Net-Zero America - Kansas data

October 29, 2021 (updated January 9, 2022)

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

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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)		22.2	0.022	0.021	0.018	0.011	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		14	6.93	3.27	2.48	1.53	0.776
Premature deaths from air pollution - Mobile - On-Road (deaths)		45.8	42.9	32.7	19	8.81	3.67
Premature deaths from air pollution - Gas Stations (deaths)		4.87	4.51	3.43	2.07	1.05	0.537
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		7.75	6.28	4.12	2.22	1.01	0.406
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.124	0.103	0.072	0.043	0.02	0.007
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		1.43	1.29	0.99	0.641	0.32	0.131
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.714	0.687	0.656	0.623	0.588	0.551
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		5.21	4.46	3.26	2.06	1.21	0.67
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.768	0.626	0.495	0.374	0.267	0.173
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.427	0.36	0.294	0.23	0.169	0.112
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.04	0.381	0.371	0.359	0.356	0.349
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		84.7	80.7	74.7	58.6	44.2	27.8
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		197	0.195	0.187	0.156	0.102	0.002
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		124	61.4	29	22	13.5	6.88
Monetary damages from air pollution - Mobile - On-Road (million $2019)		408	381	291	169	78.3	32.6
Monetary damages from air pollution - Gas Stations (million $2019)		43.1	39.9	30.4	18.3	9.27	4.76
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		68.6	55.7	36.5	19.7	8.96	3.6
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		1.1	0.916	0.641	0.381	0.173	0.066
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		12.6	11.5	8.77	5.68	2.84	1.16
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		6.32	6.08	5.81	5.51	5.2	4.88
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		46.1	39.5	28.8	18.3	10.7	5.93

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)		6.8	5.54	4.39	3.31	2.36	1.53
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		3.78	3.18	2.6	2.04	1.5	0.988
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		9.21	3.36	3.28	3.17	3.14	3.08
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		752	717	664	520	392	247

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		859	862	1,795	1,224	1,152	942
By economic sector - Construction (jobs)		8,809	13,744	17,724	21,027	24,936	29,970
By economic sector - Manufacturing (jobs)		5,555	6,225	7,477	6,970	6,529	7,031
By economic sector - Mining (jobs)		5,896	4,715	3,680	2,449	1,671	1,018
By economic sector - Other (jobs)		734	1,105	1,700	2,342	3,014	4,073
By economic sector - Pipeline (jobs)		462	898	638	333	282	285
By economic sector - Professional (jobs)		6,054	8,646	13,150	16,448	20,535	25,118
By economic sector - Trade (jobs)		4,533	5,581	7,322	8,943	10,973	13,748
By economic sector - Utilities (jobs)		6,227	10,323	13,023	15,246	19,023	23,139
By resource sector - Biomass (jobs)		2,016	1,965	4,598	3,381	4,241	4,165
By resource sector - CO2 (jobs)		40.2	4,051	2,478	673	946	1,523
By resource sector - Coal (jobs)		375	0	0	0	0	0
By resource sector - Grid (jobs)		7,620	12,322	19,346	25,789	33,023	40,896
By resource sector - Natural Gas (jobs)		4,634	3,727	3,007	2,479	1,988	1,344
By resource sector - Nuclear (jobs)		640	630	365	0.013	0.015	0.026
By resource sector - Oil (jobs)		11,916	10,519	9,106	6,609	4,912	3,139
By resource sector - Solar (jobs)		2,311	2,491	3,485	4,318	4,959	7,431
By resource sector - Wind (jobs)		9,577	16,395	24,126	31,733	38,045	46,826
By education level - All sectors - High school diploma or less (jobs)		16,117	21,486	27,414	30,340	35,260	41,846
By education level - All sectors - Associates degree or some college (jobs)		11,587	16,013	20,445	23,476	27,829	33,558
By education level - All sectors - Bachelors degree (jobs)		8,879	11,313	14,337	16,181	19,059	22,745
By education level - All sectors - Masters or professional degree (jobs)		2,206	2,846	3,709	4,270	5,102	6,131
By education level - All sectors - Doctoral degree (jobs)		340	442	605	715	866	1,044
Related work experience - All sectors - None (jobs)		5,526	7,432	9,502	10,672	12,550	15,014
Related work experience - All sectors - Up to 1 year (jobs)		7,805	10,325	13,357	14,867	17,324	20,646
Related work experience - All sectors - 1 to 4 years (jobs)		14,215	18,837	24,017	27,129	31,937	38,154
Related work experience - All sectors - 4 to 10 years (jobs)		9,113	12,263	15,564	17,728	20,937	25,101
Related work experience - All sectors - Over 10 years (jobs)		2,470	3,243	4,070	4,585	5,366	6,409
On-the-Job Training - All sectors - None (jobs)		2,206	2,859	3,636	4,099	4,817	5,771
On-the-Job Training - All sectors - Up to 1 year (jobs)		26,267	34,373	44,017	49,228	57,630	68,671

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)		7,880	10,866	13,758	15,731	18,600	22,349
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,396	3,499	4,476	5,230	6,269	7,585
On-the-Job Training - All sectors - Over 10 years (jobs)		379	503	623	694	798	948
On-Site or In-Plant Training - All sectors - None (jobs)		6,376	8,472	10,923	12,368	14,572	17,445
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		23,747	31,145	39,767	44,510	52,116	62,137
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		6,156	8,418	10,657	12,129	14,303	17,155
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,539	3,621	4,593	5,316	6,340	7,639
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		311	445	571	659	784	947
Wage income - All (million $2019)		2,053	2,755	3,545	4,046	4,824	5,833

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

Item	2020	2025	2030	2035	2040	2045	2050
Oil consumption - Annual (million bbls)		82.3	73.3	59.2	45.7	35.1	26.3
Oil consumption - Cumulative (million bbls)							1,813
Oil production - Annual (million bbls)		45	45.1	45.1	35.7	29	19.3
Natural gas consumption - Annual (tcf)		240	202	162	122	76.7	53.2
Natural gas consumption - Cumulative (tcf)							4,880
Natural gas production - Annual (tcf)		223	211	184	155	123	95.6

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	286	268	235	195	160	139	131
Final energy use - Residential (PJ)	120	113	102	86.8	74.3	66.4	62.6
Final energy use - Commercial (PJ)	110	107	101	92.6	85.5	81	78.6
Final energy use - Industry (PJ)	174	182	189	190	195	204	206

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)		1.98	2.05	3.35	3.56	3.35	3.52

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	13.8	233	452	1,220	1,987	2,600	3,213
Vehicle stocks - LDV – All others (1000 units)	2,679	2,551	2,423	1,766	1,109	627	146
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		515	1,320	2,139	3,240	3,527	3,363
Public EV charging plugs - DC Fast (1000 units)	0.119		0.964		4.24		6.85
Public EV charging plugs - L2 (1000 units)	0.786		23.3		102		165

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 (%)	4.79	20.7	76.2	90.8	91.9	91.9	91.7
Sales of space heating units - Electric Resistance (%)	11.9	15	6.62	4.42	4.27	4.39	4.55
Sales of space heating units - Gas (%)	77.4	55.1	13.1	2.17	1.44	1.41	1.38
Sales of space heating units - Fossil (%)	5.87	9.2	4.05	2.66	2.42	2.31	2.37
Sales of water heating units - Electric Heat Pump (%)	0	9.31	49.7	59.7	60.3	60.3	60.3
Sales of water heating units - Electric Resistance (%)	27.3	41.9	39.5	39.6	39.7	39.7	39.7
Sales of water heating units - Gas Furnace (%)	72.7	48.8	10.7	0.692	0.019	0	0
Sales of water heating units - Other (%)	0.024	0.027	0.027	0.027	0.027	0.027	0.027
Sales of cooking units - Electric Resistance (%)	66.4	73.6	95.5	99.8	100	100	100
Sales of cooking units - Gas (%)	33.6	26.4	4.52	0.228	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		3.01	4.04				

