Net-Zero America - Missouri 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)		62.8	0.052	0.05	0.042	0.028	0.001
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		23.4	12.4	6.2	4.87	2.59	1.25
Premature deaths from air pollution - Mobile - On-Road (deaths)		146	136	103	59.5	27.6	11.6
Premature deaths from air pollution - Gas Stations (deaths)		11.4	10.5	7.88	4.68	2.33	1.16
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		22.2	17.8	11.6	6.23	2.82	1.1
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.545	0.448	0.315	0.193	0.096	0.045
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		4.05	3.67	2.81	1.81	0.904	0.365
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		5.84	5.59	5.32	5.02	4.72	4.41
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		16.2	13.9	10.2	6.49	3.84	2.2
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.97	1.63	1.28	0.946	0.657	0.418
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		1.38	1.15	0.937	0.728	0.531	0.348
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		2.81	1.72	1.7	1.67	1.68	1.66
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		94	88.3	80.3	62.4	46.2	28.6
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		556	0.465	0.445	0.372	0.247	0.01
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		207	110	54.9	43.2	22.9	11.1
Monetary damages from air pollution - Mobile - On-Road (million $2019)		1,300	1,208	916	529	246	103
Monetary damages from air pollution - Gas Stations (million $2019)		101	92.6	69.7	41.5	20.6	10.3
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		197	158	103	55.2	25	9.74
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		4.83	3.97	2.79	1.71	0.849	0.394
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		35.9	32.5	24.9	16	8.01	3.23
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		51.7	49.5	47.1	44.5	41.8	39
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		144	123	90.6	57.5	34	19.5

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)		17.5	14.4	11.3	8.38	5.81	3.7
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		12.2	10.2	8.29	6.44	4.7	3.08
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		24.8	15.2	15	14.8	14.9	14.6
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		835	784	713	554	411	254

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		441	449	431	366	303	742
By economic sector - Construction (jobs)		14,888	16,430	24,010	31,112	25,367	25,647
By economic sector - Manufacturing (jobs)		3,126	3,542	4,437	5,025	4,625	5,280
By economic sector - Mining (jobs)		2,224	1,584	1,073	699	468	322
By economic sector - Other (jobs)		2,200	2,498	4,326	6,039	4,537	4,605
By economic sector - Pipeline (jobs)		404	504	279	221	179	217
By economic sector - Professional (jobs)		6,373	6,870	10,528	14,280	12,423	13,840
By economic sector - Trade (jobs)		4,817	4,937	7,159	9,484	7,994	8,604
By economic sector - Utilities (jobs)		8,787	10,795	15,278	21,439	21,466	22,993
By resource sector - Biomass (jobs)		1,042	1,028	963	946	1,127	3,240
By resource sector - CO2 (jobs)		14.7	1,318	91.3	194	438	1,118
By resource sector - Coal (jobs)		1,495	345	151	132	119	105
By resource sector - Grid (jobs)		12,320	17,375	28,156	40,662	42,700	45,353
By resource sector - Natural Gas (jobs)		3,513	2,388	2,008	2,340	1,045	799
By resource sector - Nuclear (jobs)		624	614	604	350	0	0
By resource sector - Oil (jobs)		5,419	4,356	3,168	2,195	1,500	1,003
By resource sector - Solar (jobs)		15,499	16,130	26,727	34,639	22,327	20,589
By resource sector - Wind (jobs)		3,334	4,056	5,651	7,206	8,109	10,043
By education level - All sectors - High school diploma or less (jobs)		18,642	20,560	29,045	37,859	32,813	34,765
By education level - All sectors - Associates degree or some college (jobs)		13,577	15,114	21,655	28,699	25,117	26,570
By education level - All sectors - Bachelors degree (jobs)		8,583	9,276	13,014	17,066	15,008	16,120
By education level - All sectors - Masters or professional degree (jobs)		2,130	2,312	3,301	4,374	3,858	4,173
By education level - All sectors - Doctoral degree (jobs)		328	347	504	665	568	621
Related work experience - All sectors - None (jobs)		6,304	6,974	9,898	13,028	11,370	12,092
Related work experience - All sectors - Up to 1 year (jobs)		8,929	9,800	13,931	18,117	15,578	16,581
Related work experience - All sectors - 1 to 4 years (jobs)		15,449	16,981	24,069	31,689	27,762	29,528
Related work experience - All sectors - 4 to 10 years (jobs)		10,013	11,029	15,637	20,605	18,056	19,160
Related work experience - All sectors - Over 10 years (jobs)		2,566	2,826	3,985	5,225	4,598	4,888
On-the-Job Training - All sectors - None (jobs)		2,429	2,633	3,743	4,883	4,176	4,434
On-the-Job Training - All sectors - Up to 1 year (jobs)		28,131	30,849	43,596	57,089	49,894	53,296

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)		9,156	10,180	14,513	19,187	16,798	17,718
On-the-Job Training - All sectors - 4 to 10 years (jobs)		3,117	3,484	5,014	6,666	5,793	6,067
On-the-Job Training - All sectors - Over 10 years (jobs)		427	464	653	839	703	734
On-Site or In-Plant Training - All sectors - None (jobs)		7,031	7,692	10,946	14,357	12,413	13,221
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		25,609	28,114	39,745	52,067	45,519	48,552
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		7,104	7,888	11,233	14,826	12,969	13,688
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		3,140	3,491	4,988	6,606	5,748	6,033
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		377	424	608	808	713	755
Wage income - All (million $2019)		2,345	2,610	3,732	4,970	4,424	4,767

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

Item	2020	2025	2030	2035	2040	2045	2050
Oil consumption - Annual (million bbls)		121	106	83.7	62.4	45.6	32.5
Oil consumption - Cumulative (million bbls)							2,577
Oil production - Annual (million bbls)		0.117	0.117	0.117	0.093	0.075	0.05
Natural gas consumption - Annual (tcf)		249	210	169	127	79.8	55.4
Natural gas consumption - Cumulative (tcf)							5,077
Natural gas production - Annual (tcf)		0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	669	623	550	461	380	331	311
Final energy use - Residential (PJ)	241	227	206	178	155	141	134
Final energy use - Commercial (PJ)	182	178	169	158	147	141	138
Final energy use - Industry (PJ)	241	249	271	274	290	326	330

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)		3.82	3.92	6.23	6.6	6.19	6.47

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	30.1	479	928	2,500	4,071	5,327	6,583
Vehicle stocks - LDV – All others (1000 units)	5,489	5,226	4,964	3,618	2,271	1,285	299
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		1,055	2,704	4,381	6,637	7,223	6,887
Public EV charging plugs - DC Fast (1000 units)	0.178		1.98		8.67		14
Public EV charging plugs - L2 (1000 units)	1.67		47.5		208		337

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 (%)	7.5	22.5	72.3	86.1	87.5	87.8	87.4
Sales of space heating units - Electric Resistance (%)	19.7	22.4	10	6.61	6.36	6.55	6.72
Sales of space heating units - Gas (%)	63.5	41.4	10.2	1.69	1.08	1.04	1.02
Sales of space heating units - Fossil (%)	9.34	13.6	7.39	5.58	5.03	4.63	4.86
Sales of water heating units - Electric Heat Pump (%)	0	8.7	46.5	56.1	56.7	56.7	56.7
Sales of water heating units - Electric Resistance (%)	42.5	55.5	45.3	43.3	43.3	43.3	43.3
Sales of water heating units - Gas Furnace (%)	57.4	35.7	8.23	0.581	0.019	0	0
Sales of water heating units - Other (%)	0.034	0.035	0.036	0.035	0.035	0.036	0.036
Sales of cooking units - Electric Resistance (%)	76.5	81.5	96.8	99.8	100	100	100
Sales of cooking units - Gas (%)	23.5	18.5	3.16	0.159	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		5.85	7.79				

