,594
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO <sub>2</sub> e/y)							-4,000

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO <sub>2</sub> e/y)							-143
Carbon sink potential - Moderate deployment - Total (1000 tCO <sub>2</sub> e/y)							-6,737
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO <sub>2</sub> e/y)							-2,594
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO <sub>2</sub> e/y)							-7,779
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO <sub>2</sub> e/y)							-286
Carbon sink potential - Aggressive deployment - Total (1000 tCO <sub>2</sub> e/y)							-10,659
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							1,456
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							3,654
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							244
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							5,354
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							1,456
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							7,064
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							489
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							9,008

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)		14.1	0.014	0.013	0.01	0.007	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		9.23	4.45	1.63	0.753	0.3	0.236
Premature deaths from air pollution - Mobile - On-Road (deaths)		22.3	22.7	22.2	20.1	16.1	11.1
Premature deaths from air pollution - Gas Stations (deaths)		2.77	2.81	2.74	2.48	1.99	1.38
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		4.06	3.77	3.43	2.98	2.35	1.62
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.09	0.088	0.085	0.078	0.064	0.049
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.865	0.895	0.915	0.875	0.726	0.533

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.433	0.418	0.401	0.381	0.361	0.339
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		3.32	3.21	3.04	2.73	2.27	1.73
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.492	0.44	0.394	0.344	0.293	0.243
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		1.07	0.979	0.885	0.789	0.693	0.6
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.552	0.084	0.081	0.076	0.064	0.046
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		34	31	27	23.7	21.1	14.8
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		125	0.122	0.115	0.092	0.061	0.001
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		81.7	39.4	14.4	6.67	2.65	2.09
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		198	202	197	179	143	98.4
Monetary damages from air pollution - Gas Stations (million \$2019)		24.5	24.9	24.3	21.9	17.6	12.3
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		36	33.4	30.4	26.4	20.8	14.4
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		0.794	0.779	0.755	0.689	0.568	0.438
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		7.67	7.93	8.11	7.75	6.43	4.73
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		3.84	3.7	3.55	3.38	3.2	3
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		29.4	28.4	26.9	24.2	20.1	15.3
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		4.35	3.9	3.48	3.04	2.59	2.15
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		9.48	8.66	7.84	6.99	6.13	5.31
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		4.87	0.737	0.714	0.671	0.568	0.403
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		302	275	240	211	187	131

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		3,680	3,683	3,732	2,286	1,522	3,866
By economic sector - Construction (jobs)		6,050	15,172	16,034	17,250	23,335	39,092

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Manufacturing (jobs)		3,897	4,334	4,749	4,299	4,871	8,123
By economic sector - Mining (jobs)		1,098	724	549	408	292	181
By economic sector - Other (jobs)		626	2,256	2,261	2,599	3,501	6,274
By economic sector - Pipeline (jobs)		200	474	446	125	154	724
By economic sector - Professional (jobs)		3,788	7,159	8,312	9,993	14,659	25,888
By economic sector - Trade (jobs)		3,368	5,162	5,514	6,034	8,105	13,782
By economic sector - Utilities (jobs)		5,810	9,610	12,299	14,004	20,993	35,281
By resource sector - Biomass (jobs)		8,622	8,384	8,502	6,020	6,474	16,555
By resource sector - CO2 (jobs)		0	2,491	2,498	24.3	423	5,421
By resource sector - Coal (jobs)		1,203	348	0	0	0	0
By resource sector - Grid (jobs)		8,631	14,405	20,729	26,675	39,930	64,606
By resource sector - Natural Gas (jobs)		1,623	1,191	957	1,133	1,620	1,146
By resource sector - Nuclear (jobs)		404	398	231	0.009	0.017	0.028
By resource sector - Oil (jobs)		2,315	1,999	1,731	1,450	1,163	809
By resource sector - Solar (jobs)		2,596	13,658	11,218	11,301	13,504	24,726
By resource sector - Wind (jobs)		3,124	5,701	8,028	10,395	14,316	19,949
By education level - All sectors - High school diploma or less (jobs)		13,754	22,417	24,470	24,791	32,547	56,301
By education level - All sectors - Associates degree or some college (jobs)		7,898	14,537	16,322	17,756	24,645	42,069
By education level - All sectors - Bachelors degree (jobs)		5,334	8,985	10,112	11,109	15,525	26,683
By education level - All sectors - Masters or professional degree (jobs)		1,337	2,285	2,598	2,895	4,078	7,044
By education level - All sectors - Doctoral degree (jobs)		194	350	392	447	637	1,114
Related work experience - All sectors - None (jobs)		4,417	7,368	8,134	8,442	11,336	19,602
Related work experience - All sectors - Up to 1 year (jobs)		7,053	11,214	12,156	12,165	15,713	27,269
Related work experience - All sectors - 1 to 4 years (jobs)		9,582	16,661	18,639	20,105	27,764	47,727
Related work experience - All sectors - 4 to 10 years (jobs)		5,902	10,607	11,903	12,963	18,024	30,793
Related work experience - All sectors - Over 10 years (jobs)		1,563	2,725	3,062	3,322	4,593	7,819
On-the-Job Training - All sectors - None (jobs)		1,615	2,729	2,971	3,117	4,186	7,225
On-the-Job Training - All sectors - Up to 1 year (jobs)		19,882	32,455	35,913	37,525	50,491	87,276
On-the-Job Training - All sectors - 1 to 4 years (jobs)		5,150	9,649	10,841	11,818	16,446	27,991
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,621	3,282	3,675	4,023	5,622	9,556
On-the-Job Training - All sectors - Over 10 years (jobs)		249	459	494	515	685	1,162
On-Site or In-Plant Training - All sectors - None (jobs)		4,499	7,801	8,621	9,180	12,537	21,650
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		17,944	29,439	32,586	34,077	45,864	79,140
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		4,136	7,584	8,492	9,188	12,705	21,661
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,696	3,318	3,709	4,037	5,620	9,559
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		242	433	486	516	705	1,201
Wage income - All (million \$2019)		1,445	2,494	2,835	3,074	4,278	7,452

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	182	171	156	144	135	124	111
Final energy use - Residential (PJ)	86.4	82	78.8	75.5	71.4	65.8	59.3
Final energy use - Commercial (PJ)	70.8	69.4	67.5	65.7	63.5	60.8	58.1
Final energy use - Industry (PJ)	281	293	300	302	307	311	314

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)		1.33	1.36	1.77	1.84	2.53	2.68

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	5.74	52.9	100	318	537	1,020	1,504
Vehicle stocks - LDV – All others (1000 units)	1,966	1,966	1,966	1,865	1,764	1,359	954
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		0	60.7	128	432	1,362	1,983
Public EV charging plugs - DC Fast (1000 units)	0.061		0.212		1.14		3.19
Public EV charging plugs - L2 (1000 units)	0.164		5.1		27.4		76.8