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 (%)	2.13	24.7	71.3	88	89.8	89.9	89.8
Sales of space heating units - Electric Resistance (%)	4.54	5.67	7.02	9.23	9.68	9.7	9.71
Sales of space heating units - Gas Furnace (%)	93.3	67.9	21.4	2.81	0.539	0.45	0.45
Sales of space heating units - Fossil (%)	0	1.73	0.333	0.014	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.677	10.7	53.8	64.7	65.3	65.3	65.3
Sales of water heating units - Electric Resistance (%)	5.85	10.9	28.5	33.6	34	34	34
Sales of water heating units - Gas Furnace (%)	92.9	77.4	17	1.1	0.03	0	0
Sales of water heating units - Other (%)	0.567	0.935	0.728	0.68	0.677	0.679	0.679
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)		8,255	8,955				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	2,770	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	3,646	2,546	3,789	4,389	4,692	5,516	5,241
Installed thermal - Nuclear (MW)	1,268	1,268	1,268	0	0.006	0.011	0.02
Installed renewables - Rooftop PV (MW)	318	560	817	1,203	1,752	2,467	3,398
Installed renewables - Solar - Base land use assumptions (MW)	22.2	22.2	22.2	22.2	22.2	22.2	99.9
Installed renewables - Wind - Base land use assumptions (MW)	7,584	7,584	7,907	9,178	11,486	14,792	14,988
Installed renewables - Solar - Constrained land use assumptions (MW)	17.1	17.1	17.1	227	227	227	227
Installed renewables - Wind - Constrained land use assumptions (MW)	7,584	7,584	8,075	9,870	14,212	19,327	19,693
Capital invested - Solar PV - Base (billion $2018)		0	0	0	0	0	0.072

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Wind - Base (billion $2018)		0	0.43	1.58	2.73	3.71	0.208
Capital invested - Solar PV - Constrained (billion $2018)		0.03	0	0.231	0	0	0.072
Capital invested - Wind - Constrained (billion $2018)		0.552	0.572	3.14	5.93	6.23	0.442
Capital invested - Biomass power plant (billion $2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion $2018)	0	0	0	0	0	0	0.042
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	0	0	0	0	0.171

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	58.5	58.5	58.5	58.5	58.5	58.5	209
Wind - Base land use assumptions (GWh)	31,394	31,394	32,596	37,276	45,638	57,527	58,220
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	45.5	45.5	45.5	450	450	450	450
Wind - Constrained land use assumptions (GWh)	31,394	31,394	33,202	39,664	55,059	72,775	74,048
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0
Biomass power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu power plant (GWh)	0	0	0	0	0	0	192
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	0	41.8

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

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu (quantity)	0	0	0	0	0	0	1
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	0	0	1
Number of facilities - Beccs hydrogen (quantity)	0	0	0	6	6	11	13
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	0	1
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	0	0	1
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0
Conversion capital investment - Cumulative 5-yr (million $2018)		0	0	6,624	0	5,640	2,843
Biomass purchases (million $2018/y)		0	0	461	461	853	1,051

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0.01	8.54	11.9	19.2	23
Annual - BECCS (MMT)		0	0	8.51	8.51	15.8	19.4
Annual - NGCC (MMT)		0	0.01	0.03	0.02	0.02	0.02
Annual - Cement and lime (MMT)		0	0	0	3.32	3.42	3.53
Cumulative - All (MMT)		0	0.01	8.55	20.4	39.6	62.6
Cumulative - BECCS (MMT)		0	0	8.51	17	32.8	52.2

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

Item	2020	2025	2030	2035	2040	2045	2050
Cumulative - NGCC (MMT)		0	0.01	0.04	0.06	0.08	0.1
Cumulative - Cement and lime (MMT)		0	0	0	3.32	6.74	10.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	997	1,361	1,361	1,361	1,361
Spur (km)		0	58.5	659	926	1,283	1,902
All (km)		0	1,055	2,020	2,287	2,644	3,263
Cumulative investment - Trunk (million $2018)		0	4,953	6,879	6,879	6,879	6,879
Cumulative investment - Spur (million $2018)		0	30.9	494	715	971	1,456
Cumulative investment - All (million $2018)		0	4,984	7,372	7,594	7,850	8,335

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual (MMT)		0	0	1.76	2.71	4.3	5.59
Injection wells (wells)		0	1	3	6	10	12
Resource characterization, appraisal, permitting costs (million $2020)		77.2	185	216	216	216	216
Wells and facilities construction costs (million $2020)		0	25.7	100	178	298	371

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)							-74.7
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-283
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-378
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-22.8
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-179
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-1,263
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-13,386
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-503
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-227
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-16,316
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-112
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-992
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-680
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-33.4
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-357

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-2,435
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-20,079
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-3,575
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-451
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-28,714
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-149
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,700
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-983
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-44.9
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-536
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-3,607
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-26,772
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-6,646
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-41,112
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-674
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							12.2
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							216
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							192
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							8.26
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)							180
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							885
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							32.7
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							135
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,662
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							18.3

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 - Avoid deforestation (over 30 years) (1000 hectares)							223
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							347
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							12.4
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)							262
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							1,328
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							237
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							272
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							2,699
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							24.4
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							230
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							501
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							16.5
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)							343
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							1,770
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							189
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							223
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							3,297

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-696

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-5,387
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-312
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-6,395
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-696
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-10,263
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-624
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-11,583
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							413
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							5,430
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							524
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							6,366
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							413
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							10,336
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							1,047
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							11,796

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)		22.2	0.022	0.021	0.018	0.011	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		13.8	5.77	2.87	1.52	0.604	0.459
Premature deaths from air pollution - Mobile - On-Road (deaths)		46.6	47.1	46.1	41.7	33.4	23
Premature deaths from air pollution - Gas Stations (deaths)		4.97	5.03	4.87	4.4	3.52	2.47
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		7.83	7.2	6.42	5.28	3.87	2.51
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.127	0.123	0.119	0.108	0.088	0.068

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		1.44	1.48	1.48	1.36	1.08	0.755
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.714	0.687	0.656	0.623	0.588	0.551
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		5.24	5.03	4.69	4.09	3.28	2.43
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.768	0.676	0.594	0.513	0.434	0.361
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.427	0.386	0.345	0.305	0.265	0.227
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1	0.383	0.377	0.37	0.357	0.329
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		84.6	78.2	69.7	62.4	56	39.1
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		197	0.195	0.187	0.156	0.102	0.002
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		122	51.1	25.4	13.5	5.35	4.06
Monetary damages from air pollution - Mobile - On-Road (million $2019)		414	419	410	371	297	205
Monetary damages from air pollution - Gas Stations (million $2019)		44	44.5	43.2	38.9	31.2	21.9
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		69.4	63.8	56.9	46.8	34.3	22.2
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		1.12	1.09	1.05	0.956	0.782	0.599
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		12.8	13.1	13.1	12.1	9.55	6.69
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		6.32	6.08	5.81	5.51	5.2	4.88
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		46.4	44.5	41.5	36.2	29	21.5
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		6.8	5.99	5.26	4.54	3.84	3.2
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		3.78	3.41	3.05	2.7	2.35	2.01
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		8.84	3.38	3.33	3.26	3.15	2.9
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		751	694	619	554	498	347