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	4.52	24.4	70.6	87.7	89.7	89.7	89.7
Sales of space heating units - Electric Resistance (%)	8.06	5.73	7.1	9.32	9.79	9.8	9.8
Sales of space heating units - Gas Furnace (%)	87.4	68.1	22	2.94	0.553	0.458	0.459
Sales of space heating units - Fossil (%)	0	1.75	0.337	0.014	0	0	0
Sales of water heating units - Electric Heat Pump (%)	1.19	10.6	53.1	64.2	65	65	65
Sales of water heating units - Electric Resistance (%)	10.1	11	28.4	33.8	34.3	34.3	34.3
Sales of water heating units - Gas Furnace (%)	87.7	77.5	17.8	1.26	0.041	0	0
Sales of water heating units - Other (%)	0.996	0.947	0.735	0.688	0.685	0.688	0.687
Sales of cooking units - Electric Resistance (%)	44.8	57.1	84	89.3	89.6	89.6	89.6
Sales of cooking units - Gas (%)	55.2	42.9	16	10.7	10.4	10.4	10.4
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		16,269	17,611				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	7,000	1,299	0	0	0	0	0
Installed thermal - Natural gas (MW)	6,692	4,262	4,288	3,916	2,586	2,383	2,172
Installed thermal - Nuclear (MW)	1,236	1,236	1,236	1,236	0	0	0
Installed renewables - Rooftop PV (MW)	153	269	400	605	898	1,277	1,767
Installed renewables - Solar - Base land use assumptions (MW)	33.6	9,863	18,696	35,534	55,733	61,382	63,727
Installed renewables - Wind - Base land use assumptions (MW)	6,593	24,947	42,054	59,780	89,561	120,496	155,043
Installed renewables - Solar - Constrained land use assumptions (MW)	1,074	7,271	17,708	32,235	48,623	52,207	53,235
Installed renewables - Wind - Constrained land use assumptions (MW)	4,745	26,146	49,853	78,238	92,807	95,002	95,116
Capital invested - Solar PV - Base (billion $2018)		13.2	10.6	18.6	21	5.54	2.17

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)		28.5	22.8	22	35.2	34.7	36.6
Capital invested - Solar PV - Constrained (billion $2018)		9.58	11.6	13.9	23.7	1.24	0.374
Capital invested - Wind - Constrained (billion $2018)		31.6	32.5	34.5	16.2	1.98	80.4
Capital invested - Biomass power plant (billion $2018)	0	0.003	0.021	0	0.003	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	1.19	0.005	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	72.4	18,541	35,193	66,831	104,688	115,313	119,768
Wind - Base land use assumptions (GWh)	19,737	83,563	139,217	196,305	291,874	389,204	494,930
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	0	13,674	33,346	60,726	91,519	98,271	100,217
Wind - Constrained land use assumptions (GWh)	17,665	86,986	161,857	250,834	294,590	301,857	302,230
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0
Biomass power plant (GWh)	0	5.97	46.4	46.4	52.4	52.4	52.4
Biomass w/ccu power plant (GWh)	0	0	0	0	1,335	1,341	1,341
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	9.08	9.08

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

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Power (quantity)	0	1	1	1	1	1	1
Number of facilities - Power ccu (quantity)	0	0	0	0	1	2	2
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	1	4	11
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	1	2	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)		3.44	23	19.7	1,705	1,881	6,256
Biomass purchases (million $2018/y)		38.3	97	98	192	298	656

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	3.24	3.35	5.37	14.7	23.1
Annual - BECCS (MMT)		0	0	0	2.05	4.46	12.5
Annual - NGCC (MMT)		0	0	0	0	0	0
Annual - Cement and lime (MMT)		0	3.24	3.35	3.32	10.3	10.6
Cumulative - All (MMT)		0	3.24	6.59	12	26.7	49.8
Cumulative - BECCS (MMT)		0	0	0	2.05	6.51	19

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

Item	2020	2025	2030	2035	2040	2045	2050
Cumulative - NGCC (MMT)		0	0	0	0	0	0
Cumulative - Cement and lime (MMT)		0	3.24	6.59	9.91	20.2	30.8

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	409	409	409	409	409
Spur (km)		0	10.4	180	278	550	1,148
All (km)		0	420	589	687	959	1,557
Cumulative investment - Trunk (million $2018)		0	1,950	1,950	1,950	1,950	1,950
Cumulative investment - Spur (million $2018)		0	11.9	160	242	387	895
Cumulative investment - All (million $2018)		0	1,962	2,109	2,192	2,337	2,845

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual (MMT)		0	0	0.88	1.81	3.44	3.73
Injection wells (wells)		0	1	2	4	7	9
Resource characterization, appraisal, permitting costs (million $2020)		27.9	78.2	101	101	101	101
Wells and facilities construction costs (million $2020)		0	18.6	72.5	129	216	268

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)							-82
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-379
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,973
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-77
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-1,071
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-787
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-5,328
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-1,597
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,244
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-13,537
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-123
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,326
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-5,357
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-113
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-2,141

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)							-1,517
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-7,992
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-11,338
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,467
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-32,374
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-164
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-2,274
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-7,741
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-151
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-3,212
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-2,247
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-10,656
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-21,079
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-51,213
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,690
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							13.4
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							289
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,512
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							27.9
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)							112
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							352
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							104
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							740
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,151
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							20.1

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)							298
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							2,730
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							41.9
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)							163
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							528
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							751
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,490
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							6,022
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							26.8
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							308
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							3,947
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							55.7
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)							214
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							705
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							599
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,223
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							7,077

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

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

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)							-7,068
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-157
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-7,225
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-13,495
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-313
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-13,808
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							3,016
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							285
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							3,301
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							5,748
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							570
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							6,318

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)		62.8	0.052	0.05	0.042	0.028	0.001
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		22.7	10.5	4.66	2.24	0.862	0.676
Premature deaths from air pollution - Mobile - On-Road (deaths)		149	149	145	131	104	71.3
Premature deaths from air pollution - Gas Stations (deaths)		11.6	11.7	11.2	10	7.95	5.51
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		22.4	20.3	17.8	14.5	10.6	6.8
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.556	0.531	0.505	0.451	0.363	0.271

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)		4.1	4.16	4.14	3.78	2.98	2.08
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		5.84	5.59	5.32	5.02	4.72	4.41
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		16.3	15.6	14.6	12.7	10.1	7.49
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.98	1.78	1.59	1.38	1.14	0.924
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		1.38	1.24	1.1	0.962	0.831	0.708
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		2.74	1.72	1.71	1.69	1.69	1.62
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		93.8	85.1	74.1	64.9	57.4	39.9
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		556	0.465	0.445	0.372	0.247	0.01
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		201	92.7	41.3	19.8	7.64	5.99
Monetary damages from air pollution - Mobile - On-Road (million $2019)		1,321	1,328	1,290	1,161	924	634
Monetary damages from air pollution - Gas Stations (million $2019)		103	103	99.3	88.7	70.4	48.8
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		199	180	157	128	93.6	60.3
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		4.93	4.7	4.47	4	3.22	2.4
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		36.3	36.9	36.7	33.5	26.4	18.4
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		51.7	49.5	47.1	44.5	41.8	39
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		144	138	129	112	89.8	66.3
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		17.5	15.7	14.1	12.2	10.1	8.18
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		12.2	11	9.72	8.52	7.36	6.27
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		24.2	15.2	15.1	14.9	14.9	14.3
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		833	756	658	576	509	355