Table 22: E- scenario - PILLAR 1: Efficiency/Electrification - Residential

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	6.37	11	13.7	22.5	43.2	68.9	83.6
Sales of space heating units - Electric Resistance (%)	16.5	22.2	21.5	19.8	15.5	10.2	7.2
Sales of space heating units - Gas (%)	71.3	56.8	54.9	48.8	34.5	16.7	6.23
Sales of space heating units - Fossil (%)	5.83	9.99	9.81	8.95	6.83	4.3	2.95
Sales of water heating units - Electric Heat Pump (%)	0	0.395	1.48	5.1	13.9	24.9	31.5
Sales of water heating units - Electric Resistance (%)	35.5	51.4	51.8	53.2	56.8	61.3	64
Sales of water heating units - Gas Furnace (%)	64.5	48.2	46.7	41.7	29.3	13.7	4.47
Sales of water heating units - Other (%)	0.03	0.032	0.032	0.032	0.032	0.032	0.032
Sales of cooking units - Electric Resistance (%)	74.1	74.8	77.2	83.4	92.1	97.4	99.3
Sales of cooking units - Gas (%)	25.9	25.2	22.8	16.6	7.91	2.55	0.687
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		1.78	2.27				

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 (%)	3.92	6.69	9.32	17.9	38.6	64.5	79.7
Sales of space heating units - Electric Resistance (%)	6.31	5.58	5.85	6.72	8.6	10.7	11.9
Sales of space heating units - Gas (%)	89.8	85.6	82.9	73.9	52.1	24.5	8.31
Sales of space heating units - Fossil (%)	0	2.1	1.98	1.48	0.719	0.234	0.062
Sales of water heating units - Electric Heat Pump (%)	0.944	1.35	2.81	7.68	19.4	34.3	43
Sales of water heating units - Electric Resistance (%)	8.03	7.53	8.96	13.7	25.1	39.5	48
Sales of water heating units - Gas (%)	90.2	90.1	87.3	77.8	54.7	25.5	8.33
Sales of water heating units - Other (%)	0.788	0.981	0.957	0.887	0.782	0.716	0.691

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of cooking units - Electric Resistance (%)	44.8	49.3	53.1	63	76.9	85.5	88.5
Sales of cooking units - Gas (%)	55.2	50.7	46.9	37	23.1	14.5	11.5
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		5,540	6,039				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	3,836	1,938	0	0	0	0	0
Installed thermal - Natural gas (MW)	2,012	1,577	1,695	1,532	2,682	5,413	6,387
Installed thermal - Nuclear (MW)	801	801	801	0.004	0.007	0.013	0.023

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)							-124
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-158
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-164
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-23.8
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-95
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-951
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-3,928
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-317
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-145
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-5,906
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-186
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-553
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-296
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-34.9
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-190
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,834
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-5,891
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,253
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-288
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-11,526
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-248
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-947



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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-427
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-46.9
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-285
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-2,717
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-7,855
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-4,189
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-17,146
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-431
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							20.2
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							120
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							83.4
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							8.63
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							136
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							260
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							20.6
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							86.4
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							735
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							30.4
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							124
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							151
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							13
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)							197

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							390
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							149
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							174
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,228
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							40.5
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							128
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							218
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							17.3
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							258
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							519
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							119
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							143
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,443

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)							-2,594
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-4,000
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-143
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-6,737
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-2,594
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-7,779

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO <sub>2</sub> e/y)							-286
Carbon sink potential - Aggressive deployment - Total (1000 tCO <sub>2</sub> e/y)							-10,659
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							1,456
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							3,654
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							244
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							5,354
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							1,456
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							7,064
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							489
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							9,008

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)		14.1	0.014	0.013	0.01	0.007	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		7.72	4.27	1.24	0.735	0.324	0.212
Premature deaths from air pollution - Mobile - On-Road (deaths)		22	20.6	15.7	9.14	4.19	1.65
Premature deaths from air pollution - Gas Stations (deaths)		2.72	2.52	1.92	1.15	0.567	0.271
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		4.04	3.53	2.54	1.48	0.736	0.299
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.088	0.074	0.051	0.03	0.013	0.005
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.859	0.832	0.68	0.462	0.243	0.095
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.433	0.418	0.401	0.381	0.361	0.339
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		3.31	2.95	2.29	1.52	0.89	0.459
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.491	0.406	0.323	0.245	0.175	0.113
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		1.07	0.913	0.755	0.597	0.443	0.294

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.668	0.082	0.076	0.067	0.063	0.026
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		33.5	31.7	27.4	19.8	12.2	1.83
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		125	0.122	0.115	0.092	0.061	0.001
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		68.4	37.8	10.9	6.51	2.87	1.88
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		195	183	140	81.3	37.2	14.7
Monetary damages from air pollution - Gas Stations (million \$2019)		24	22.3	17	10.2	5.02	2.4
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		35.8	31.3	22.5	13.2	6.53	2.65
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		0.779	0.652	0.455	0.268	0.119	0.042
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		7.61	7.37	6.02	4.1	2.16	0.845
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		3.84	3.7	3.55	3.38	3.2	3
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		29.3	26.1	20.3	13.4	7.88	4.06
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		4.35	3.59	2.86	2.17	1.55	0.998
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		9.48	8.08	6.68	5.28	3.92	2.61
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		5.9	0.726	0.668	0.594	0.554	0.232
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		298	281	244	176	108	16.3

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		3,679	3,686	3,640	2,106	1,037	3,883
By economic sector - Construction (jobs)		4,477	17,072	20,715	29,503	36,405	75,157
By economic sector - Manufacturing (jobs)		3,833	4,551	5,597	5,811	6,562	13,172
By economic sector - Mining (jobs)		1,047	690	453	265	127	14.5
By economic sector - Other (jobs)		330	2,852	3,255	4,885	5,964	14,223
By economic sector - Pipeline (jobs)		194	165	121	81.4	46.3	15.1
By economic sector - Professional (jobs)		3,257	8,261	10,900	15,719	20,680	44,493
By economic sector - Trade (jobs)		2,986	5,865	7,040	9,580	12,066	26,086
By economic sector - Utilities (jobs)		5,150	9,207	14,742	22,901	31,592	64,493
By resource sector - Biomass (jobs)		8,619	8,392	8,139	5,090	4,006	17,687
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Coal (jobs)		1,025	257	0	0	0	0
By resource sector - Grid (jobs)		7,459	16,081	28,261	44,542	62,115	129,773

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

Item	2020	2025	2030	2035	2040	2045	2050
By resource sector - Natural Gas (jobs)		1,529	1,341	970	1,157	1,296	934
By resource sector - Nuclear (jobs)		404	234	0	0	0	0
By resource sector - Oil (jobs)		2,296	1,875	1,397	924	491	18.6
By resource sector - Solar (jobs)		252	18,025	16,957	23,539	25,363	63,151
By resource sector - Wind (jobs)		3,368	6,145	10,739	15,601	21,208	29,973
By education level - All sectors - High school diploma or less (jobs)		12,174	24,057	29,732	39,037	47,995	101,963
By education level - All sectors - Associates degree or some college (jobs)		6,742	15,688	20,402	28,919	36,998	77,388
By education level - All sectors - Bachelors degree (jobs)		4,692	9,720	12,577	17,608	22,650	47,701
By education level - All sectors - Masters or professional degree (jobs)		1,175	2,491	3,252	4,585	5,928	12,545
By education level - All sectors - Doctoral degree (jobs)		168	393	500	704	907	1,940
Related work experience - All sectors - None (jobs)		3,893	7,895	9,939	13,392	16,742	35,511
Related work experience - All sectors - Up to 1 year (jobs)		6,298	12,100	14,755	18,970	23,031	49,181
Related work experience - All sectors - 1 to 4 years (jobs)		8,320	17,985	23,130	32,227	41,085	86,610
Related work experience - All sectors - 4 to 10 years (jobs)		5,082	11,435	14,829	20,929	26,802	56,012
Related work experience - All sectors - Over 10 years (jobs)		1,360	2,934	3,809	5,334	6,820	14,223
On-the-Job Training - All sectors - None (jobs)		1,414	2,974	3,677	4,958	6,174	13,156
On-the-Job Training - All sectors - Up to 1 year (jobs)		17,617	34,943	44,019	59,109	74,024	157,085
On-the-Job Training - All sectors - 1 to 4 years (jobs)		4,371	10,391	13,544	19,296	24,726	51,476
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,338	3,540	4,609	6,656	8,527	17,686
On-the-Job Training - All sectors - Over 10 years (jobs)		212	500	614	834	1,029	2,133
On-Site or In-Plant Training - All sectors - None (jobs)		3,919	8,463	10,688	14,658	18,490	39,108
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		15,872	31,685	39,966	53,796	67,400	142,846
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		3,533	8,171	10,582	14,936	19,059	39,801
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,418	3,569	4,628	6,629	8,475	17,584
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		210	462	599	833	1,055	2,197
Wage income - All (million \$2019)		1,265	2,676	3,493	4,893	6,306	13,448