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		860	861	2,628	1,855	1,592	942
By economic sector - Construction (jobs)		8,880	14,916	18,146	21,085	27,781	35,692
By economic sector - Manufacturing (jobs)		5,631	6,295	7,544	7,713	8,559	9,010
By economic sector - Mining (jobs)		5,905	4,725	3,772	2,998	2,394	1,531
By economic sector - Other (jobs)		741	1,116	1,678	2,317	3,261	4,689
By economic sector - Pipeline (jobs)		463	1,240	847	422	422	460
By economic sector - Professional (jobs)		6,123	8,771	14,056	17,692	23,585	29,877
By economic sector - Trade (jobs)		4,570	5,664	7,606	9,496	12,554	16,465
By economic sector - Utilities (jobs)		6,188	11,330	13,231	14,813	21,179	27,587
By resource sector - Biomass (jobs)		2,017	1,961	7,818	6,963	6,777	4,028
By resource sector - CO2 (jobs)		40.4	6,916	4,256	1,175	1,623	2,585
By resource sector - Coal (jobs)		375	0	0	0	0	0
By resource sector - Grid (jobs)		7,489	11,866	18,391	24,870	36,499	48,137
By resource sector - Natural Gas (jobs)		4,639	3,269	2,442	1,906	2,027	1,591
By resource sector - Nuclear (jobs)		640	630	365	0.015	0.017	0.03
By resource sector - Oil (jobs)		11,952	10,712	9,618	8,447	7,255	4,769
By resource sector - Solar (jobs)		2,341	2,525	3,293	4,172	5,095	7,470
By resource sector - Wind (jobs)		9,865	17,040	23,324	30,857	42,047	57,673
By education level - All sectors - High school diploma or less (jobs)		16,206	22,720	28,904	31,842	40,638	50,073
By education level - All sectors - Associates degree or some college (jobs)		11,656	16,999	21,112	24,148	31,743	40,244
By education level - All sectors - Bachelors degree (jobs)		8,934	11,793	14,966	17,114	22,061	27,342
By education level - All sectors - Masters or professional degree (jobs)		2,220	2,952	3,884	4,518	5,881	7,347
By education level - All sectors - Doctoral degree (jobs)		343	453	642	768	1,000	1,247
Related work experience - All sectors - None (jobs)		5,556	7,865	9,984	11,165	14,426	17,971
Related work experience - All sectors - Up to 1 year (jobs)		7,854	10,850	14,120	15,702	20,002	24,661
Related work experience - All sectors - 1 to 4 years (jobs)		14,297	19,834	25,063	28,351	36,722	45,772
Related work experience - All sectors - 4 to 10 years (jobs)		9,167	12,958	16,138	18,402	23,997	30,138
Related work experience - All sectors - Over 10 years (jobs)		2,485	3,409	4,203	4,771	6,179	7,711
On-the-Job Training - All sectors - None (jobs)		2,220	2,994	3,813	4,329	5,557	6,906
On-the-Job Training - All sectors - Up to 1 year (jobs)		26,423	36,072	46,247	51,890	66,589	82,310
On-the-Job Training - All sectors - 1 to 4 years (jobs)		7,925	11,555	14,191	16,146	21,192	26,820
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,409	3,762	4,613	5,307	7,069	9,076
On-the-Job Training - All sectors - Over 10 years (jobs)		382	533	643	719	917	1,141
On-Site or In-Plant Training - All sectors - None (jobs)		6,419	8,913	11,448	12,969	16,758	20,898
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		23,885	32,713	41,709	46,825	60,163	74,483
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		6,191	8,936	11,017	12,492	16,330	20,584
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,552	3,880	4,743	5,429	7,181	9,153
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		312	476	590	675	892	1,135
Wage income - All (million $2019)		2,065	2,902	3,701	4,230	5,548	6,999

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	287	270	245	226	212	195	175
Final energy use - Residential (PJ)	120	114	109	103	93.6	83.1	73.8
Final energy use - Commercial (PJ)	110	107	104	99.9	95.2	90.4	86.3
Final energy use - Industry (PJ)	174	182	190	193	200	209	211

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)		1.64	1.66	2.05	2.12	3.02	3.19

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	10.7	75.1	140	438	737	1,397	2,058
Vehicle stocks - LDV – All others (1000 units)	2,690	2,690	2,690	2,552	2,413	1,860	1,306
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		0	83.3	175	591	1,861	2,710
Public EV charging plugs - DC Fast (1000 units)	0.119		0.298		1.57		4.39
Public EV charging plugs - L2 (1000 units)	0.786		7.18		37.9		106

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 (%)	4.79	10.1	16.5	34.7	63.2	82.5	89.3
Sales of space heating units - Electric Resistance (%)	11.9	16.6	15.6	12.9	8.54	5.65	4.74
Sales of space heating units - Gas (%)	77.4	63	58.2	44.5	23.1	8.65	3.34
Sales of space heating units - Fossil (%)	5.87	10.2	9.69	7.94	5.1	3.2	2.63
Sales of water heating units - Electric Heat Pump (%)	0	1.62	6.21	19.5	40	53.6	58.5
Sales of water heating units - Electric Resistance (%)	27.3	42.3	42	41.2	40.3	39.8	39.7
Sales of water heating units - Gas Furnace (%)	72.7	56	51.8	39.3	19.8	6.56	1.76
Sales of water heating units - Other (%)	0.024	0.027	0.027	0.027	0.027	0.027	0.027
Sales of cooking units - Electric Resistance (%)	66.3	67.2	70.2	78.4	89.7	96.7	99.1
Sales of cooking units - Gas (%)	33.7	32.8	29.8	21.6	10.3	3.33	0.895
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		2.99	4.02				

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 (%)	2.13	16	21.4	36.9	61.7	79.8	87
Sales of space heating units - Electric Resistance (%)	4.54	5.5	5.66	6.18	7.29	8.59	9.36
Sales of space heating units - Gas Furnace (%)	93.3	76.5	71.1	55.5	30.3	11.4	3.55
Sales of space heating units - Fossil (%)	0	2	1.88	1.4	0.684	0.222	0.059
Sales of water heating units - Electric Heat Pump (%)	0.677	2.54	7.44	21.6	43.5	58.2	63.4
Sales of water heating units - Electric Resistance (%)	5.85	7.67	9.68	15.4	24.5	30.8	33.1

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Gas Furnace (%)	92.9	88.8	81.9	62.1	31.2	10.4	2.79
Sales of water heating units - Other (%)	0.567	0.974	0.953	0.882	0.777	0.711	0.687
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)		8,253	8,961				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	2,770	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	3,652	2,606	2,610	2,425	2,162	4,286	4,865
Installed thermal - Nuclear (MW)	1,268	1,268	1,268	0	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)							-74.7
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-283
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-378
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-22.8
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-179
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-1,263
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-13,386
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-503
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-227
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-16,316
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-112
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-992
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-680
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-33.4
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-357
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-2,435
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-20,079
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-3,575
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-451
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-28,714

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-149
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,700
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-983
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-44.9
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-536
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-3,607
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-26,772
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-6,646
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-41,112
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-674
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							12.2
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							216
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							192
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							8.26
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)							180
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							885
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							32.7
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							135
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,662
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							18.3
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							223
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							347
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							12.4

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							262
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							1,328
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							237
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							272
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							2,699
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							24.4
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							230
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							501
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							16.5
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)							343
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							1,770
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							189
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							223
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							3,297

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)							-696
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-5,387
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-312
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-6,395

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-696
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-10,263
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-624
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-11,583
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							413
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							5,430
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							524
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							6,366
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							413
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							10,336
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							1,047
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							11,796

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)		22.2	0.022	0.021	0.018	0.011	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		13.1	6.36	2	1.38	0.639	0.405
Premature deaths from air pollution - Mobile - On-Road (deaths)		45.8	42.9	32.7	19	8.81	3.67
Premature deaths from air pollution - Gas Stations (deaths)		4.87	4.51	3.43	2.07	1.05	0.537
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		7.75	6.28	4.12	2.22	1.01	0.406
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.124	0.103	0.072	0.043	0.02	0.007
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		1.43	1.29	0.99	0.641	0.32	0.131
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.714	0.687	0.656	0.623	0.588	0.551
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		5.21	4.46	3.26	2.06	1.21	0.67

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.768	0.626	0.495	0.374	0.267	0.173
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.427	0.36	0.294	0.23	0.169	0.112
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.15	0.381	0.371	0.358	0.354	0.303
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		83.5	79.8	70.4	51.2	32.1	5.22
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		197	0.195	0.187	0.156	0.102	0.002
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		116	56.4	17.7	12.2	5.66	3.59
Monetary damages from air pollution - Mobile - On-Road (million $2019)		408	381	291	169	78.3	32.6
Monetary damages from air pollution - Gas Stations (million $2019)		43.1	39.9	30.4	18.3	9.27	4.76
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		68.6	55.7	36.5	19.7	8.96	3.6
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		1.1	0.916	0.641	0.381	0.173	0.066
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		12.6	11.5	8.77	5.68	2.84	1.16
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		6.32	6.08	5.81	5.51	5.2	4.88
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		46.1	39.5	28.8	18.3	10.7	5.93
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		6.8	5.54	4.39	3.31	2.36	1.53
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		3.78	3.18	2.6	2.04	1.5	0.988
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		10.2	3.37	3.27	3.16	3.13	2.67
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		742	708	625	454	285	46.3