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		442	456	434	475	411	742
By economic sector - Construction (jobs)		15,446	17,340	20,900	27,638	27,436	28,355
By economic sector - Manufacturing (jobs)		3,177	3,662	4,109	4,855	5,647	6,355
By economic sector - Mining (jobs)		2,243	1,665	1,293	984	751	515
By economic sector - Other (jobs)		2,313	2,613	3,701	5,295	4,715	4,801
By economic sector - Pipeline (jobs)		407	616	302	280	279	359
By economic sector - Professional (jobs)		6,578	7,120	9,303	13,059	13,678	15,345
By economic sector - Trade (jobs)		4,959	5,141	6,485	8,741	8,775	9,525
By economic sector - Utilities (jobs)		8,781	11,261	13,206	18,628	23,638	26,061
By resource sector - Biomass (jobs)		1,043	1,047	980	1,569	1,751	3,132
By resource sector - CO2 (jobs)		14.9	2,248	159	343	751	1,904
By resource sector - Coal (jobs)		1,495	345	151	132	119	105
By resource sector - Grid (jobs)		12,259	17,524	23,993	35,092	46,771	50,566
By resource sector - Natural Gas (jobs)		3,513	2,226	1,859	1,999	1,224	1,177
By resource sector - Nuclear (jobs)		624	614	604	350	0	0
By resource sector - Oil (jobs)		5,479	4,662	3,974	3,256	2,545	1,708
By resource sector - Solar (jobs)		16,442	16,985	22,657	30,205	22,719	20,505
By resource sector - Wind (jobs)		3,477	4,225	5,355	7,008	9,450	12,960
By education level - All sectors - High school diploma or less (jobs)		19,122	21,553	25,679	34,131	36,181	38,831
By education level - All sectors - Associates degree or some college (jobs)		13,921	15,853	19,056	25,715	27,606	29,754
By education level - All sectors - Bachelors degree (jobs)		8,784	9,697	11,612	15,525	16,648	18,108
By education level - All sectors - Masters or professional degree (jobs)		2,182	2,412	2,937	3,974	4,268	4,673
By education level - All sectors - Doctoral degree (jobs)		338	361	450	610	628	691
Related work experience - All sectors - None (jobs)		6,461	7,311	8,746	11,734	12,529	13,516
Related work experience - All sectors - Up to 1 year (jobs)		9,169	10,257	12,320	16,365	17,171	18,475
Related work experience - All sectors - 1 to 4 years (jobs)		15,829	17,787	21,313	28,591	30,635	33,075
Related work experience - All sectors - 4 to 10 years (jobs)		10,261	11,562	13,823	18,552	19,909	21,495
Related work experience - All sectors - Over 10 years (jobs)		2,627	2,958	3,531	4,714	5,086	5,496
On-the-Job Training - All sectors - None (jobs)		2,495	2,757	3,320	4,421	4,601	4,940
On-the-Job Training - All sectors - Up to 1 year (jobs)		28,823	32,282	38,670	51,651	55,159	59,650
On-the-Job Training - All sectors - 1 to 4 years (jobs)		9,387	10,685	12,776	17,187	18,464	19,862
On-the-Job Training - All sectors - 4 to 10 years (jobs)		3,201	3,665	4,390	5,939	6,331	6,782
On-the-Job Training - All sectors - Over 10 years (jobs)		440	488	577	756	774	823
On-Site or In-Plant Training - All sectors - None (jobs)		7,217	8,059	9,685	12,966	13,683	14,778
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		26,238	29,425	35,237	47,068	50,300	54,342
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		7,283	8,276	9,898	13,295	14,265	15,337
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		3,223	3,671	4,380	5,903	6,298	6,754
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		386	445	534	722	783	846
Wage income - All (million $2019)		2,402	2,734	3,304	4,480	4,882	5,345

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	670	628	574	531	498	459	413
Final energy use - Residential (PJ)	241	228	218	206	189	170	154
Final energy use - Commercial (PJ)	182	179	174	169	162	155	149
Final energy use - Industry (PJ)	241	250	272	277	295	331	335

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)		3.2	3.23	3.9	4.01	5.79	6.1

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	23.3	155	287	899	1,510	2,863	4,216
Vehicle stocks - LDV – All others (1000 units)	5,511	5,511	5,511	5,228	4,944	3,810	2,676
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		0	171	359	1,211	3,810	5,551
Public EV charging plugs - DC Fast (1000 units)	0.178		0.611		3.21		8.98
Public EV charging plugs - L2 (1000 units)	1.67		14.7		77.3		216

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 (%)	7.5	13	18.7	35.2	61.1	79	85.2
Sales of space heating units - Electric Resistance (%)	19.7	24.8	23.3	19.2	12.8	8.51	7.04
Sales of space heating units - Gas (%)	63.5	47.3	43.7	33.5	17.6	6.67	2.55
Sales of space heating units - Fossil (%)	9.34	14.9	14.4	12.2	8.46	5.78	5.24
Sales of water heating units - Electric Heat Pump (%)	0	1.51	5.81	18.2	37.5	50.4	55
Sales of water heating units - Electric Resistance (%)	42.5	57.5	56.3	52.9	47.8	44.7	43.6
Sales of water heating units - Gas Furnace (%)	57.4	40.9	37.8	28.9	14.7	4.93	1.34
Sales of water heating units - Other (%)	0.034	0.035	0.036	0.036	0.036	0.036	0.036
Sales of cooking units - Electric Resistance (%)	76.4	77	79.2	84.9	92.8	97.7	99.4
Sales of cooking units - Gas (%)	23.6	23	20.8	15.1	7.21	2.33	0.626
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		5.81	7.68				

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	4.52	15.9	21.2	36.6	61.3	79.5	86.8
Sales of space heating units - Electric Resistance (%)	8.06	5.57	5.72	6.25	7.38	8.69	9.45
Sales of space heating units - Gas Furnace (%)	87.4	76.5	71.1	55.7	30.6	11.6	3.64
Sales of space heating units - Fossil (%)	0	2.02	1.9	1.42	0.689	0.224	0.059
Sales of water heating units - Electric Heat Pump (%)	1.19	2.53	7.36	21.3	43.1	57.7	63
Sales of water heating units - Electric Resistance (%)	10.1	7.76	9.75	15.5	24.6	31	33.4

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Gas Furnace (%)	87.7	88.7	81.9	62.3	31.6	10.6	2.88
Sales of water heating units - Other (%)	0.996	0.987	0.962	0.892	0.786	0.72	0.695
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)		16,266	17,675				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	7,000	1,299	0	0	0	0	0
Installed thermal - Natural gas (MW)	6,692	4,262	4,134	3,511	647	2,254	3,204
Installed thermal - Nuclear (MW)	1,236	1,236	1,236	1,236	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-82
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-379
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,973
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-77
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-1,071
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-787
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-5,328
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-1,597
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,244
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-13,537
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-123
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,326
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-5,357
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-113
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-2,141
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,517
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-7,992
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-11,338
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,467
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-32,374

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)							-164
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-2,274
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-7,741
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-151
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-3,212
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-2,247
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-10,656
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-21,079
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-51,213
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,690
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							13.4
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							289
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,512
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							27.9
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)							112
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							352
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							104
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							740
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,151
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							20.1
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							298
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							2,730
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							41.9

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)							163
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							528
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							751
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,490
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							6,022
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							26.8
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							308
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							3,947
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							55.7
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)							214
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							705
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							599
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,223
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							7,077

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-7,068
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-157
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-7,225

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)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-13,495
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-313
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-13,808
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							3,016
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							285
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							3,301
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							5,748
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							570
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							6,318

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)		62.8	0.052	0.05	0.042	0.028	0.001
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		21.6	11.3	4.17	2.81	1.05	0.61
Premature deaths from air pollution - Mobile - On-Road (deaths)		146	136	103	59.5	27.6	11.6
Premature deaths from air pollution - Gas Stations (deaths)		11.4	10.5	7.88	4.68	2.33	1.16
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		22.2	17.8	11.6	6.23	2.82	1.1
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.545	0.448	0.315	0.193	0.096	0.045
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		4.05	3.67	2.81	1.81	0.904	0.365
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		5.84	5.59	5.32	5.02	4.72	4.41
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		16.2	13.9	10.2	6.49	3.84	2.2