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	182	170	150	125	103	89.2	83.4
Final energy use - Residential (PJ)	86.4	81.9	77.8	69.7	60.5	53.3	48.7
Final energy use - Commercial (PJ)	70.8	69.4	66.6	62.4	57.8	54.2	52.1
Final energy use - Industry (PJ)	281	293	298	298	301	304	307

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)		1.62	1.68	2.88	3.08	2.81	2.96

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	7.42	168	328	889	1,451	1,899	2,348
Vehicle stocks - LDV – All others (1000 units)	1,958	1,864	1,771	1,290	810	458	107
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		377	964	1,565	2,370	2,580	2,460
Public EV charging plugs - DC Fast (1000 units)	0.061		0.695		3.07		4.98
Public EV charging plugs - L2 (1000 units)	0.164		16.7		74		120

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	6.37	12.2	35.2	81.9	90.3	90.9	90.6
Sales of space heating units - Electric Resistance (%)	16.5	22	17.4	7.5	5.7	5.65	5.9
Sales of space heating units - Gas (%)	71.3	55.9	39.7	7.36	1.62	1.25	1.22
Sales of space heating units - Fossil (%)	5.83	9.86	7.69	3.24	2.34	2.21	2.25
Sales of water heating units - Electric Heat Pump (%)	0	0.739	10.1	30.7	34.4	34.6	34.6
Sales of water heating units - Electric Resistance (%)	35.5	51.5	55.3	63.7	65.3	65.4	65.3
Sales of water heating units - Gas Furnace (%)	64.5	47.7	34.5	5.53	0.326	0	0
Sales of water heating units - Other (%)	0.03	0.032	0.032	0.032	0.032	0.032	0.032
Sales of cooking units - Electric Resistance (%)	74.2	79.7	96.5	99.8	100	100	100
Sales of cooking units - Gas (%)	25.8	20.3	3.47	0.175	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		1.79	2.3				

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 (%)	3.92	7.61	30.1	78	86.6	87.1	87.1
Sales of space heating units - Electric Resistance (%)	6.31	5.8	8.21	11.8	12.4	12.4	12.4
Sales of space heating units - Gas (%)	89.8	84.8	61.3	10.2	1.03	0.454	0.456
Sales of space heating units - Fossil (%)	0	1.82	0.351	0.015	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.944	1.84	14.5	42	47	47.3	47.3
Sales of water heating units - Electric Resistance (%)	8.03	8	20.3	47	51.8	52.1	52.1
Sales of water heating units - Gas (%)	90.2	89.2	64.5	10.3	0.61	0	0
Sales of water heating units - Other (%)	0.788	0.941	0.732	0.684	0.681	0.683	0.683
Sales of cooking units - Electric Resistance (%)	44.8	57.1	84	89.3	89.6	89.6	89.6
Sales of cooking units - Gas (%)	55.2	42.9	16	10.7	10.4	10.4	10.4
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		5,541	6,031				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	3,836	1,938	0	0	0	0	0
Installed thermal - Natural gas (MW)	1,874	1,575	2,400	2,252	4,000	5,413	6,387

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Nuclear (MW)	801	801	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	15.1	27	34.4	46	61	78.7	99.6
Installed renewables - Solar - Base land use assumptions (MW)	1.28	1.28	13,024	23,937	38,022	50,459	107,446
Installed renewables - Wind - Base land use assumptions (MW)	3,194	4,828	15,204	38,344	77,960	127,723	196,462
Installed renewables - Solar - Constrained land use assumptions (MW)	1.28	1.28	15,119	24,758	35,773	50,326	89,870
Installed renewables - Wind - Constrained land use assumptions (MW)	3,480	10,848	23,917	47,231	81,627	124,095	191,540
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion \$2018)		0	15.6	12	14.6	12.2	52.8
Capital invested - Wind - Base (billion \$2018)		2.4	13.8	28.7	46.8	55.8	72.8

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	3.05	3.05	24,916	46,102	73,931	98,534	214,569
Wind - Base land use assumptions (GWh)	13,033	18,764	54,815	134,543	267,937	435,076	661,392
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	6.1	6.1	57,980	96,024	140,054	197,333	355,916
Wind - Constrained land use assumptions (GWh)	26,065	77,272	165,853	322,911	549,778	816,526	1,260,047
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)							-124
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-158
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-164
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-23.8
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-95
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-951
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-3,928
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-317
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-145
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-5,906
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-186
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-553
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-296

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Improve plantations (1000 tCO <sub>2</sub> e/y)							-34.9
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)							-190
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)							-1,834
Carbon sink potential - Mid - Reforest cropland (1000 tCO <sub>2</sub> e/y)							-5,891
Carbon sink potential - Mid - Reforest pasture (1000 tCO <sub>2</sub> e/y)							-2,253
Carbon sink potential - Mid - Restore productivity (1000 tCO <sub>2</sub> e/y)							-288
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)							-11,526
Carbon sink potential - High - Accelerate regeneration (1000 tCO <sub>2</sub> e/y)							-248
Carbon sink potential - High - Avoid deforestation (1000 tCO <sub>2</sub> e/y)							-947
Carbon sink potential - High - Extend rotation length (1000 tCO <sub>2</sub> e/y)							-427
Carbon sink potential - High - Improve plantations (1000 tCO <sub>2</sub> e/y)							-46.9
Carbon sink potential - High - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)							-285
Carbon sink potential - High - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)							-2,717
Carbon sink potential - High - Reforest cropland (1000 tCO <sub>2</sub> e/y)							-7,855
Carbon sink potential - High - Reforest pasture (1000 tCO <sub>2</sub> e/y)							-4,189
Carbon sink potential - High - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)							-17,146
Carbon sink potential - High - Restore productivity (1000 tCO <sub>2</sub> e/y)							-431
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							20.2
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							120
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							83.4
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							8.63
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							136
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							260
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							20.6
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							86.4



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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							735
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							30.4
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							124
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							151
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							13
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)							197
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							390
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							149
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							174
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,228
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							40.5
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							128
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							218
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							17.3
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							258
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							519
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							119
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							143
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,443

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO <sub>2</sub> e/y)							-2,594
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO <sub>2</sub> e/y)							-4,000
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO <sub>2</sub> e/y)							-143
Carbon sink potential - Moderate deployment - Total (1000 tCO <sub>2</sub> e/y)							-6,737
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO <sub>2</sub> e/y)							-2,594
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO <sub>2</sub> e/y)							-7,779
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO <sub>2</sub> e/y)							-286
Carbon sink potential - Aggressive deployment - Total (1000 tCO <sub>2</sub> e/y)							-10,659
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							1,456
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							3,654
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							244
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							5,354
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							1,456
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							7,064
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							489
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							9,008