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		859	862	1,713	1,162	991	946
By economic sector - Construction (jobs)		9,020	12,754	20,069	27,860	37,624	51,775
By economic sector - Manufacturing (jobs)		5,715	6,682	8,722	9,025	10,527	11,949
By economic sector - Mining (jobs)		5,833	4,629	3,464	2,119	1,170	177
By economic sector - Other (jobs)		757	1,168	2,038	3,094	4,462	6,691
By economic sector - Pipeline (jobs)		453	400	314	221	138	34.6
By economic sector - Professional (jobs)		6,218	9,092	15,620	22,190	31,093	43,932

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Trade (jobs)		4,607	5,794	8,519	11,777	16,422	23,669
By economic sector - Utilities (jobs)		5,969	7,950	13,593	20,109	29,215	41,956
By resource sector - Biomass (jobs)		2,015	1,966	4,225	3,378	3,719	4,303
By resource sector - CO2 (jobs)		0	0.001	0.001	0.001	0.001	0.001
By resource sector - Coal (jobs)		375	0	0	0	0	0
By resource sector - Grid (jobs)		7,456	12,360	23,070	35,265	52,534	77,156
By resource sector - Natural Gas (jobs)		4,493	3,395	2,404	1,900	1,661	1,213
By resource sector - Nuclear (jobs)		377	0	0	0	0	0
By resource sector - Oil (jobs)		11,917	10,491	8,874	6,072	3,831	610
By resource sector - Solar (jobs)		2,385	2,801	4,008	5,072	6,532	8,603
By resource sector - Wind (jobs)		10,413	18,318	31,472	45,871	63,368	89,246
By education level - All sectors - High school diploma or less (jobs)		16,248	20,233	30,289	39,186	52,329	71,495
By education level - All sectors - Associates degree or some college (jobs)		11,692	14,992	22,846	30,779	41,989	58,194
By education level - All sectors - Bachelors degree (jobs)		8,928	10,895	16,040	21,058	28,412	39,064
By education level - All sectors - Masters or professional degree (jobs)		2,219	2,765	4,183	5,590	7,621	10,580
By education level - All sectors - Doctoral degree (jobs)		344	445	696	945	1,292	1,797
Related work experience - All sectors - None (jobs)		5,567	6,972	10,515	13,841	18,687	25,755
Related work experience - All sectors - Up to 1 year (jobs)		7,880	9,878	14,892	19,306	25,809	35,368
Related work experience - All sectors - 1 to 4 years (jobs)		14,315	17,843	26,734	35,268	47,657	65,578
Related work experience - All sectors - 4 to 10 years (jobs)		9,183	11,560	17,367	23,162	31,425	43,361
Related work experience - All sectors - Over 10 years (jobs)		2,486	3,077	4,544	5,981	8,066	11,070
On-the-Job Training - All sectors - None (jobs)		2,222	2,742	4,064	5,336	7,176	9,877
On-the-Job Training - All sectors - Up to 1 year (jobs)		26,463	32,794	48,998	63,868	85,825	117,736
On-the-Job Training - All sectors - 1 to 4 years (jobs)		7,943	10,116	15,315	20,576	27,996	38,713
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,420	3,200	4,978	6,872	9,444	13,179
On-the-Job Training - All sectors - Over 10 years (jobs)		383	478	698	906	1,202	1,627
On-Site or In-Plant Training - All sectors - None (jobs)		6,434	8,083	12,228	16,149	21,813	30,023
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		23,918	29,647	44,239	57,753	77,649	106,585
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		6,204	7,862	11,854	15,833	21,483	29,651
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,561	3,326	5,095	6,959	9,515	13,226
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		314	412	636	864	1,183	1,647
Wage income - All (million $2019)		2,065	2,599	3,936	5,255	7,191	10,032

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	286	268	235	195	160	139	131
Final energy use - Residential (PJ)	120	113	102	86.8	74.3	66.4	62.6
Final energy use - Commercial (PJ)	110	107	101	92.6	85.5	81	78.6
Final energy use - Industry (PJ)	174	182	189	190	195	204	206

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)		1.98	2.05	3.35	3.56	3.35	3.52

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	13.8	233	452	1,220	1,987	2,600	3,213
Vehicle stocks - LDV – All others (1000 units)	2,679	2,551	2,423	1,766	1,109	627	146
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		515	1,320	2,139	3,240	3,527	3,363
Public EV charging plugs - DC Fast (1000 units)	0.119		0.964		4.24		6.85
Public EV charging plugs - L2 (1000 units)	0.786		23.3		102		165

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 (%)	4.79	20.7	76.2	90.8	91.9	91.9	91.7
Sales of space heating units - Electric Resistance (%)	11.9	15	6.62	4.42	4.27	4.39	4.55
Sales of space heating units - Gas (%)	77.4	55.1	13.1	2.17	1.44	1.41	1.38
Sales of space heating units - Fossil (%)	5.87	9.2	4.05	2.66	2.42	2.31	2.37
Sales of water heating units - Electric Heat Pump (%)	0	9.31	49.7	59.7	60.3	60.3	60.3
Sales of water heating units - Electric Resistance (%)	27.3	41.9	39.5	39.6	39.7	39.7	39.7
Sales of water heating units - Gas Furnace (%)	72.7	48.8	10.7	0.692	0.019	0	0
Sales of water heating units - Other (%)	0.024	0.027	0.027	0.027	0.027	0.027	0.027
Sales of cooking units - Electric Resistance (%)	66.4	73.6	95.5	99.8	100	100	100
Sales of cooking units - Gas (%)	33.6	26.4	4.52	0.228	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		3.01	4.04				

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 (%)	2.13	24.7	71.3	88	89.8	89.9	89.8
Sales of space heating units - Electric Resistance (%)	4.54	5.67	7.02	9.23	9.68	9.7	9.71
Sales of space heating units - Gas Furnace (%)	93.3	67.9	21.4	2.81	0.539	0.45	0.45
Sales of space heating units - Fossil (%)	0	1.73	0.333	0.014	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.677	10.7	53.8	64.7	65.3	65.3	65.3
Sales of water heating units - Electric Resistance (%)	5.85	10.9	28.5	33.6	34	34	34
Sales of water heating units - Gas Furnace (%)	92.9	77.4	17	1.1	0.03	0	0
Sales of water heating units - Other (%)	0.567	0.935	0.728	0.68	0.677	0.679	0.679
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)		8,255	8,955				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	2,770	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	3,652	2,549	2,760	2,908	3,606	5,664	6,941
Installed thermal - Nuclear (MW)	1,268	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	318	560	817	1,203	1,752	2,467	3,398
Installed renewables - Solar - Base land use assumptions (MW)	22.2	22.2	22.2	22.2	22.2	22.2	122
Installed renewables - Wind - Base land use assumptions (MW)	7,584	7,664	8,301	11,773	22,479	47,304	81,898
Installed renewables - Solar - Constrained land use assumptions (MW)	22.2	22.2	22.2	22.2	22.2	522	1,195
Installed renewables - Wind - Constrained land use assumptions (MW)	8,454	8,676	9,223	15,669	29,591	57,059	83,147
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion $2018)		0	0	0	0	0	0.093
Capital invested - Wind - Base (billion $2018)		0.117	0.849	4.31	12.7	27.9	36.6

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	58.5	58.5	58.5	58.5	58.5	58.5	274
Wind - Base land use assumptions (GWh)	31,394	31,691	34,060	46,683	84,776	171,754	291,098
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	117	117	117	117	117	2,193	4,951
Wind - Constrained land use assumptions (GWh)	62,787	64,440	68,416	114,196	210,095	394,449	561,516
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)							-74.7
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-283
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-378
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-22.8
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-179
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-1,263
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-13,386
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-503
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-227
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-16,316

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-112
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-992
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-680
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-33.4
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-357
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-2,435
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-20,079
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-3,575
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-451
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-28,714
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-149
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,700
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-983
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-44.9
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-536
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-3,607
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-26,772
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-6,646
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-41,112
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-674
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							12.2
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							216
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							192
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							8.26
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)							180
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							885