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)		1.97	1.63	1.28	0.946	0.657	0.418
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		1.38	1.15	0.937	0.728	0.531	0.348
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		2.98	1.72	1.7	1.67	1.68	1.58
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		92.5	87	75.2	54	33.1	5.02
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		556	0.465	0.445	0.372	0.247	0.01
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		192	100	36.9	24.9	9.27	5.4
Monetary damages from air pollution - Mobile - On-Road (million $2019)		1,300	1,208	916	529	246	103
Monetary damages from air pollution - Gas Stations (million $2019)		101	92.6	69.7	41.5	20.6	10.3
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		197	158	103	55.2	25	9.74
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		4.83	3.97	2.79	1.71	0.849	0.394
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		35.9	32.5	24.9	16	8.01	3.23
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		51.7	49.5	47.1	44.5	41.8	39
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		144	123	90.6	57.5	34	19.5
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		17.5	14.4	11.3	8.38	5.81	3.7
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		12.2	10.2	8.29	6.44	4.7	3.08
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		26.3	15.2	15	14.7	14.8	14
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		821	773	668	480	294	44.6

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		441	446	430	355	264	745
By economic sector - Construction (jobs)		13,828	18,696	28,091	33,430	58,740	52,620
By economic sector - Manufacturing (jobs)		3,195	3,904	5,511	6,401	8,744	9,497
By economic sector - Mining (jobs)		2,202	1,533	978	566	288	44.1
By economic sector - Other (jobs)		1,997	3,091	4,987	6,102	12,901	11,224
By economic sector - Pipeline (jobs)		396	335	243	162	94.2	25
By economic sector - Professional (jobs)		6,024	7,936	12,504	15,809	28,121	27,643

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Trade (jobs)		4,586	5,627	8,283	10,157	18,886	18,018
By economic sector - Utilities (jobs)		8,494	10,886	18,461	25,291	39,654	41,537
By resource sector - Biomass (jobs)		1,040	1,021	960	945	997	3,349
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Coal (jobs)		1,495	345	151	132	119	104
By resource sector - Grid (jobs)		11,811	18,790	34,856	48,618	78,648	83,166
By resource sector - Natural Gas (jobs)		3,426	2,258	1,689	1,907	1,442	1,520
By resource sector - Nuclear (jobs)		624	614	604	595	345	0
By resource sector - Oil (jobs)		5,420	4,307	3,062	1,951	1,060	1.61
By resource sector - Solar (jobs)		13,899	20,652	30,438	33,691	71,377	55,179
By resource sector - Wind (jobs)		3,448	4,468	7,728	10,436	13,702	18,032
By education level - All sectors - High school diploma or less (jobs)		17,713	22,675	34,120	41,804	71,179	68,063
By education level - All sectors - Associates degree or some college (jobs)		12,897	16,638	25,562	31,843	54,574	52,441
By education level - All sectors - Bachelors degree (jobs)		8,209	10,195	15,321	19,021	32,300	31,440
By education level - All sectors - Masters or professional degree (jobs)		2,033	2,555	3,892	4,873	8,355	8,171
By education level - All sectors - Doctoral degree (jobs)		311	393	593	732	1,283	1,238
Related work experience - All sectors - None (jobs)		5,995	7,666	11,641	14,408	24,655	23,722
Related work experience - All sectors - Up to 1 year (jobs)		8,482	10,887	16,363	19,976	34,213	32,683
Related work experience - All sectors - 1 to 4 years (jobs)		14,710	18,683	28,343	35,158	59,991	57,851
Related work experience - All sectors - 4 to 10 years (jobs)		9,529	12,119	18,436	22,896	38,976	37,556
Related work experience - All sectors - Over 10 years (jobs)		2,448	3,102	4,704	5,836	9,856	9,539
On-the-Job Training - All sectors - None (jobs)		2,308	2,930	4,388	5,365	9,288	8,831
On-the-Job Training - All sectors - Up to 1 year (jobs)		26,817	33,993	51,305	63,349	107,868	104,208
On-the-Job Training - All sectors - 1 to 4 years (jobs)		8,693	11,182	17,122	21,292	36,320	34,837
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,942	3,833	5,907	7,345	12,640	12,007
On-the-Job Training - All sectors - Over 10 years (jobs)		405	517	767	922	1,575	1,469
On-Site or In-Plant Training - All sectors - None (jobs)		6,684	8,522	12,881	15,874	27,252	26,120
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		24,406	30,965	46,772	57,770	98,368	94,960
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		6,747	8,670	13,245	16,443	28,054	26,906
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,969	3,833	5,871	7,288	12,487	11,889
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		357	464	719	899	1,530	1,477
Wage income - All (million $2019)		2,233	2,862	4,395	5,524	9,493	9,295

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	669	623	550	461	380	331	311
Final energy use - Residential (PJ)	241	227	206	178	155	141	134
Final energy use - Commercial (PJ)	182	178	169	158	147	141	138
Final energy use - Industry (PJ)	241	249	271	274	290	326	330

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)		3.82	3.92	6.23	6.6	6.19	6.47

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	30.1	479	928	2,500	4,071	5,327	6,583
Vehicle stocks - LDV – All others (1000 units)	5,489	5,226	4,964	3,618	2,271	1,285	299
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		1,055	2,704	4,381	6,637	7,223	6,887
Public EV charging plugs - DC Fast (1000 units)	0.178		1.98		8.67		14
Public EV charging plugs - L2 (1000 units)	1.67		47.5		208		337

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 (%)	7.5	22.5	72.3	86.1	87.5	87.8	87.4
Sales of space heating units - Electric Resistance (%)	19.7	22.4	10	6.61	6.36	6.55	6.72
Sales of space heating units - Gas (%)	63.5	41.4	10.2	1.69	1.08	1.04	1.02
Sales of space heating units - Fossil (%)	9.34	13.6	7.39	5.58	5.03	4.63	4.86
Sales of water heating units - Electric Heat Pump (%)	0	8.7	46.5	56.1	56.7	56.7	56.7
Sales of water heating units - Electric Resistance (%)	42.5	55.5	45.3	43.3	43.3	43.3	43.3
Sales of water heating units - Gas Furnace (%)	57.4	35.7	8.23	0.581	0.019	0	0
Sales of water heating units - Other (%)	0.034	0.035	0.036	0.035	0.035	0.036	0.036
Sales of cooking units - Electric Resistance (%)	76.5	81.5	96.8	99.8	100	100	100
Sales of cooking units - Gas (%)	23.5	18.5	3.16	0.159	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		5.85	7.79				