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)		14.1	0.014	0.013	0.01	0.007	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		8.5	3.85	4.82	2.84	1.14	0.512
Premature deaths from air pollution - Mobile - On-Road (deaths)		22	20.6	15.7	9.14	4.19	1.65
Premature deaths from air pollution - Gas Stations (deaths)		2.72	2.52	1.92	1.15	0.567	0.271

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		4.04	3.53	2.54	1.48	0.736	0.299
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.088	0.074	0.051	0.03	0.013	0.005
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.859	0.832	0.68	0.462	0.243	0.095
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.433	0.418	0.401	0.381	0.361	0.339
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		3.31	2.95	2.29	1.52	0.89	0.459
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.491	0.406	0.323	0.245	0.175	0.113
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		1.07	0.913	0.755	0.597	0.443	0.294
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.501	0.082	0.076	0.068	0.064	0.026
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		34.5	33.5	32.8	27.8	23.3	17.3
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		125	0.122	0.115	0.092	0.061	0.001
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		75.3	34.1	42.7	25.1	10.1	4.54
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		195	183	140	81.3	37.2	14.7
Monetary damages from air pollution - Gas Stations (million \$2019)		24	22.3	17	10.2	5.02	2.4
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		35.8	31.3	22.5	13.2	6.53	2.65
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		0.779	0.652	0.455	0.268	0.119	0.042
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		7.61	7.37	6.02	4.1	2.16	0.845
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		3.84	3.7	3.55	3.38	3.2	3
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		29.3	26.1	20.3	13.4	7.88	4.06
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		4.35	3.59	2.86	2.17	1.55	0.998
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		9.48	8.08	6.68	5.28	3.92	2.61
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		4.42	0.72	0.67	0.597	0.562	0.231

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		306	297	292	247	206	154

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		3,680	3,683	3,734	2,214	1,278	3,854
By economic sector - Construction (jobs)		7,509	8,942	11,008	10,376	11,168	13,985
By economic sector - Manufacturing (jobs)		3,826	3,751	3,850	3,167	2,723	4,319
By economic sector - Mining (jobs)		1,099	714	509	336	219	147
By economic sector - Other (jobs)		930	998	1,399	1,375	1,365	1,348
By economic sector - Pipeline (jobs)		203	525	505	139	166	818
By economic sector - Professional (jobs)		4,205	4,434	5,523	5,888	7,164	11,795
By economic sector - Trade (jobs)		3,664	3,462	3,883	3,618	3,717	4,787
By economic sector - Utilities (jobs)		6,106	7,887	9,441	9,808	11,547	14,664
By resource sector - Biomass (jobs)		8,619	8,384	8,530	5,579	5,099	16,621
By resource sector - CO2 (jobs)		0	2,814	2,823	27.4	478	6,125
By resource sector - Coal (jobs)		1,203	348	0	0	0	0
By resource sector - Grid (jobs)		9,220	10,652	14,614	18,225	21,409	22,292
By resource sector - Natural Gas (jobs)		1,645	1,543	1,380	1,606	1,484	1,139
By resource sector - Nuclear (jobs)		404	398	231	0.023	0.054	0.379
By resource sector - Oil (jobs)		2,294	1,889	1,433	1,005	721	539
By resource sector - Solar (jobs)		5,130	4,835	6,681	5,350	4,239	3,242
By resource sector - Wind (jobs)		2,707	3,533	4,158	5,128	5,917	5,759
By education level - All sectors - High school diploma or less (jobs)		14,980	16,311	18,616	16,467	16,759	24,074
By education level - All sectors - Associates degree or some college (jobs)		8,776	9,979	11,801	11,312	12,386	16,815
By education level - All sectors - Bachelors degree (jobs)		5,797	6,294	7,303	7,048	7,839	11,324
By education level - All sectors - Masters or professional degree (jobs)		1,455	1,585	1,861	1,824	2,051	3,011
By education level - All sectors - Doctoral degree (jobs)		215	227	270	270	313	495
Related work experience - All sectors - None (jobs)		4,818	5,314	6,112	5,541	5,799	8,281
Related work experience - All sectors - Up to 1 year (jobs)		7,646	8,202	9,295	8,093	8,052	11,789
Related work experience - All sectors - 1 to 4 years (jobs)		10,528	11,645	13,611	12,904	14,082	19,849
Related work experience - All sectors - 4 to 10 years (jobs)		6,519	7,329	8,609	8,255	9,091	12,599
Related work experience - All sectors - Over 10 years (jobs)		1,712	1,906	2,224	2,128	2,324	3,201
On-the-Job Training - All sectors - None (jobs)		1,774	1,906	2,189	1,997	2,097	3,004
On-the-Job Training - All sectors - Up to 1 year (jobs)		21,575	23,395	26,855	24,541	25,822	37,353
On-the-Job Training - All sectors - 1 to 4 years (jobs)		5,748	6,597	7,820	7,522	8,281	11,165
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,848	2,188	2,629	2,536	2,809	3,733
On-the-Job Training - All sectors - Over 10 years (jobs)		278	310	358	325	339	464
On-Site or In-Plant Training - All sectors - None (jobs)		4,947	5,430	6,308	5,874	6,325	9,113
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		19,495	21,192	24,350	22,280	23,435	33,633

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

Item	2020	2025	2030	2035	2040	2045	2050
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		4,598	5,225	6,164	5,876	6,411	8,698
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,916	2,243	2,670	2,557	2,819	3,788
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		266	307	359	336	358	486
Wage income - All (million \$2019)		1,578	1,775	2,092	1,994	2,185	3,136

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	182	170	150	125	103	89.2	83.4
Final energy use - Residential (PJ)	86.4	81.9	77.8	69.7	60.5	53.3	48.7
Final energy use - Commercial (PJ)	70.8	69.4	66.6	62.4	57.8	54.2	52.1
Final energy use - Industry (PJ)	281	293	298	298	301	304	307

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)		1.62	1.68	2.88	3.08	2.81	2.96

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	7.42	168	328	889	1,451	1,899	2,348
Vehicle stocks - LDV – All others (1000 units)	1,958	1,864	1,771	1,290	810	458	107
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		377	964	1,565	2,370	2,580	2,460
Public EV charging plugs - DC Fast (1000 units)	0.061		0.695		3.07		4.98
Public EV charging plugs - L2 (1000 units)	0.164		16.7		74		120

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	6.37	12.2	35.2	81.9	90.3	90.9	90.6
Sales of space heating units - Electric Resistance (%)	16.5	22	17.4	7.5	5.7	5.65	5.9
Sales of space heating units - Gas (%)	71.3	55.9	39.7	7.36	1.62	1.25	1.22
Sales of space heating units - Fossil (%)	5.83	9.86	7.69	3.24	2.34	2.21	2.25
Sales of water heating units - Electric Heat Pump (%)	0	0.739	10.1	30.7	34.4	34.6	34.6
Sales of water heating units - Electric Resistance (%)	35.5	51.5	55.3	63.7	65.3	65.4	65.3
Sales of water heating units - Gas Furnace (%)	64.5	47.7	34.5	5.53	0.326	0	0
Sales of water heating units - Other (%)	0.03	0.032	0.032	0.032	0.032	0.032	0.032
Sales of cooking units - Electric Resistance (%)	74.2	79.7	96.5	99.8	100	100	100
Sales of cooking units - Gas (%)	25.8	20.3	3.47	0.175	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		1.79	2.3				