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							32.7
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							135
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,662
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							18.3
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							223
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							347
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							12.4
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)							262
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							1,328
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							237
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							272
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							2,699
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							24.4
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							230
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							501
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							16.5
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)							343
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							1,770
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							189
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							223

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							3,297

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-696
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-5,387
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-312
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-6,395
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-696
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-10,263
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-624
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-11,583
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							413
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							5,430
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							524
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							6,366
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							413
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							10,336
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							1,047
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							11,796

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)		22.2	0.022	0.021	0.018	0.011	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		14.6	6.4	6.57	4.98	2.1	0.837
Premature deaths from air pollution - Mobile - On-Road (deaths)		45.8	42.9	32.7	19	8.81	3.67
Premature deaths from air pollution - Gas Stations (deaths)		4.87	4.51	3.43	2.07	1.05	0.537
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		7.75	6.28	4.12	2.22	1.01	0.406
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.124	0.103	0.072	0.043	0.02	0.007
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		1.43	1.29	0.99	0.641	0.32	0.131
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.714	0.687	0.656	0.623	0.588	0.551
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		5.21	4.46	3.26	2.06	1.21	0.67
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.768	0.626	0.495	0.374	0.267	0.173
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.427	0.36	0.294	0.23	0.169	0.112
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.936	0.38	0.371	0.359	0.356	0.303
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		85.6	83.6	82.3	69.2	57.7	42.9
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		197	0.195	0.187	0.156	0.102	0.002
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		129	56.7	58.2	44.1	18.6	7.41
Monetary damages from air pollution - Mobile - On-Road (million $2019)		408	381	291	169	78.3	32.6
Monetary damages from air pollution - Gas Stations (million $2019)		43.1	39.9	30.4	18.3	9.27	4.76
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		68.6	55.7	36.5	19.7	8.96	3.6
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		1.1	0.916	0.641	0.381	0.173	0.066
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		12.6	11.5	8.77	5.68	2.84	1.16
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		6.32	6.08	5.81	5.51	5.2	4.88
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		46.1	39.5	28.8	18.3	10.7	5.93
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		6.8	5.54	4.39	3.31	2.36	1.53

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		3.78	3.18	2.6	2.04	1.5	0.988
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		8.26	3.36	3.27	3.16	3.14	2.67
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		760	743	731	614	513	381

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		860	861	2,655	1,576	1,290	939
By economic sector - Construction (jobs)		8,413	12,763	13,586	13,606	14,938	16,343
By economic sector - Manufacturing (jobs)		5,244	5,100	5,803	5,154	4,644	3,949
By economic sector - Mining (jobs)		5,934	4,822	3,913	2,720	1,999	1,392
By economic sector - Other (jobs)		699	876	1,178	1,503	1,831	2,345
By economic sector - Pipeline (jobs)		471	1,372	956	459	442	509
By economic sector - Professional (jobs)		5,761	6,781	10,103	10,643	12,042	12,573
By economic sector - Trade (jobs)		4,403	4,713	5,626	5,922	6,526	7,066
By economic sector - Utilities (jobs)		6,013	10,748	11,127	10,500	11,643	12,618
By resource sector - Biomass (jobs)		2,016	1,961	8,106	5,263	5,073	4,044
By resource sector - CO2 (jobs)		40.7	7,828	4,824	1,315	1,817	2,913
By resource sector - Coal (jobs)		375	0	0	0	0	0
By resource sector - Grid (jobs)		7,209	9,792	14,049	16,579	18,741	19,917
By resource sector - Natural Gas (jobs)		4,773	4,203	3,688	3,523	2,918	2,520
By resource sector - Nuclear (jobs)		640	630	365	0.032	0.039	0.202
By resource sector - Oil (jobs)		11,915	10,519	9,106	6,609	5,027	3,552
By resource sector - Solar (jobs)		2,217	2,224	2,874	3,673	4,391	6,620
By resource sector - Wind (jobs)		8,612	10,881	11,934	15,120	17,388	18,169
By education level - All sectors - High school diploma or less (jobs)		15,575	20,021	23,219	21,502	22,558	23,416
By education level - All sectors - Associates degree or some college (jobs)		11,159	14,853	16,481	15,954	17,191	18,219
By education level - All sectors - Bachelors degree (jobs)		8,600	10,252	11,747	11,220	11,929	12,293
By education level - All sectors - Masters or professional degree (jobs)		2,135	2,537	3,016	2,926	3,150	3,263
By education level - All sectors - Doctoral degree (jobs)		328	375	483	481	526	544
Related work experience - All sectors - None (jobs)		5,341	6,932	7,973	7,488	7,948	8,317
Related work experience - All sectors - Up to 1 year (jobs)		7,531	9,434	11,215	10,462	10,992	11,402
Related work experience - All sectors - 1 to 4 years (jobs)		13,741	17,367	19,815	18,834	20,059	20,900
Related work experience - All sectors - 4 to 10 years (jobs)		8,798	11,327	12,645	12,143	13,006	13,633
Related work experience - All sectors - Over 10 years (jobs)		2,386	2,978	3,299	3,156	3,350	3,482
On-the-Job Training - All sectors - None (jobs)		2,134	2,600	2,997	2,851	3,029	3,161
On-the-Job Training - All sectors - Up to 1 year (jobs)		25,390	31,514	36,734	34,547	36,493	37,762
On-the-Job Training - All sectors - 1 to 4 years (jobs)		7,600	10,148	11,125	10,707	11,508	12,172
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,308	3,313	3,593	3,505	3,827	4,120

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

Item	2020	2025	2030	2035	2040	2045	2050
On-the-Job Training - All sectors - Over 10 years (jobs)		365	462	498	473	498	520
On-Site or In-Plant Training - All sectors - None (jobs)		6,151	7,723	8,967	8,531	9,102	9,493
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		22,956	28,620	33,135	31,203	32,974	34,181
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		5,940	7,850	8,665	8,305	8,894	9,378
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,450	3,426	3,717	3,597	3,901	4,168
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		299	418	462	448	483	515
Wage income - All (million $2019)		1,986	2,549	2,937	2,817	3,033	3,196

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	286	268	235	195	160	139	131
Final energy use - Residential (PJ)	120	113	102	86.8	74.3	66.4	62.6
Final energy use - Commercial (PJ)	110	107	101	92.6	85.5	81	78.6
Final energy use - Industry (PJ)	174	182	189	190	195	204	206

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)		1.98	2.05	3.35	3.56	3.35	3.52

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	13.8	233	452	1,220	1,987	2,600	3,213
Vehicle stocks - LDV – All others (1000 units)	2,679	2,551	2,423	1,766	1,109	627	146
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		515	1,320	2,139	3,240	3,527	3,363
Public EV charging plugs - DC Fast (1000 units)	0.119		0.964		4.24		6.85
Public EV charging plugs - L2 (1000 units)	0.786		23.3		102		165

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 (%)	4.79	20.7	76.2	90.8	91.9	91.9	91.7
Sales of space heating units - Electric Resistance (%)	11.9	15	6.62	4.42	4.27	4.39	4.55
Sales of space heating units - Gas (%)	77.4	55.1	13.1	2.17	1.44	1.41	1.38
Sales of space heating units - Fossil (%)	5.87	9.2	4.05	2.66	2.42	2.31	2.37
Sales of water heating units - Electric Heat Pump (%)	0	9.31	49.7	59.7	60.3	60.3	60.3
Sales of water heating units - Electric Resistance (%)	27.3	41.9	39.5	39.6	39.7	39.7	39.7
Sales of water heating units - Gas Furnace (%)	72.7	48.8	10.7	0.692	0.019	0	0
Sales of water heating units - Other (%)	0.024	0.027	0.027	0.027	0.027	0.027	0.027
Sales of cooking units - Electric Resistance (%)	66.4	73.6	95.5	99.8	100	100	100
Sales of cooking units - Gas (%)	33.6	26.4	4.52	0.228	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		3.01	4.04				