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	4.52	24.4	70.6	87.7	89.7	89.7	89.7
Sales of space heating units - Electric Resistance (%)	8.06	5.73	7.1	9.32	9.79	9.8	9.8
Sales of space heating units - Gas Furnace (%)	87.4	68.1	22	2.94	0.553	0.458	0.459
Sales of space heating units - Fossil (%)	0	1.75	0.337	0.014	0	0	0
Sales of water heating units - Electric Heat Pump (%)	1.19	10.6	53.1	64.2	65	65	65
Sales of water heating units - Electric Resistance (%)	10.1	11	28.4	33.8	34.3	34.3	34.3
Sales of water heating units - Gas Furnace (%)	87.7	77.5	17.8	1.26	0.041	0	0
Sales of water heating units - Other (%)	0.996	0.947	0.735	0.688	0.685	0.688	0.687
Sales of cooking units - Electric Resistance (%)	44.8	57.1	84	89.3	89.6	89.6	89.6
Sales of cooking units - Gas (%)	55.2	42.9	16	10.7	10.4	10.4	10.4
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		16,269	17,611				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	7,000	1,299	0	0	0	0	0
Installed thermal - Natural gas (MW)	6,692	4,262	4,134	3,844	2,056	5,529	8,394
Installed thermal - Nuclear (MW)	1,236	1,236	1,236	1,236	1,236	0	0
Installed renewables - Rooftop PV (MW)	153	269	400	605	898	1,277	1,767
Installed renewables - Solar - Base land use assumptions (MW)	110	8,903	20,953	40,065	57,163	102,834	132,465
Installed renewables - Wind - Base land use assumptions (MW)	5,327	25,030	42,116	75,250	119,064	170,086	198,707
Installed renewables - Solar - Constrained land use assumptions (MW)	33.6	8,809	22,631	37,113	57,486	98,641	116,501
Installed renewables - Wind - Constrained land use assumptions (MW)	5,101	27,080	51,233	93,031	97,026	99,812	231,168
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion $2018)		11.8	14.4	21.1	17.8	44.8	27.5
Capital invested - Wind - Base (billion $2018)		29	22.7	41.1	51.8	57.2	30.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	216	16,765	39,441	75,390	107,459	193,354	249,128
Wind - Base land use assumptions (GWh)	19,737	84,539	140,172	247,311	386,254	545,010	631,310
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	145	33,147	85,095	139,507	215,976	370,604	437,809
Wind - Constrained land use assumptions (GWh)	35,330	177,376	330,559	588,274	614,269	631,531	1,466,853
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)							-82
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-379
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,973
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-77
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-1,071
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-787
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-5,328
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-1,597
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,244
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-13,537

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)							-123
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,326
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-5,357
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-113
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-2,141
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,517
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-7,992
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-11,338
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,467
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-32,374
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-164
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-2,274
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-7,741
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-151
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-3,212
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-2,247
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-10,656
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-21,079
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-51,213
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,690
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							13.4
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							289
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,512
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							27.9
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)							112
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							352

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)							104
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							740
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,151
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							20.1
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							298
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							2,730
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							41.9
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)							163
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							528
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							751
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,490
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							6,022
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							26.8
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							308
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							3,947
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							55.7
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)							214
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							705
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							599
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,223

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)							7,077

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-7,068
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-157
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-7,225
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-13,495
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-313
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-13,808
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							3,016
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							285
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							3,301
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							5,748
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							570
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							6,318

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)		62.8	0.052	0.05	0.042	0.028	0.001

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)		24.1	12.1	12.8	9.67	3.68	1.31
Premature deaths from air pollution - Mobile - On-Road (deaths)		146	136	103	59.5	27.6	11.6
Premature deaths from air pollution - Gas Stations (deaths)		11.4	10.5	7.88	4.68	2.33	1.16
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		22.2	17.8	11.6	6.23	2.82	1.1
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.545	0.448	0.315	0.193	0.096	0.045
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		4.05	3.67	2.81	1.81	0.904	0.365
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		5.84	5.59	5.32	5.02	4.72	4.41
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		16.2	13.9	10.2	6.49	3.84	2.2
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.97	1.63	1.28	0.946	0.657	0.418
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		1.38	1.15	0.937	0.728	0.531	0.348
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		2.64	1.72	1.7	1.67	1.68	1.58
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		95.1	91.8	89.6	75.3	62.5	46.2
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		556	0.465	0.445	0.372	0.247	0.01
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		213	107	114	85.7	32.6	11.6
Monetary damages from air pollution - Mobile - On-Road (million $2019)		1,300	1,208	916	529	246	103
Monetary damages from air pollution - Gas Stations (million $2019)		101	92.6	69.7	41.5	20.6	10.3
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		197	158	103	55.2	25	9.74
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		4.83	3.97	2.79	1.71	0.849	0.394
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		35.9	32.5	24.9	16	8.01	3.23
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		51.7	49.5	47.1	44.5	41.8	39
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		144	123	90.6	57.5	34	19.5
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		17.5	14.4	11.3	8.38	5.81	3.7

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)		12.2	10.2	8.29	6.44	4.7	3.08
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		23.3	15.2	15	14.7	14.9	14
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		845	815	796	669	555	410

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		442	458	434	426	337	740
By economic sector - Construction (jobs)		13,084	14,336	15,959	19,524	18,099	16,870
By economic sector - Manufacturing (jobs)		2,922	2,766	2,771	3,225	3,042	3,196
By economic sector - Mining (jobs)		2,237	1,668	1,197	830	618	460
By economic sector - Other (jobs)		1,840	2,110	2,805	3,630	3,364	2,854
By economic sector - Pipeline (jobs)		412	666	323	291	283	397
By economic sector - Professional (jobs)		5,738	5,713	6,855	8,925	8,621	8,664
By economic sector - Trade (jobs)		4,407	4,327	4,942	6,046	5,734	5,377
By economic sector - Utilities (jobs)		8,469	9,767	10,758	14,513	14,772	15,826
By resource sector - Biomass (jobs)		1,040	1,048	982	1,274	1,331	3,145
By resource sector - CO2 (jobs)		15.1	2,547	187	382	841	2,148
By resource sector - Coal (jobs)		1,494	587	505	469	440	228
By resource sector - Grid (jobs)		11,690	13,416	18,369	25,774	27,725	29,162
By resource sector - Natural Gas (jobs)		3,603	3,048	2,613	3,073	1,958	1,644
By resource sector - Nuclear (jobs)		624	614	604	350	0	0
By resource sector - Oil (jobs)		5,418	4,356	3,168	2,195	1,553	1,173
By resource sector - Solar (jobs)		12,561	13,824	17,350	20,611	17,363	12,893
By resource sector - Wind (jobs)		3,107	2,372	2,266	3,284	3,661	3,990
By education level - All sectors - High school diploma or less (jobs)		16,997	18,100	19,873	24,574	23,378	23,180
By education level - All sectors - Associates degree or some college (jobs)		12,383	13,273	14,677	18,501	17,762	17,516
By education level - All sectors - Bachelors degree (jobs)		7,913	8,128	8,910	11,086	10,612	10,573
By education level - All sectors - Masters or professional degree (jobs)		1,961	2,012	2,247	2,826	2,717	2,719
By education level - All sectors - Doctoral degree (jobs)		298	298	338	424	401	397
Related work experience - All sectors - None (jobs)		5,765	6,150	6,770	8,458	8,092	8,044
Related work experience - All sectors - Up to 1 year (jobs)		8,120	8,573	9,491	11,704	11,084	10,969
Related work experience - All sectors - 1 to 4 years (jobs)		14,149	14,921	16,429	20,537	19,682	19,516
Related work experience - All sectors - 4 to 10 years (jobs)		9,163	9,695	10,643	13,329	12,772	12,640
Related work experience - All sectors - Over 10 years (jobs)		2,354	2,473	2,712	3,383	3,242	3,215
On-the-Job Training - All sectors - None (jobs)		2,212	2,307	2,552	3,148	2,977	2,914
On-the-Job Training - All sectors - Up to 1 year (jobs)		25,772	27,054	29,797	37,049	35,405	35,246
On-the-Job Training - All sectors - 1 to 4 years (jobs)		8,354	8,961	9,856	12,387	11,880	11,715
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,827	3,082	3,399	4,290	4,108	4,028

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)		386	407	441	537	501	482
On-Site or In-Plant Training - All sectors - None (jobs)		6,408	6,734	7,430	9,258	8,810	8,697
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		23,460	24,671	27,172	33,789	32,298	32,120
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		6,483	6,940	7,637	9,577	9,179	9,055
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,856	3,093	3,393	4,265	4,080	4,011
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		344	374	413	522	504	501
Wage income - All (million $2019)		2,150	2,298	2,553	3,228	3,133	3,159