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 (%)	3.92	7.61	30.1	78	86.6	87.1	87.1
Sales of space heating units - Electric Resistance (%)	6.31	5.8	8.21	11.8	12.4	12.4	12.4
Sales of space heating units - Gas (%)	89.8	84.8	61.3	10.2	1.03	0.454	0.456
Sales of space heating units - Fossil (%)	0	1.82	0.351	0.015	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.944	1.84	14.5	42	47	47.3	47.3
Sales of water heating units - Electric Resistance (%)	8.03	8	20.3	47	51.8	52.1	52.1
Sales of water heating units - Gas (%)	90.2	89.2	64.5	10.3	0.61	0	0
Sales of water heating units - Other (%)	0.788	0.941	0.732	0.684	0.681	0.683	0.683
Sales of cooking units - Electric Resistance (%)	44.8	57.1	84	89.3	89.6	89.6	89.6
Sales of cooking units - Gas (%)	55.2	42.9	16	10.7	10.4	10.4	10.4
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		5,541	6,031				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	3,836	2,619	0	0	0	0	0
Installed thermal - Natural gas (MW)	1,871	1,526	2,453	2,556	3,664	3,412	4,192
Installed thermal - Nuclear (MW)	801	801	801	0.011	0.019	0.038	0.197
Installed renewables - Rooftop PV (MW)	15.1	27	34.4	46	61	78.7	99.6
Installed renewables - Solar - Base land use assumptions (MW)	328	4,584	7,858	12,085	15,059	16,423	16,423
Installed renewables - Wind - Base land use assumptions (MW)	3,194	3,194	5,602	13,020	22,825	37,594	38,360
Installed renewables - Solar - Constrained land use assumptions (MW)	184	1,790	4,347	10,785	14,650	15,943	15,943
Installed renewables - Wind - Constrained land use assumptions (MW)	3,194	4,861	12,201	20,755	31,810	46,209	46,823
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion \$2018)		5.7	3.92	4.66	3.09	1.34	0
Capital invested - Wind - Base (billion \$2018)		0	3.21	9.2	11.5	16.6	0.769
Capital invested - Solar PV - Constrained (billion \$2018)		2.15	3.06	7.09	4.01	1.27	0
Capital invested - Wind - Constrained (billion \$2018)		2.45	9.77	10.6	13.1	16.1	0.65

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	622	8,751	15,039	23,132	28,859	31,458	31,458
Wind - Base land use assumptions (GWh)	13,033	13,033	21,498	47,321	81,119	131,906	134,361
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	348	3,428	8,361	20,717	28,122	30,619	30,619
Wind - Constrained land use assumptions (GWh)	13,033	18,818	44,238	73,249	110,476	158,938	160,933
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)							-124
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-158
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-164
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-23.8
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-95
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-951
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-3,928
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-317
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-145
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-5,906
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-186
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-553
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-296
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-34.9
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-190
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,834
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-5,891
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,253
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-288
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-11,526
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-248
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-947
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-427
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-46.9
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-285
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-2,717
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-7,855
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-4,189
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-17,146
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-431

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							20.2
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							120
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							83.4
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							8.63
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							136
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							260
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							20.6
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							86.4
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							735
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							30.4
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							124
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							151
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							13
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)							197
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							390
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							149
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							174
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,228
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							40.5
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							128



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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							218
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							17.3
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							258
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							519
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							119
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							143
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,443

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO <sub>2</sub> e/y)							-2,594
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO <sub>2</sub> e/y)							-4,000
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO <sub>2</sub> e/y)							-143
Carbon sink potential - Moderate deployment - Total (1000 tCO <sub>2</sub> e/y)							-6,737
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO <sub>2</sub> e/y)							-2,594
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO <sub>2</sub> e/y)							-7,779
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO <sub>2</sub> e/y)							-286
Carbon sink potential - Aggressive deployment - Total (1000 tCO <sub>2</sub> e/y)							-10,659
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							1,456
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							3,654
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							244
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							5,354

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							1,456
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							7,064
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							489
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							9,008

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)		14.1	0.014	0.013	0.01	0.007	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		9.33	3.89	1.95	1.22	0.491	0.249
Premature deaths from air pollution - Mobile - On-Road (deaths)		22.3	22.7	22.2	20.1	16.1	11.1
Premature deaths from air pollution - Gas Stations (deaths)		2.77	2.81	2.74	2.48	1.99	1.38
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		4.06	3.77	3.43	2.98	2.35	1.62
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.09	0.088	0.085	0.078	0.064	0.049
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.865	0.895	0.915	0.875	0.726	0.533
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.433	0.418	0.401	0.381	0.361	0.339
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		3.32	3.21	3.04	2.73	2.27	1.73
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.492	0.44	0.394	0.344	0.293	0.243
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		1.07	0.979	0.885	0.789	0.693	0.6
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.58	0.083	0.081	0.077	0.072	0.066
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		34	31	27	23.7	21.1	14.8
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		125	0.122	0.115	0.092	0.061	0.001
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		82.7	34.5	17.3	10.8	4.35	2.21
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		198	202	197	179	143	98.4
Monetary damages from air pollution - Gas Stations (million \$2019)		24.5	24.9	24.3	21.9	17.6	12.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		36	33.4	30.4	26.4	20.8	14.4
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		0.794	0.779	0.755	0.689	0.568	0.438
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		7.67	7.93	8.11	7.75	6.43	4.73
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		3.84	3.7	3.55	3.38	3.2	3
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		29.4	28.4	26.9	24.2	20.1	15.3
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		4.35	3.9	3.48	3.04	2.59	2.15
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		9.48	8.66	7.84	6.99	6.13	5.31
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		5.12	0.735	0.714	0.676	0.633	0.581
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		302	275	240	211	187	131

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		3,680	3,690	3,716	3,125	2,565	5,232
By economic sector - Construction (jobs)		5,971	15,162	14,811	14,177	18,163	34,612
By economic sector - Manufacturing (jobs)		3,878	4,350	4,546	4,199	4,757	8,688
By economic sector - Mining (jobs)		1,058	724	550	418	291	175
By economic sector - Other (jobs)		618	2,238	2,030	2,054	2,581	5,480
By economic sector - Pipeline (jobs)		198	482	456	128	153	738
By economic sector - Professional (jobs)		3,742	7,165	7,733	9,637	13,753	26,121
By economic sector - Trade (jobs)		3,310	5,158	5,167	5,407	6,899	12,849
By economic sector - Utilities (jobs)		5,641	9,629	11,554	11,700	16,668	31,405
By resource sector - Biomass (jobs)		8,621	8,402	8,461	9,539	11,754	25,270
By resource sector - CO2 (jobs)		0	2,556	2,564	24.9	434	5,564
By resource sector - Coal (jobs)		1,025	257	0	0	0	0
By resource sector - Grid (jobs)		8,376	14,469	19,163	22,116	31,430	56,377
By resource sector - Natural Gas (jobs)		1,604	1,188	975	1,014	1,298	1,247
By resource sector - Nuclear (jobs)		404	398	231	0.008	0.017	0.029
By resource sector - Oil (jobs)		2,315	1,999	1,731	1,488	1,168	783
By resource sector - Solar (jobs)		2,555	13,465	9,816	8,532	9,377	22,027
By resource sector - Wind (jobs)		3,194	5,863	7,624	8,131	10,368	14,032
By education level - All sectors - High school diploma or less (jobs)		13,571	22,427	23,048	22,364	27,865	53,234
By education level - All sectors - Associates degree or some college (jobs)		7,762	14,542	15,245	15,393	20,350	38,741
By education level - All sectors - Bachelors degree (jobs)		5,253	8,992	9,473	10,028	13,460	25,456
By education level - All sectors - Masters or professional degree (jobs)		1,318	2,287	2,432	2,638	3,572	6,763
By education level - All sectors - Doctoral degree (jobs)		192	350	366	422	583	1,106