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 (%)	2.13	24.7	71.3	88	89.8	89.9	89.8
Sales of space heating units - Electric Resistance (%)	4.54	5.67	7.02	9.23	9.68	9.7	9.71
Sales of space heating units - Gas Furnace (%)	93.3	67.9	21.4	2.81	0.539	0.45	0.45
Sales of space heating units - Fossil (%)	0	1.73	0.333	0.014	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.677	10.7	53.8	64.7	65.3	65.3	65.3
Sales of water heating units - Electric Resistance (%)	5.85	10.9	28.5	33.6	34	34	34
Sales of water heating units - Gas Furnace (%)	92.9	77.4	17	1.1	0.03	0	0
Sales of water heating units - Other (%)	0.567	0.935	0.728	0.68	0.677	0.679	0.679
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)		8,255	8,955				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	2,770	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	3,651	2,541	4,388	4,435	5,576	4,991	4,404
Installed thermal - Nuclear (MW)	1,268	1,268	1,268	0	0.014	0.028	0.111
Installed renewables - Rooftop PV (MW)	318	560	817	1,203	1,752	2,467	3,398
Installed renewables - Solar - Base land use assumptions (MW)	22.2	22.2	22.2	22.2	22.2	22.2	22.2
Installed renewables - Wind - Base land use assumptions (MW)	7,384	7,384	7,384	7,744	8,556	8,902	8,902
Installed renewables - Solar - Constrained land use assumptions (MW)	22.2	22.2	22.2	22.2	22.2	22.2	22.2
Installed renewables - Wind - Constrained land use assumptions (MW)	7,594	7,594	7,594	8,159	9,059	9,844	9,844
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion $2018)		0	0	0	0	0	0
Capital invested - Wind - Base (billion $2018)		0	0	0.447	0.999	0.435	0
Capital invested - Solar PV - Constrained (billion $2018)		0	0	0	0	0	0
Capital invested - Wind - Constrained (billion $2018)		0	0	0.7	1.06	0.879	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	58.5	58.5	58.5	58.5	58.5	58.5	58.5
Wind - Base land use assumptions (GWh)	31,394	31,394	31,394	32,737	35,854	37,276	37,276
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Constrained land use assumptions (GWh)	58.5	58.5	58.5	58.5	58.5	58.5	58.5
Wind - Constrained land use assumptions (GWh)	31,394	31,394	31,394	33,470	36,713	39,536	39,536
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)							-74.7
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-283
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-378
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-22.8
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-179
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-1,263
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-13,386
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-503
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-227
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-16,316
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-112
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-992
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-680
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-33.4
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-357
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-2,435
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-20,079
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-3,575
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-451
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-28,714
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-149
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,700
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-983
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-44.9
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-536

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-3,607
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-26,772
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-6,646
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-41,112
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-674
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							12.2
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							216
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							192
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							8.26
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)							180
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							885
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							32.7
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							135
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,662
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							18.3
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							223
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							347
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							12.4
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)							262
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							1,328
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							237

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							272
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							2,699
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							24.4
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							230
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							501
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							16.5
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)							343
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							1,770
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							189
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							223
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							3,297

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-696
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-5,387
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-312
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-6,395
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-696
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-10,263
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-624
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-11,583

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							413
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							5,430
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							524
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							6,366
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							413
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							10,336
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							1,047
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							11,796

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)		22.2	0.022	0.021	0.018	0.011	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		13.5	5.35	3.57	2.3	1.04	0.539
Premature deaths from air pollution - Mobile - On-Road (deaths)		46.6	47.1	46.1	41.7	33.4	23
Premature deaths from air pollution - Gas Stations (deaths)		4.97	5.03	4.87	4.4	3.52	2.47
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		7.83	7.2	6.42	5.28	3.87	2.51
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.127	0.123	0.119	0.108	0.088	0.068
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		1.44	1.48	1.48	1.36	1.08	0.755
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.714	0.687	0.656	0.623	0.588	0.551
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		5.24	5.03	4.69	4.09	3.28	2.43
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.768	0.676	0.594	0.513	0.434	0.361
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.427	0.386	0.345	0.305	0.265	0.227
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.04	0.383	0.377	0.37	0.366	0.355

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		84.6	78.2	69.7	62.4	56	39.1
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		197	0.195	0.187	0.156	0.102	0.002
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		120	47.4	31.6	20.3	9.2	4.77
Monetary damages from air pollution - Mobile - On-Road (million $2019)		414	419	410	371	297	205
Monetary damages from air pollution - Gas Stations (million $2019)		44	44.5	43.2	38.9	31.2	21.9
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		69.4	63.8	56.9	46.8	34.3	22.2
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		1.12	1.09	1.05	0.956	0.782	0.599
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		12.8	13.1	13.1	12.1	9.55	6.69
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		6.32	6.08	5.81	5.51	5.2	4.88
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		46.4	44.5	41.5	36.2	29	21.5
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		6.8	5.99	5.26	4.54	3.84	3.2
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		3.78	3.41	3.05	2.7	2.35	2.01
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		9.17	3.38	3.33	3.27	3.23	3.14
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		751	694	619	554	498	347

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		860	866	834	963	2,038	2,070
By economic sector - Construction (jobs)		8,962	15,215	16,762	17,403	22,311	28,310
By economic sector - Manufacturing (jobs)		5,661	6,346	6,279	5,863	7,380	8,278
By economic sector - Mining (jobs)		5,891	4,720	3,787	3,045	2,420	1,466
By economic sector - Other (jobs)		749	1,137	1,556	1,949	2,649	3,766
By economic sector - Pipeline (jobs)		460	1,261	864	431	423	458
By economic sector - Professional (jobs)		6,186	8,950	11,211	13,637	19,983	25,127
By economic sector - Trade (jobs)		4,598	5,746	6,792	7,799	10,452	13,262
By economic sector - Utilities (jobs)		6,217	11,548	11,843	11,838	16,813	21,954
By resource sector - Biomass (jobs)		2,017	1,974	1,862	3,210	9,405	9,902
By resource sector - CO2 (jobs)		40.4	7,092	4,368	1,229	1,684	2,612
By resource sector - Coal (jobs)		375	0	0	0	0	0
By resource sector - Grid (jobs)		7,562	12,095	15,756	19,402	28,831	38,018
By resource sector - Natural Gas (jobs)		4,579	3,250	2,460	1,999	1,644	1,310
By resource sector - Nuclear (jobs)		640	630	365	0.014	0.014	0.027
By resource sector - Oil (jobs)		11,953	10,712	9,618	8,520	7,290	4,603

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

Item	2020	2025	2030	2035	2040	2045	2050
By resource sector - Solar (jobs)		2,333	2,516	3,177	3,904	4,727	7,426
By resource sector - Wind (jobs)		10,085	17,519	22,321	24,663	30,888	40,820
By education level - All sectors - High school diploma or less (jobs)		16,296	23,075	24,529	25,443	34,120	42,057
By education level - All sectors - Associates degree or some college (jobs)		11,727	17,284	18,626	19,501	26,055	32,774
By education level - All sectors - Bachelors degree (jobs)		8,982	11,970	12,928	13,766	18,509	22,709
By education level - All sectors - Masters or professional degree (jobs)		2,233	2,998	3,312	3,611	4,937	6,103
By education level - All sectors - Doctoral degree (jobs)		345	461	532	606	849	1,047
Related work experience - All sectors - None (jobs)		5,587	7,990	8,546	8,941	12,059	14,975
Related work experience - All sectors - Up to 1 year (jobs)		7,900	11,021	11,865	12,453	16,874	20,856
Related work experience - All sectors - 1 to 4 years (jobs)		14,377	20,147	21,655	22,815	30,581	37,839
Related work experience - All sectors - 4 to 10 years (jobs)		9,221	13,169	14,163	14,863	19,839	24,689
Related work experience - All sectors - Over 10 years (jobs)		2,499	3,462	3,699	3,856	5,116	6,332
On-the-Job Training - All sectors - None (jobs)		2,233	3,041	3,283	3,473	4,671	5,772
On-the-Job Training - All sectors - Up to 1 year (jobs)		26,569	36,627	39,340	41,448	55,940	68,933
On-the-Job Training - All sectors - 1 to 4 years (jobs)		7,972	11,748	12,589	13,098	17,361	21,764
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,425	3,831	4,143	4,326	5,742	7,286
On-the-Job Training - All sectors - Over 10 years (jobs)		384	542	573	584	756	934
On-Site or In-Plant Training - All sectors - None (jobs)		6,457	9,056	9,788	10,360	13,987	17,356
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		24,016	33,217	35,642	37,473	50,461	62,245
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		6,227	9,083	9,725	10,122	13,426	16,779
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,568	3,949	4,250	4,428	5,865	7,386
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		314	484	523	545	731	924
Wage income - All (million $2019)		2,076	2,947	3,199	3,404	4,625	5,793