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	669	623	550	461	380	331	311
Final energy use - Residential (PJ)	241	227	206	178	155	141	134
Final energy use - Commercial (PJ)	182	178	169	158	147	141	138
Final energy use - Industry (PJ)	241	249	271	274	290	326	330

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)		3.82	3.92	6.23	6.6	6.19	6.47

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	30.1	479	928	2,500	4,071	5,327	6,583
Vehicle stocks - LDV – All others (1000 units)	5,489	5,226	4,964	3,618	2,271	1,285	299
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		1,055	2,704	4,381	6,637	7,223	6,887
Public EV charging plugs - DC Fast (1000 units)	0.178		1.98		8.67		14
Public EV charging plugs - L2 (1000 units)	1.67		47.5		208		337

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 (%)	7.5	22.5	72.3	86.1	87.5	87.8	87.4
Sales of space heating units - Electric Resistance (%)	19.7	22.4	10	6.61	6.36	6.55	6.72
Sales of space heating units - Gas (%)	63.5	41.4	10.2	1.69	1.08	1.04	1.02
Sales of space heating units - Fossil (%)	9.34	13.6	7.39	5.58	5.03	4.63	4.86
Sales of water heating units - Electric Heat Pump (%)	0	8.7	46.5	56.1	56.7	56.7	56.7
Sales of water heating units - Electric Resistance (%)	42.5	55.5	45.3	43.3	43.3	43.3	43.3
Sales of water heating units - Gas Furnace (%)	57.4	35.7	8.23	0.581	0.019	0	0
Sales of water heating units - Other (%)	0.034	0.035	0.036	0.035	0.035	0.036	0.036
Sales of cooking units - Electric Resistance (%)	76.5	81.5	96.8	99.8	100	100	100
Sales of cooking units - Gas (%)	23.5	18.5	3.16	0.159	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)		5.85	7.79				

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	4.52	24.4	70.6	87.7	89.7	89.7	89.7
Sales of space heating units - Electric Resistance (%)	8.06	5.73	7.1	9.32	9.79	9.8	9.8
Sales of space heating units - Gas Furnace (%)	87.4	68.1	22	2.94	0.553	0.458	0.459
Sales of space heating units - Fossil (%)	0	1.75	0.337	0.014	0	0	0
Sales of water heating units - Electric Heat Pump (%)	1.19	10.6	53.1	64.2	65	65	65
Sales of water heating units - Electric Resistance (%)	10.1	11	28.4	33.8	34.3	34.3	34.3
Sales of water heating units - Gas Furnace (%)	87.7	77.5	17.8	1.26	0.041	0	0
Sales of water heating units - Other (%)	0.996	0.947	0.735	0.688	0.685	0.688	0.687
Sales of cooking units - Electric Resistance (%)	44.8	57.1	84	89.3	89.6	89.6	89.6
Sales of cooking units - Gas (%)	55.2	42.9	16	10.7	10.4	10.4	10.4
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		16,269	17,611				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	7,000	1,299	999	999	999	999	0
Installed thermal - Natural gas (MW)	6,692	4,262	5,706	6,189	4,839	4,341	4,057
Installed thermal - Nuclear (MW)	1,236	1,236	1,236	1,236	0	0	0
Installed renewables - Rooftop PV (MW)	153	269	400	605	898	1,277	1,767
Installed renewables - Solar - Base land use assumptions (MW)	33.6	10,071	19,446	29,638	43,884	51,858	51,858
Installed renewables - Wind - Base land use assumptions (MW)	4,409	21,499	26,901	26,901	36,539	49,328	70,070
Installed renewables - Solar - Constrained land use assumptions (MW)	111	9,629	19,626	28,260	40,546	47,421	47,421
Installed renewables - Wind - Constrained land use assumptions (MW)	4,138	23,048	29,268	29,541	43,453	65,037	90,259
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion $2018)		13.4	11.2	11.2	14.8	7.82	0
Capital invested - Wind - Base (billion $2018)		25.1	7.19	0	11.4	14.3	21.8
Capital invested - Solar PV - Constrained (billion $2018)		12.7	12	9.51	12.8	6.74	0
Capital invested - Wind - Constrained (billion $2018)		27.8	8.28	0.338	16.4	24.2	26.7

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	72.4	18,933	36,537	55,667	82,436	97,369	97,369
Wind - Base land use assumptions (GWh)	16,617	73,100	90,582	90,582	122,043	163,615	228,918
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)	216	18,113	36,914	53,140	76,195	89,104	89,104
Wind - Constrained land use assumptions (GWh)	14,915	76,207	96,035	97,035	141,929	209,549	285,205
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)							-82
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-379
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,973
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-77
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-1,071
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-787
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-5,328
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-1,597
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,244
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-13,537
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-123
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,326
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-5,357
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-113
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-2,141
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,517
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-7,992
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-11,338
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,467
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-32,374
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-164
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-2,274
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-7,741
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-151
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-3,212

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)							-2,247
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-10,656
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-21,079
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-51,213
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,690
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							13.4
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							289
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,512
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							27.9
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)							112
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							352
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							104
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							740
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,151
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							20.1
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							298
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							2,730
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							41.9
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)							163
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							528
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							751

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)							1,490
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							6,022
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							26.8
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							308
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							3,947
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							55.7
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)							214
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							705
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							599
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,223
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							7,077

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-7,068
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-157
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-7,225
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-13,495
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-313
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-13,808

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)							0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							3,016
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							285
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							3,301
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							5,748
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							570
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							6,318

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)		62.8	0.052	0.05	0.042	0.028	0.001
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		22.7	9.88	5.78	3.74	1.65	0.849
Premature deaths from air pollution - Mobile - On-Road (deaths)		149	149	145	131	104	71.3
Premature deaths from air pollution - Gas Stations (deaths)		11.6	11.7	11.2	10	7.95	5.51
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		22.4	20.3	17.8	14.5	10.6	6.8
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.556	0.531	0.505	0.451	0.363	0.271
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		4.1	4.16	4.14	3.78	2.98	2.08
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		5.84	5.59	5.32	5.02	4.72	4.41
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		16.3	15.6	14.6	12.7	10.1	7.49
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.98	1.78	1.59	1.38	1.14	0.924
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		1.38	1.24	1.1	0.962	0.831	0.708
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		2.8	1.72	1.71	1.69	1.7	1.66

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)		93.8	85.1	74.1	64.9	57.4	39.9
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		556	0.465	0.445	0.372	0.247	0.01
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		201	87.5	51.2	33.1	14.6	7.52
Monetary damages from air pollution - Mobile - On-Road (million $2019)		1,321	1,328	1,290	1,161	924	634
Monetary damages from air pollution - Gas Stations (million $2019)		103	103	99.3	88.7	70.4	48.8
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		199	180	157	128	93.6	60.3
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		4.93	4.7	4.47	4	3.22	2.4
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		36.3	36.9	36.7	33.5	26.4	18.4
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		51.7	49.5	47.1	44.5	41.8	39
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		144	138	129	112	89.8	66.3
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		17.5	15.7	14.1	12.2	10.1	8.18
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		12.2	11	9.72	8.52	7.36	6.27
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		24.7	15.2	15.1	14.9	15	14.7
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		833	756	658	576	509	355