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

Item	2020	2025	2030	2035	2040	2045	2050
Related work experience - All sectors - None (jobs)		4,356	7,370	7,648	7,568	9,662	18,475
Related work experience - All sectors - Up to 1 year (jobs)		6,970	11,217	11,469	11,118	13,682	26,156
Related work experience - All sectors - 1 to 4 years (jobs)		9,427	16,670	17,452	17,868	23,529	44,729
Related work experience - All sectors - 4 to 10 years (jobs)		5,805	10,613	11,130	11,373	15,100	28,648
Related work experience - All sectors - Over 10 years (jobs)		1,538	2,727	2,866	2,918	3,857	7,292
On-the-Job Training - All sectors - None (jobs)		1,594	2,729	2,787	2,806	3,607	6,887
On-the-Job Training - All sectors - Up to 1 year (jobs)		19,603	32,473	33,770	33,984	43,625	83,063
On-the-Job Training - All sectors - 1 to 4 years (jobs)		5,061	9,654	10,121	10,191	13,494	25,627
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,592	3,283	3,424	3,417	4,537	8,646
On-the-Job Training - All sectors - Over 10 years (jobs)		246	459	462	447	567	1,076
On-Site or In-Plant Training - All sectors - None (jobs)		4,436	7,803	8,077	8,239	10,744	20,480
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		17,688	29,454	30,634	30,735	39,448	75,089
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		4,067	7,587	7,936	7,968	10,481	19,916
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,666	3,319	3,461	3,455	4,576	8,708
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		238	433	456	448	582	1,107
Wage income - All (million \$2019)		1,422	2,496	2,660	2,742	3,639	7,005

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	182	171	156	144	135	124	111
Final energy use - Residential (PJ)	86.4	82	78.8	75.5	71.4	65.8	59.3
Final energy use - Commercial (PJ)	70.8	69.4	67.5	65.7	63.5	60.8	58.1
Final energy use - Industry (PJ)	281	293	300	302	307	311	314

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)		1.33	1.36	1.77	1.84	2.53	2.68

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	5.74	52.9	100	318	537	1,020	1,504
Vehicle stocks - LDV – All others (1000 units)	1,966	1,966	1,966	1,865	1,764	1,359	954
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		0	60.7	128	432	1,362	1,983
Public EV charging plugs - DC Fast (1000 units)	0.061		0.212		1.14		3.19
Public EV charging plugs - L2 (1000 units)	0.164		5.1		27.4		76.8

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	6.37	11	13.7	22.5	43.2	68.9	83.6
Sales of space heating units - Electric Resistance (%)	16.5	22.2	21.5	19.8	15.5	10.2	7.2
Sales of space heating units - Gas (%)	71.3	56.8	54.9	48.8	34.5	16.7	6.23
Sales of space heating units - Fossil (%)	5.83	9.99	9.81	8.95	6.83	4.3	2.95
Sales of water heating units - Electric Heat Pump (%)	0	0.395	1.48	5.1	13.9	24.9	31.5
Sales of water heating units - Electric Resistance (%)	35.5	51.4	51.8	53.2	56.8	61.3	64
Sales of water heating units - Gas Furnace (%)	64.5	48.2	46.7	41.7	29.3	13.7	4.47
Sales of water heating units - Other (%)	0.03	0.032	0.032	0.032	0.032	0.032	0.032
Sales of cooking units - Electric Resistance (%)	74.1	74.8	77.2	83.4	92.1	97.4	99.3
Sales of cooking units - Gas (%)	25.9	25.2	22.8	16.6	7.91	2.55	0.687
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		1.78	2.27				

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 (%)	3.92	6.69	9.32	17.9	38.6	64.5	79.7
Sales of space heating units - Electric Resistance (%)	6.31	5.58	5.85	6.72	8.6	10.7	11.9
Sales of space heating units - Gas (%)	89.8	85.6	82.9	73.9	52.1	24.5	8.31
Sales of space heating units - Fossil (%)	0	2.1	1.98	1.48	0.719	0.234	0.062
Sales of water heating units - Electric Heat Pump (%)	0.944	1.35	2.81	7.68	19.4	34.3	43
Sales of water heating units - Electric Resistance (%)	8.03	7.53	8.96	13.7	25.1	39.5	48
Sales of water heating units - Gas (%)	90.2	90.1	87.3	77.8	54.7	25.5	8.33
Sales of water heating units - Other (%)	0.788	0.981	0.957	0.887	0.782	0.716	0.691
Sales of cooking units - Electric Resistance (%)	44.8	49.3	53.1	63	76.9	85.5	88.5
Sales of cooking units - Gas (%)	55.2	50.7	46.9	37	23.1	14.5	11.5
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		5,540	6,039				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	3,836	2,619	0	0	0	0	0
Installed thermal - Natural gas (MW)	2,012	1,577	1,695	1,532	1,970	3,481	6,382
Installed thermal - Nuclear (MW)	801	801	801	0.004	0.007	0.013	0.023
Capital invested - Biomass power plant (billion \$2018)	0	0.003	0.032	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion \$2018)	0	0	0	0.024	0.006	0.01	0
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	0	0.061	0.002	0.208	0.095

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass power plant (GWh)	0	5.4	67.8	67.8	67.8	67.8	67.8
Biomass w/ccu power plant (GWh)	0	0	0	68	69.9	303	410
Biomass w/ccu allam power plant (GWh)	0	0	0	24.1	30.2	40.1	40.1

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

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Power (quantity)	0	1	1	1	1	1	1
Number of facilities - Power ccu (quantity)	0	0	0	1	2	3	3
Number of facilities - Allam power w ccu (quantity)	0	0	0	1	2	3	3
Number of facilities - Beccs hydrogen (quantity)	0	0	0	1	15	35	41
Number of facilities - Diesel (quantity)	0	0	0	1	1	2	3
Number of facilities - Diesel ccu (quantity)	0	0	0	1	2	3	4
Number of facilities - Pyrolysis (quantity)	0	0	0	1	1	2	32
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	1	2	3	17
Number of facilities - Sng (quantity)	0	1	1	1	1	2	2
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	1	2
Conversion capital investment - Cumulative 5-yr (million \$2018)		3.12	35.5	1,454	12,265	18,692	53,340
Biomass purchases (million \$2018/y)		0.41	4.64	117	1,093	2,577	6,002

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	1.79	17.5	41.5	57.6
Annual - BECCS (MMT)		0	0	1.79	17.5	41.5	57.6
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	1.79	19.3	60.8	118
Cumulative - BECCS (MMT)		0	0	1.79	19.3	60.8	118
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	276	552	828	828	828
Spur (km)		0	0	21.5	675	1,814	2,905
All (km)		0	276	573	1,503	2,642	3,732
Cumulative investment - Trunk (million \$2018)		0	1,627	3,255	4,882	4,882	4,882
Cumulative investment - Spur (million \$2018)		0	0	17.9	986	1,993	3,050
Cumulative investment - All (million \$2018)		0	1,627	3,273	5,868	6,875	7,932