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	287	270	245	226	212	195	175
Final energy use - Residential (PJ)	120	114	109	103	93.6	83.1	73.8
Final energy use - Commercial (PJ)	110	107	104	99.9	95.2	90.4	86.3
Final energy use - Industry (PJ)	174	182	190	193	200	209	211

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)		1.64	1.66	2.05	2.12	3.02	3.19

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	10.7	75.1	140	438	737	1,397	2,058
Vehicle stocks - LDV – All others (1000 units)	2,690	2,690	2,690	2,552	2,413	1,860	1,306
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		0	83.3	175	591	1,861	2,710
Public EV charging plugs - DC Fast (1000 units)	0.119		0.298		1.57		4.39
Public EV charging plugs - L2 (1000 units)	0.786		7.18		37.9		106

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 (%)	4.79	10.1	16.5	34.7	63.2	82.5	89.3
Sales of space heating units - Electric Resistance (%)	11.9	16.6	15.6	12.9	8.54	5.65	4.74
Sales of space heating units - Gas (%)	77.4	63	58.2	44.5	23.1	8.65	3.34
Sales of space heating units - Fossil (%)	5.87	10.2	9.69	7.94	5.1	3.2	2.63
Sales of water heating units - Electric Heat Pump (%)	0	1.62	6.21	19.5	40	53.6	58.5
Sales of water heating units - Electric Resistance (%)	27.3	42.3	42	41.2	40.3	39.8	39.7
Sales of water heating units - Gas Furnace (%)	72.7	56	51.8	39.3	19.8	6.56	1.76
Sales of water heating units - Other (%)	0.024	0.027	0.027	0.027	0.027	0.027	0.027
Sales of cooking units - Electric Resistance (%)	66.3	67.2	70.2	78.4	89.7	96.7	99.1
Sales of cooking units - Gas (%)	33.7	32.8	29.8	21.6	10.3	3.33	0.895
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		2.99	4.02				

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 (%)	2.13	16	21.4	36.9	61.7	79.8	87
Sales of space heating units - Electric Resistance (%)	4.54	5.5	5.66	6.18	7.29	8.59	9.36
Sales of space heating units - Gas Furnace (%)	93.3	76.5	71.1	55.5	30.3	11.4	3.55
Sales of space heating units - Fossil (%)	0	2	1.88	1.4	0.684	0.222	0.059
Sales of water heating units - Electric Heat Pump (%)	0.677	2.54	7.44	21.6	43.5	58.2	63.4
Sales of water heating units - Electric Resistance (%)	5.85	7.67	9.68	15.4	24.5	30.8	33.1
Sales of water heating units - Gas Furnace (%)	92.9	88.8	81.9	62.1	31.2	10.4	2.79
Sales of water heating units - Other (%)	0.567	0.974	0.953	0.882	0.777	0.711	0.687
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)		8,253	8,961				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	2,770	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	3,651	2,551	2,559	2,623	2,237	2,191	2,809
Installed thermal - Nuclear (MW)	1,268	1,268	1,268	0	0.006	0.011	0.021

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Biomass power plant (billion $2018)	0	0.004	0.02	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion $2018)	0	0	0	0	0	0.009	0
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	0	0	13.7	21.5	9.82

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass power plant (GWh)	0	7.3	46.3	46.3	46.3	46.3	46.3
Biomass w/ccu power plant (GWh)	0	0	0	0	15,353	39,484	50,500
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	8.96	8.96

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	0	12	32	40
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	0	1	1
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	0	14	14
Number of facilities - Diesel (quantity)	0	0	0	1	1	1	1
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	1	1
Number of facilities - Pyrolysis (quantity)	0	0	0	1	1	1	1
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	0	1	2
Number of facilities - Sng (quantity)	0	1	1	1	1	1	1
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0
Conversion capital investment - Cumulative 5-yr (million $2018)		4.25	22.2	27.7	12,551	31,594	9,940
Biomass purchases (million $2018/y)		60	154	156	1,144	3,772	4,531

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	0.03	18.5	57.7	69
Annual - BECCS (MMT)		0	0	0	15.2	54.3	65.5
Annual - NGCC (MMT)		0	0	0.03	0.03	0.02	0.02
Annual - Cement and lime (MMT)		0	0	0	3.32	3.42	3.53
Cumulative - All (MMT)		0	0	0.03	18.6	76.3	145
Cumulative - BECCS (MMT)		0	0	0	15.2	69.5	135
Cumulative - NGCC (MMT)		0	0	0.03	0.06	0.08	0.1
Cumulative - Cement and lime (MMT)		0	0	0	3.32	6.74	10.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	997	1,361	1,725	1,725	1,725
Spur (km)		0	58.5	117	1,026	2,994	3,323
All (km)		0	1,055	1,478	2,751	4,720	5,048
Cumulative investment - Trunk (million $2018)		0	5,174	7,488	9,761	9,761	9,761
Cumulative investment - Spur (million $2018)		0	30.8	61.8	951	2,889	3,347
Cumulative investment - All (million $2018)		0	5,205	7,550	10,712	12,651	13,109

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual (MMT)		0	0.92	3.21	7.13	9.85	10
Injection wells (wells)		0	2	7	12	20	25
Resource characterization, appraisal, permitting costs (million $2020)		77.2	216	278	278	278	278
Wells and facilities construction costs (million $2020)		0	51.4	200	357	597	741

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-74.7
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-283
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-378
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-22.8
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-179
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-1,263
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-13,386
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-503
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-227
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-16,316
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-112
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-992
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-680
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-33.4
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-357
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-2,435
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-20,079
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-3,575
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-451
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-28,714
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-149
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,700
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-983
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-44.9

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-536
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-3,607
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-26,772
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-6,646
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-41,112
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-674
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							12.2
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							216
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							192
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							8.26
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)							180
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							885
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							32.7
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							135
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,662
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							18.3
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							223
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							347
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							12.4
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)							262
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							1,328
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							237

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							272
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							2,699
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							24.4
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							230
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							501
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							16.5
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)							343
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							1,770
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							189
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							223
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							3,297

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-2,596
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-4,848
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-278
Carbon sink potential - Moderate deployment - Cropland to woody energy crops (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Pasture to energy crops (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-7,721
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-2,596
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-9,241

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-556
Carbon sink potential - Aggressive deployment - Cropland to woody energy crops (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Pasture to energy crops (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-12,393
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							1,528
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							4,878
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							466
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)							496
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)							1,272
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							8,639
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							1,528
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							22,937
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							931
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)							496
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)							1,272
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							27,165

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)		77.6	39	24.5	19.5	17	16.6
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		14.4	12.7	13.2	9.19	8.31	7.03
Premature deaths from air pollution - Mobile - On-Road (deaths)		46.6	47.8	49.2	50.8	52.3	53.9
Premature deaths from air pollution - Gas Stations (deaths)		4.95	5.07	5.18	5.32	5.44	5.55

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		7.68	7.05	6.48	6.14	5.99	5.9
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.125	0.109	0.082	0.055	0.033	0.021
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		1.34	1.32	1.32	1.34	1.34	1.34
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.746	0.751	0.753	0.752	0.749	0.743
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		5.3	5.16	4.72	4.25	4	4.01
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.801	0.792	0.783	0.771	0.762	0.758
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.446	0.457	0.469	0.48	0.49	0.502
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		2.3	1.59	1.27	1.2	1.15	1.07
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		85	89.3	91.4	88	87.3	81.2
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		687	345	217	172	151	147
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		127	113	117	81.4	73.6	62.3
Monetary damages from air pollution - Mobile - On-Road (million $2019)		414	425	437	452	465	479
Monetary damages from air pollution - Gas Stations (million $2019)		43.8	44.9	45.8	47.1	48.2	49.1
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		68.1	62.4	57.4	54.4	53.1	52.3
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		1.1	0.969	0.73	0.49	0.297	0.187
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		11.9	11.7	11.7	11.9	11.9	11.9
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		6.6	6.65	6.67	6.66	6.63	6.57
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		47	45.6	41.8	37.6	35.4	35.5
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		7.09	7.01	6.93	6.83	6.74	6.71
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		3.95	4.05	4.15	4.25	4.34	4.44
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		20.3	14	11.2	10.6	10.2	9.48