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		442	444	1,129	1,147	2,009	2,027
By economic sector - Construction (jobs)		15,343	17,280	19,378	21,856	21,766	24,266
By economic sector - Manufacturing (jobs)		3,194	3,677	4,180	4,253	5,491	6,305
By economic sector - Mining (jobs)		2,238	1,663	1,298	1,025	760	490
By economic sector - Other (jobs)		2,288	2,588	3,327	4,049	3,604	4,059
By economic sector - Pipeline (jobs)		404	623	305	289	278	356
By economic sector - Professional (jobs)		6,565	7,098	9,485	11,454	13,733	15,319
By economic sector - Trade (jobs)		4,942	5,125	6,225	7,309	7,739	8,602
By economic sector - Utilities (jobs)		8,787	11,290	12,750	15,187	18,861	22,242
By resource sector - Biomass (jobs)		1,042	1,013	3,332	4,389	9,281	9,633
By resource sector - CO2 (jobs)		14.9	2,304	163	363	779	1,935
By resource sector - Coal (jobs)		1,495	345	151	132	119	105
By resource sector - Grid (jobs)		12,290	17,523	23,046	28,041	36,793	42,899
By resource sector - Natural Gas (jobs)		3,481	2,220	1,847	2,025	1,143	859
By resource sector - Nuclear (jobs)		624	614	604	350	0	0
By resource sector - Oil (jobs)		5,479	4,662	3,974	3,387	2,560	1,630

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

Item	2020	2025	2030	2035	2040	2045	2050
By resource sector - Solar (jobs)		16,191	16,757	19,944	22,698	16,907	17,568
By resource sector - Wind (jobs)		3,585	4,350	5,016	5,183	6,658	9,037
By education level - All sectors - High school diploma or less (jobs)		19,052	21,506	25,078	28,512	31,667	35,536
By education level - All sectors - Associates degree or some college (jobs)		13,874	15,830	18,274	21,062	23,244	26,407
By education level - All sectors - Bachelors degree (jobs)		8,764	9,684	11,378	13,097	14,858	16,698
By education level - All sectors - Masters or professional degree (jobs)		2,177	2,408	2,897	3,370	3,866	4,351
By education level - All sectors - Doctoral degree (jobs)		337	360	450	527	606	673
Related work experience - All sectors - None (jobs)		6,438	7,298	8,522	9,785	10,924	12,312
Related work experience - All sectors - Up to 1 year (jobs)		9,136	10,232	12,079	13,748	15,322	17,165
Related work experience - All sectors - 1 to 4 years (jobs)		15,780	17,758	20,725	23,800	26,581	29,962
Related work experience - All sectors - 4 to 10 years (jobs)		10,229	11,547	13,343	15,336	17,052	19,288
Related work experience - All sectors - Over 10 years (jobs)		2,620	2,955	3,409	3,900	4,361	4,938
On-the-Job Training - All sectors - None (jobs)		2,486	2,750	3,225	3,694	4,065	4,548
On-the-Job Training - All sectors - Up to 1 year (jobs)		28,735	32,223	37,900	43,393	48,869	54,928
On-the-Job Training - All sectors - 1 to 4 years (jobs)		9,355	10,670	12,234	14,052	15,446	17,537
On-the-Job Training - All sectors - 4 to 10 years (jobs)		3,188	3,659	4,168	4,811	5,207	5,919
On-the-Job Training - All sectors - Over 10 years (jobs)		438	487	550	618	653	734
On-Site or In-Plant Training - All sectors - None (jobs)		7,193	8,043	9,443	10,825	12,031	13,526
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		26,157	29,372	34,450	39,444	44,321	49,854
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		7,258	8,263	9,500	10,900	12,000	13,602
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		3,210	3,666	4,173	4,807	5,229	5,933
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		385	445	511	591	658	751
Wage income - All (million $2019)		2,394	2,730	3,209	3,728	4,227	4,835

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	670	628	574	531	498	459	413
Final energy use - Residential (PJ)	241	228	218	206	189	170	154
Final energy use - Commercial (PJ)	182	179	174	169	162	155	149
Final energy use - Industry (PJ)	241	250	272	277	295	331	335

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)		3.2	3.23	3.9	4.01	5.79	6.1

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	23.3	155	287	899	1,510	2,863	4,216
Vehicle stocks - LDV – All others (1000 units)	5,511	5,511	5,511	5,228	4,944	3,810	2,676
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		0	171	359	1,211	3,810	5,551
Public EV charging plugs - DC Fast (1000 units)	0.178		0.611		3.21		8.98
Public EV charging plugs - L2 (1000 units)	1.67		14.7		77.3		216

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 (%)	7.5	13	18.7	35.2	61.1	79	85.2
Sales of space heating units - Electric Resistance (%)	19.7	24.8	23.3	19.2	12.8	8.51	7.04
Sales of space heating units - Gas (%)	63.5	47.3	43.7	33.5	17.6	6.67	2.55
Sales of space heating units - Fossil (%)	9.34	14.9	14.4	12.2	8.46	5.78	5.24
Sales of water heating units - Electric Heat Pump (%)	0	1.51	5.81	18.2	37.5	50.4	55
Sales of water heating units - Electric Resistance (%)	42.5	57.5	56.3	52.9	47.8	44.7	43.6
Sales of water heating units - Gas Furnace (%)	57.4	40.9	37.8	28.9	14.7	4.93	1.34
Sales of water heating units - Other (%)	0.034	0.035	0.036	0.036	0.036	0.036	0.036
Sales of cooking units - Electric Resistance (%)	76.4	77	79.2	84.9	92.8	97.7	99.4
Sales of cooking units - Gas (%)	23.6	23	20.8	15.1	7.21	2.33	0.626
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		5.81	7.68				

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	4.52	15.9	21.2	36.6	61.3	79.5	86.8
Sales of space heating units - Electric Resistance (%)	8.06	5.57	5.72	6.25	7.38	8.69	9.45
Sales of space heating units - Gas Furnace (%)	87.4	76.5	71.1	55.7	30.6	11.6	3.64
Sales of space heating units - Fossil (%)	0	2.02	1.9	1.42	0.689	0.224	0.059
Sales of water heating units - Electric Heat Pump (%)	1.19	2.53	7.36	21.3	43.1	57.7	63
Sales of water heating units - Electric Resistance (%)	10.1	7.76	9.75	15.5	24.6	31	33.4
Sales of water heating units - Gas Furnace (%)	87.7	88.7	81.9	62.3	31.6	10.6	2.88
Sales of water heating units - Other (%)	0.996	0.987	0.962	0.892	0.786	0.72	0.695
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)		16,266	17,675				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	7,000	1,299	0	0	0	0	0
Installed thermal - Natural gas (MW)	6,692	4,262	4,134	3,736	1,071	1,404	1,302
Installed thermal - Nuclear (MW)	1,236	1,236	1,236	1,236	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Biomass power plant (billion $2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion $2018)	0	0	0	0	0	0.01	0
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	0	0	3.67	21.9	3.22

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu power plant (GWh)	0	0	0	0	4,118	28,723	32,333
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	9.64	9.64

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

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu (quantity)	0	0	0	0	3	23	26
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	0	1	1
Number of facilities - Beccs hydrogen (quantity)	0	0	0	7	10	18	21
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	1	1
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	1	1	2
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	6,005	6,222	27,270	5,804
Biomass purchases (million $2018/y)		0	0	549	1,075	3,318	3,802

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	3.24	11.1	18.8	59.3	66.5
Annual - BECCS (MMT)		0	0	7.72	15.5	49	55.9
Annual - NGCC (MMT)		0	0	0	0	0	0
Annual - Cement and lime (MMT)		0	3.24	3.35	3.32	10.3	10.6
Cumulative - All (MMT)		0	3.24	14.3	33.1	92.3	159
Cumulative - BECCS (MMT)		0	0	7.72	23.2	72.2	128
Cumulative - NGCC (MMT)		0	0	0	0	0	0
Cumulative - Cement and lime (MMT)		0	3.24	6.59	9.91	20.2	30.8