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO <sub>2</sub> e/y)							-124
Carbon sink potential - Low - Avoid deforestation (1000 tCO <sub>2</sub> e/y)							-158
Carbon sink potential - Low - Extend rotation length (1000 tCO <sub>2</sub> e/y)							-164
Carbon sink potential - Low - Improve plantations (1000 tCO <sub>2</sub> e/y)							-23.8
Carbon sink potential - Low - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)							-95
Carbon sink potential - Low - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)							-951
Carbon sink potential - Low - Reforest cropland (1000 tCO <sub>2</sub> e/y)							-3,928
Carbon sink potential - Low - Reforest pasture (1000 tCO <sub>2</sub> e/y)							-317
Carbon sink potential - Low - Restore productivity (1000 tCO <sub>2</sub> e/y)							-145
Carbon sink potential - Low - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)							-5,906
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO <sub>2</sub> e/y)							-186
Carbon sink potential - Mid - Avoid deforestation (1000 tCO <sub>2</sub> e/y)							-553
Carbon sink potential - Mid - Extend rotation length (1000 tCO <sub>2</sub> e/y)							-296
Carbon sink potential - Mid - Improve plantations (1000 tCO <sub>2</sub> e/y)							-34.9
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)							-190
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)							-1,834
Carbon sink potential - Mid - Reforest cropland (1000 tCO <sub>2</sub> e/y)							-5,891
Carbon sink potential - Mid - Reforest pasture (1000 tCO <sub>2</sub> e/y)							-2,253
Carbon sink potential - Mid - Restore productivity (1000 tCO <sub>2</sub> e/y)							-288
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)							-11,526
Carbon sink potential - High - Accelerate regeneration (1000 tCO <sub>2</sub> e/y)							-248
Carbon sink potential - High - Avoid deforestation (1000 tCO <sub>2</sub> e/y)							-947
Carbon sink potential - High - Extend rotation length (1000 tCO <sub>2</sub> e/y)							-427
Carbon sink potential - High - Improve plantations (1000 tCO <sub>2</sub> e/y)							-46.9
Carbon sink potential - High - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)							-285
Carbon sink potential - High - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)							-2,717
Carbon sink potential - High - Reforest cropland (1000 tCO <sub>2</sub> e/y)							-7,855
Carbon sink potential - High - Reforest pasture (1000 tCO <sub>2</sub> e/y)							-4,189
Carbon sink potential - High - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)							-17,146
Carbon sink potential - High - Restore productivity (1000 tCO <sub>2</sub> e/y)							-431

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							20.2
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							120
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							83.4
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							8.63
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							136
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							260
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							20.6
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							86.4
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							735
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							30.4
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							124
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							151
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							13
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)							197
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							390
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							149
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							174
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,228
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							40.5
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							128



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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							218
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							17.3
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							258
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							519
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							119
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							143
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,443

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO <sub>2</sub> e/y)							-2,881
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO <sub>2</sub> e/y)							-3,910
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO <sub>2</sub> e/y)							-136
Carbon sink potential - Moderate deployment - Cropland to woody energy crops (1000 tCO <sub>2</sub> e/y)							0
Carbon sink potential - Moderate deployment - Pasture to energy crops (1000 tCO <sub>2</sub> e/y)							0
Carbon sink potential - Moderate deployment - Total (1000 tCO <sub>2</sub> e/y)							-6,927
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO <sub>2</sub> e/y)							-2,881
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO <sub>2</sub> e/y)							-7,608
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO <sub>2</sub> e/y)							-273
Carbon sink potential - Aggressive deployment - Cropland to woody energy crops (1000 tCO <sub>2</sub> e/y)							0
Carbon sink potential - Aggressive deployment - Pasture to energy crops (1000 tCO <sub>2</sub> e/y)							0
Carbon sink potential - Aggressive deployment - Total (1000 tCO <sub>2</sub> e/y)							-10,762

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							1,679
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							3,547
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							233
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)							15.7
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)							288
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							5,762
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							1,679
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							16,939
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							466
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)							15.7
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)							288
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							19,388

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)		41.6	21.4	13.9	10.9	9.45	9.2
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		10.8	8.84	10.1	6.41	3.72	3.36
Premature deaths from air pollution - Mobile - On-Road (deaths)		22.3	23	23.6	24.4	25.2	26
Premature deaths from air pollution - Gas Stations (deaths)		2.76	2.84	2.91	3	3.08	3.15
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		4.03	3.76	3.53	3.4	3.35	3.31
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.088	0.077	0.058	0.038	0.022	0.013
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.836	0.855	0.888	0.922	0.925	0.917
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.453	0.458	0.46	0.461	0.46	0.457

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		3.36	3.31	3.06	2.77	2.6	2.59
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.512	0.513	0.512	0.505	0.499	0.496
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		1.12	1.16	1.2	1.24	1.28	1.32
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.55	1	0.762	0.707	0.666	0.608
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		34.2	36.1	37	35.6	35.4	33.2
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		369	190	124	96.6	83.7	81.5
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		95.6	78.3	89.6	56.8	32.9	29.7
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		198	204	210	217	224	231
Monetary damages from air pollution - Gas Stations (million \$2019)		24.4	25.1	25.8	26.5	27.2	27.9
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		35.7	33.3	31.3	30.1	29.7	29.4
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		0.778	0.685	0.512	0.337	0.195	0.115
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		7.4	7.58	7.87	8.17	8.2	8.13
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		4.01	4.05	4.07	4.08	4.07	4.05
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		29.8	29.3	27.1	24.5	23	22.9
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		4.53	4.54	4.53	4.47	4.42	4.39
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		9.9	10.3	10.7	11	11.3	11.7
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		13.7	8.85	6.72	6.24	5.88	5.36
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		304	321	329	316	314	294

Table 65: REF scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		3,681	3,680	3,680	3,679	3,679	3,679
By economic sector - Construction (jobs)		4,095	3,592	3,856	4,784	4,815	5,288
By economic sector - Manufacturing (jobs)		3,495	3,335	3,273	3,425	3,383	3,426
By economic sector - Mining (jobs)		1,150	882	695	570	483	382