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		754	793	812	782	775	721

Table 65: *REF scenario - IMPACTS - Jobs*

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		860	859	859	859	859	859
By economic sector - Construction (jobs)		5,800	7,374	7,919	9,473	10,950	12,454
By economic sector - Manufacturing (jobs)		4,185	4,465	4,513	4,728	4,691	4,522
By economic sector - Mining (jobs)		6,031	5,018	4,165	3,379	2,800	2,180
By economic sector - Other (jobs)		344	642	794	1,092	1,384	1,905
By economic sector - Pipeline (jobs)		470	487	493	472	476	465
By economic sector - Professional (jobs)		4,312	4,933	5,211	6,411	7,436	8,449
By economic sector - Trade (jobs)		3,781	3,920	3,948	4,507	5,068	5,744
By economic sector - Utilities (jobs)		5,392	6,026	6,066	7,026	8,468	8,992
By resource sector - Biomass (jobs)		2,016	1,960	1,909	1,863	1,823	1,786
By resource sector - CO2 (jobs)		0	0.046	0.058	0.063	0.07	0.074
By resource sector - Coal (jobs)		910	446	93.8	0	0	0
By resource sector - Grid (jobs)		6,175	7,402	7,876	9,804	12,491	14,336
By resource sector - Natural Gas (jobs)		4,731	4,992	4,767	4,426	4,901	4,523
By resource sector - Nuclear (jobs)		640	630	620	610	354	0.034
By resource sector - Oil (jobs)		11,978	10,778	9,779	8,871	8,157	7,070
By resource sector - Solar (jobs)			1,977	2,737	3,510	4,257	6,599
By resource sector - Wind (jobs)		4,723	5,540	6,185	8,862	10,148	11,256
By education level - All sectors - High school diploma or less (jobs)		12,841	14,001	14,157	15,766	17,475	18,910
By education level - All sectors - Associates degree or some college (jobs)		9,027	9,963	10,120	11,481	12,939	14,153
By education level - All sectors - Bachelors degree (jobs)		7,255	7,595	7,528	8,282	9,049	9,633
By education level - All sectors - Masters or professional degree (jobs)		1,786	1,881	1,875	2,090	2,306	2,480
By education level - All sectors - Doctoral degree (jobs)		265	284	286	327	362	395
Related work experience - All sectors - None (jobs)		4,408	4,802	4,854	5,434	6,067	6,594
Related work experience - All sectors - Up to 1 year (jobs)		6,152	6,706	6,787	7,593	8,400	9,125
Related work experience - All sectors - 1 to 4 years (jobs)		11,406	12,272	12,329	13,743	15,247	16,456
Related work experience - All sectors - 4 to 10 years (jobs)		7,231	7,829	7,881	8,830	9,835	10,632
Related work experience - All sectors - Over 10 years (jobs)		1,976	2,115	2,117	2,346	2,583	2,763
On-the-Job Training - All sectors - None (jobs)		1,758	1,883	1,885	2,096	2,305	2,497
On-the-Job Training - All sectors - Up to 1 year (jobs)		21,122	22,656	22,749	25,270	27,893	30,041
On-the-Job Training - All sectors - 1 to 4 years (jobs)		6,177	6,790	6,877	7,759	8,715	9,481
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,827	2,077	2,136	2,464	2,828	3,132
On-the-Job Training - All sectors - Over 10 years (jobs)		290	318	321	357	390	419
On-Site or In-Plant Training - All sectors - None (jobs)		5,013	5,429	5,467	6,129	6,793	7,366
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		19,102	20,506	20,593	22,880	25,278	27,237

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

Item	2020	2025	2030	2035	2040	2045	2050
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		4,848	5,313	5,376	6,048	6,774	7,359
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,971	2,205	2,252	2,570	2,922	3,207
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		240	271	278	319	365	401
Wage income - All (million $2019)		1,657	1,800	1,829	2,060	2,313	2,520

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	286	270	247	233	233	241	250
Final energy use - Residential (PJ)	120	113	109	106	105	106	106
Final energy use - Commercial (PJ)	110	110	109	108	107	108	111
Final energy use - Industry (PJ)	174	186	192	198	205	212	220

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)		1.74	1.77	1.9	1.95	2.5	2.61

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	2.8	27.6	29.1	31.3	32.6	33.7	35
Sales of space heating units - Electric Resistance (%)	12.4	13.9	13.6	13.3	13.1	12.1	10.6
Sales of space heating units - Gas (%)	78.7	51.5	50.2	48.4	47.5	47.5	47.5
Sales of space heating units - Fossil (%)	6.08	6.99	7.07	7.06	6.83	6.72	6.86
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	27.3	42.4	42.3	42.2	42.2	42.2	42.1
Sales of water heating units - Gas Furnace (%)	72.7	57.5	57.6	57.7	57.7	57.8	57.8
Sales of water heating units - Other (%)	0.024	0.027	0.027	0.027	0.027	0.027	0.027
Sales of cooking units - Electric Resistance (%)	66	66	66	66	66	66	66
Sales of cooking units - Gas (%)	34	34	34	34	34	34	34
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		2.83	3.07				

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 (%)	2.13	20.6	48.3	71.1	74.8	75.3	75.3
Sales of space heating units - Electric Resistance (%)	4.54	6.37	10.8	18.4	23.4	24.2	24.3
Sales of space heating units - Gas Furnace (%)	93.3	71.1	39.4	9.85	1.63	0.515	0.452
Sales of space heating units - Fossil (%)	0	1.96	1.54	0.687	0.101	0.009	0
Sales of water heating units - Electric Heat Pump (%)	0.677	0.816	0.812	0.813	0.809	0.806	0.805
Sales of water heating units - Electric Resistance (%)	5.85	6.96	6.99	6.96	6.96	6.97	6.97
Sales of water heating units - Gas Furnace (%)	92.9	91.2	91.2	91.2	91.2	91.2	91.2

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Other (%)	0.567	0.983	0.985	0.982	0.982	0.985	0.986
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)		8,160	8,377				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	2,770	2,050	720	0	0	0	0
Installed thermal - Natural gas (MW)	3,635	2,556	5,255	5,257	5,016	7,758	8,316
Installed thermal - Nuclear (MW)	1,268	1,268	1,268	1,268	1,268	0	0.015
Installed renewables - Rooftop PV (MW)	318	560	817	1,203	1,752	2,467	3,398
Installed renewables - Wind - Base land use assumptions (MW)	7,188	7,188	7,188	7,188	7,188	7,426	7,426
Installed renewables - Solar - Constrained land use assumptions (MW)	22.2	22.2	22.2	22.2	22.2	22.2	22.2
Installed renewables - Wind - Constrained land use assumptions (MW)	196	196	196	196	196	196	196

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	58.5	58.5	58.5	58.5	58.5	58.5	58.5
Wind - Base land use assumptions (GWh)	31,394	31,394	31,394	31,394	31,394	32,282	32,282
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)	-6.75		0.507				0.145
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-0.146		-0.303				-0.319
Business-as-usual carbon sink - Total (Mt CO2e/y)	-6.9		0.204				-0.174

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)							-74.7
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-283
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-378
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-22.8
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-179
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-1,263
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-13,386
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-503
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-227

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-16,316
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-112
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-992
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-680
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-33.4
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-357
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-2,435
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-20,079
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-3,575
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-451
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-28,714
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-149
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,700
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-983
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-44.9
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-536
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-3,607
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-26,772
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-6,646
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-41,112
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-674
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							12.2
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							216
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							192
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							8.26
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)							180

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							885
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							32.7
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							135
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,662
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							18.3
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							223
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							347
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							12.4
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)							262
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							1,328
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							237
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							272
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							2,699
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							24.4
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							230
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							501
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							16.5
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)							343
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							1,770
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							189

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							223
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							3,297