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Other (jobs)		283	254	341	458	413	473
By economic sector - Pipeline (jobs)		203	211	213	203	206	205
By economic sector - Professional (jobs)		2,905	2,574	2,567	3,054	3,155	3,354
By economic sector - Trade (jobs)		2,909	2,471	2,309	2,456	2,386	2,410
By economic sector - Utilities (jobs)		5,672	4,484	4,074	4,842	5,141	5,759
By resource sector - Biomass (jobs)		8,622	8,381	8,165	7,971	7,797	7,639
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Coal (jobs)		1,397	914	491	359	343	131
By resource sector - Grid (jobs)		8,414	6,149	5,812	7,901	8,392	9,590
By resource sector - Natural Gas (jobs)		1,728	1,762	1,795	1,689	1,792	2,007
By resource sector - Nuclear (jobs)		404	398	231	0.006	0.011	0.019
By resource sector - Oil (jobs)		2,334	2,043	1,830	1,700	1,616	1,542
By resource sector - Solar (jobs)			89	732	941	335	437
By resource sector - Wind (jobs)		1,493	1,747	1,950	2,910	3,387	3,629
By education level - All sectors - High school diploma or less (jobs)		11,990	10,750	10,574	11,601	11,635	12,175
By education level - All sectors - Associates degree or some college (jobs)		6,576	5,675	5,568	6,417	6,511	6,976
By education level - All sectors - Bachelors degree (jobs)		4,540	3,933	3,777	4,225	4,265	4,500
By education level - All sectors - Masters or professional degree (jobs)		1,131	987	955	1,077	1,096	1,161
By education level - All sectors - Doctoral degree (jobs)		155	138	135	153	155	163
Related work experience - All sectors - None (jobs)		3,830	3,398	3,327	3,684	3,706	3,899
Related work experience - All sectors - Up to 1 year (jobs)		6,161	5,599	5,525	6,010	6,022	6,270
Related work experience - All sectors - 1 to 4 years (jobs)		8,138	7,069	6,878	7,760	7,835	8,306
Related work experience - All sectors - 4 to 10 years (jobs)		4,943	4,271	4,162	4,753	4,817	5,138
Related work experience - All sectors - Over 10 years (jobs)		1,320	1,147	1,116	1,264	1,281	1,363
On-the-Job Training - All sectors - None (jobs)		1,372	1,215	1,185	1,303	1,301	1,361
On-the-Job Training - All sectors - Up to 1 year (jobs)		17,248	15,302	14,928	16,472	16,562	17,368
On-the-Job Training - All sectors - 1 to 4 years (jobs)		4,265	3,669	3,603	4,176	4,247	4,567
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,307	1,118	1,113	1,320	1,350	1,467
On-the-Job Training - All sectors - Over 10 years (jobs)		201	180	179	201	202	213
On-Site or In-Plant Training - All sectors - None (jobs)		3,788	3,340	3,267	3,652	3,673	3,874
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		15,558	13,784	13,450	14,866	14,954	15,699
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		3,454	2,987	2,932	3,368	3,416	3,657
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,386	1,192	1,180	1,381	1,409	1,522
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		206	181	179	205	209	224
Wage income - All (million \$2019)		1,241	1,102	1,090	1,243	1,279	1,377

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	182	171	157	149	149	153	158

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Residential (PJ)	86.4	82.5	80.6	79.4	79.2	79.6	79.9
Final energy use - Commercial (PJ)	70.8	71	71	70.2	69.4	70	71.9
Final energy use - Industry (PJ)	281	297	305	312	321	329	340

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)		1.36	1.39	1.46	1.5	1.63	1.69

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	5.61	14.1	14.5	15.1	15.7	16.4	17.4
Sales of space heating units - Electric Resistance (%)	16.7	21.4	21.2	20.9	20.5	19.8	18.9
Sales of space heating units - Gas (%)	71.7	55	54.8	54.5	54.5	54.6	54.4
Sales of space heating units - Fossil (%)	5.95	9.38	9.47	9.46	9.32	9.23	9.3
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	35.5	51.2	51.2	51.1	51.1	51	51
Sales of water heating units - Gas Furnace (%)	64.5	48.7	48.8	48.9	48.9	48.9	49
Sales of water heating units - Other (%)	0.03	0.032	0.032	0.032	0.032	0.032	0.032
Sales of cooking units - Electric Resistance (%)	73.9	73.9	73.9	73.9	73.9	73.9	73.9
Sales of cooking units - Gas (%)	26.1	26.1	26.1	26.1	26.1	26.1	26.1
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		1.71	1.81				

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 (%)	3.92	13	44.6	70.5	74.8	75.2	75.2
Sales of space heating units - Electric Resistance (%)	6.31	6.4	10.8	18.4	23.4	24.2	24.3
Sales of space heating units - Gas (%)	89.8	78.5	43	10.4	1.69	0.518	0.457
Sales of space heating units - Fossil (%)	0	2.06	1.59	0.699	0.102	0.009	0
Sales of water heating units - Electric Heat Pump (%)	0.944	0.821	0.817	0.818	0.814	0.81	0.81
Sales of water heating units - Electric Resistance (%)	8.03	7.01	7.03	7.01	7.01	7.01	7.01
Sales of water heating units - Gas (%)	90.2	91.2	91.2	91.2	91.2	91.2	91.2
Sales of water heating units - Other (%)	0.788	0.989	0.989	0.988	0.987	0.991	0.991
Sales of cooking units - Electric Resistance (%)	44.8	47.8	47.9	47.8	47.9	47.9	48
Sales of cooking units - Gas (%)	55.2	52.2	52.1	52.2	52.1	52.1	52
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		5,476	5,633				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	3,836	3,362	1,938	1,065	1,065	1,065	0
Installed thermal - Natural gas (MW)	2,012	1,952	2,544	2,504	2,117	1,544	4,792
Installed thermal - Nuclear (MW)	801	801	801	0.003	0.005	0.009	0.015
Installed renewables - Rooftop PV (MW)	15.1	27	34.4	46	61	78.7	99.6

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed renewables - Solar - Base land use assumptions (MW)	1.28	1.28	1.28	338	1,308	1,308	1,308
Installed renewables - Wind - Base land use assumptions (MW)	3,194	3,194	3,194	3,194	5,524	11,740	13,731

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	3.05	3.05	3.05	639	2,495	2,495	2,495
Wind - Base land use assumptions (GWh)	13,033	13,033	13,033	13,033	21,237	42,900	49,761
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0

Table 72: REF scenario - PILLAR 6: Land sinks - Forests - REF only

Item	2020	2025	2030	2035	2040	2045	2050
Business-as-usual carbon sink - Natural uptake (Mt CO2e/y)	-0.18		0.307				0.088
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-0.078		-0.161				-0.17
Business-as-usual carbon sink - Total (Mt CO2e/y)	-0.258		0.146				-0.081

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)							-124
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-158
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-164
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-23.8
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-95
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-951
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-3,928
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-317
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-145
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-5,906
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-186
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-553
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-296
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-34.9
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-190
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,834
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-5,891

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Reforest pasture (1000 tCO <sub>2</sub> e/y)							-2,253
Carbon sink potential - Mid - Restore productivity (1000 tCO <sub>2</sub> e/y)							-288
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)							-11,526
Carbon sink potential - High - Accelerate regeneration (1000 tCO <sub>2</sub> e/y)							-248
Carbon sink potential - High - Avoid deforestation (1000 tCO <sub>2</sub> e/y)							-947
Carbon sink potential - High - Extend rotation length (1000 tCO <sub>2</sub> e/y)							-427
Carbon sink potential - High - Improve plantations (1000 tCO <sub>2</sub> e/y)							-46.9
Carbon sink potential - High - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)							-285
Carbon sink potential - High - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)							-2,717
Carbon sink potential - High - Reforest cropland (1000 tCO <sub>2</sub> e/y)							-7,855
Carbon sink potential - High - Reforest pasture (1000 tCO <sub>2</sub> e/y)							-4,189
Carbon sink potential - High - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)							-17,146
Carbon sink potential - High - Restore productivity (1000 tCO <sub>2</sub> e/y)							-431
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							20.2
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							120
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							83.4
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							8.63
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							136
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							260
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							20.6
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							86.4
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							735
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							30.4
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							124

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							151
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							13
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)							197
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							390
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							149
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							174
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,228
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							40.5
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							128
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							218
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							17.3
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							258
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							519
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							119
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							143
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,443