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	409	409	409	409	409
Spur (km)		0	10.4	173	393	2,027	2,587
All (km)		0	420	582	802	2,436	2,996
Cumulative investment - Trunk (million $2018)		0	1,950	1,950	2,145	2,145	2,145
Cumulative investment - Spur (million $2018)		0	11.9	351	550	2,677	3,120
Cumulative investment - All (million $2018)		0	1,962	2,301	2,695	4,822	5,266

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual (MMT)		0	0.92	4.28	7.13	10.8	10.9
Injection wells (wells)		0	2	7	13	22	27
Resource characterization, appraisal, permitting costs (million $2020)		27.9	123	190	190	190	190
Wells and facilities construction costs (million $2020)		0	55.8	217	387	648	804

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)							-82
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-379
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,973
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-77
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-1,071
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-787
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-5,328
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-1,597
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,244
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-13,537
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-123
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,326
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-5,357
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-113
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-2,141
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,517
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-7,992
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-11,338
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,467
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-32,374
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-164
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-2,274
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-7,741
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-151

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)							-3,212
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-2,247
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-10,656
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-21,079
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-51,213
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,690
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							13.4
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							289
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,512
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							27.9
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)							112
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							352
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							104
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							740
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,151
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							20.1
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							298
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							2,730
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							41.9
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)							163
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							528
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							751

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)							1,490
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							6,022
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							26.8
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							308
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							3,947
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							55.7
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)							214
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							705
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							599
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,223
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							7,077

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-1,072
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-6,467
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-142
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)							-7,681
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-1,072
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-12,355

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)							-284
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)							-13,711
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							497
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							2,765
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							259
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)							292
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)							979
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							4,793
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							497
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							13,018
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							517
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)							292
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)							979
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							15,303

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)		255	152	102	80	71.1	70.3
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		24.7	22.2	23.6	17.2	14.8	13.2
Premature deaths from air pollution - Mobile - On-Road (deaths)		149	152	155	159	163	167
Premature deaths from air pollution - Gas Stations (deaths)		11.6	11.8	11.9	12.1	12.3	12.4

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)		22	19.9	17.9	16.7	16.1	15.7
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.549	0.476	0.362	0.252	0.165	0.115
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		3.83	3.74	3.71	3.73	3.71	3.64
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		6.1	6.12	6.11	6.07	6.02	5.94
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		16.5	15.9	14.3	12.6	11.6	11.3
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		2.05	2.04	2.01	1.93	1.87	1.83
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		1.44	1.47	1.49	1.52	1.54	1.56
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		4.77	3.6	3.1	2.97	2.91	2.76
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		94.3	98.9	101	96.2	95.1	88.3
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		2,256	1,349	900	709	630	623
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		219	197	209	152	131	117
Monetary damages from air pollution - Mobile - On-Road (million $2019)		1,320	1,347	1,376	1,412	1,448	1,483
Monetary damages from air pollution - Gas Stations (million $2019)		103	104	105	107	109	110
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		195	176	159	148	143	139
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		4.86	4.22	3.2	2.23	1.46	1.02
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		33.9	33.1	32.9	33.1	32.8	32.3
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		54	54.2	54.1	53.7	53.3	52.6
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		146	141	127	111	102	100
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		18.2	18.1	17.8	17.1	16.5	16.2
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		12.8	13	13.2	13.4	13.6	13.8
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		42.1	31.7	27.4	26.2	25.6	24.4

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)		837	878	895	855	844	784

Table 65: *REF scenario - IMPACTS - Jobs*

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		442	441	441	440	440	441
By economic sector - Construction (jobs)		4,797	4,298	7,826	9,060	9,143	10,941
By economic sector - Manufacturing (jobs)		2,241	1,995	2,050	2,383	2,262	2,522
By economic sector - Mining (jobs)		2,463	1,853	1,511	1,213	1,005	855
By economic sector - Other (jobs)		260	306	1,229	1,456	1,617	2,061
By economic sector - Pipeline (jobs)		413	421	423	406	413	415
By economic sector - Professional (jobs)		2,748	2,204	3,465	4,212	4,237	5,110
By economic sector - Trade (jobs)		2,739	2,179	2,994	3,322	3,359	3,981
By economic sector - Utilities (jobs)		7,177	4,973	5,279	7,033	6,606	8,201
By resource sector - Biomass (jobs)		1,041	1,011	985	960	940	921
By resource sector - CO2 (jobs)		0	0.022	0.028	0.03	0.033	0.035
By resource sector - Coal (jobs)		2,494	1,346	875	603	246	106
By resource sector - Grid (jobs)		9,115	5,758	6,596	9,915	10,346	14,478
By resource sector - Natural Gas (jobs)		3,570	3,052	3,126	3,457	2,869	2,755
By resource sector - Nuclear (jobs)		624	614	604	595	345	0
By resource sector - Oil (jobs)		5,513	4,760	4,222	3,930	3,751	3,628
By resource sector - Solar (jobs)			1,017	7,618	7,965	8,523	10,196
By resource sector - Wind (jobs)		922	1,111	1,191	2,100	2,062	2,444
By education level - All sectors - High school diploma or less (jobs)		9,856	7,996	10,920	12,687	12,541	14,876
By education level - All sectors - Associates degree or some college (jobs)		7,116	5,655	7,810	9,273	9,153	10,975
By education level - All sectors - Bachelors degree (jobs)		4,953	3,940	5,057	5,883	5,739	6,731
By education level - All sectors - Masters or professional degree (jobs)		1,195	948	1,244	1,464	1,436	1,695
By education level - All sectors - Doctoral degree (jobs)		159	131	186	216	213	249
Related work experience - All sectors - None (jobs)		3,396	2,729	3,700	4,342	4,291	5,112
Related work experience - All sectors - Up to 1 year (jobs)		4,593	3,755	5,209	6,034	5,971	7,064
Related work experience - All sectors - 1 to 4 years (jobs)		8,466	6,745	9,024	10,574	10,405	12,359
Related work experience - All sectors - 4 to 10 years (jobs)		5,404	4,305	5,791	6,819	6,696	7,959
Related work experience - All sectors - Over 10 years (jobs)		1,420	1,134	1,493	1,755	1,718	2,034
On-the-Job Training - All sectors - None (jobs)		1,257	1,023	1,414	1,630	1,608	1,892
On-the-Job Training - All sectors - Up to 1 year (jobs)		15,513	12,448	16,555	19,299	18,998	22,486
On-the-Job Training - All sectors - 1 to 4 years (jobs)		4,793	3,817	5,251	6,223	6,130	7,333
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,516	1,211	1,755	2,093	2,073	2,498
On-the-Job Training - All sectors - Over 10 years (jobs)		200	169	242	278	273	318
On-Site or In-Plant Training - All sectors - None (jobs)		3,653	2,952	4,061	4,740	4,666	5,518
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		14,114	11,315	15,064	17,572	17,301	20,496

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)		3,739	2,984	4,092	4,834	4,765	5,695
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,576	1,261	1,784	2,117	2,091	2,506
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		197	157	217	260	258	311
Wage income - All (million $2019)		1,292	1,042	1,400	1,665	1,656	1,990

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	670	629	580	552	553	571	593
Final energy use - Residential (PJ)	241	227	219	214	212	213	214
Final energy use - Commercial (PJ)	182	183	183	181	179	181	187
Final energy use - Industry (PJ)	241	258	268	276	288	303	318

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)		3.46	3.52	3.75	3.83	4.56	4.72

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 (%)	4.86	29.6	30.8	32.6	34.1	35.7	37.6
Sales of space heating units - Electric Resistance (%)	20.4	20.8	20.3	19.8	19.4	18	15.9
Sales of space heating units - Gas (%)	65.2	38.7	37.8	36.4	35.8	36	36
Sales of space heating units - Fossil (%)	9.54	10.9	11.1	11.1	10.6	10.2	10.6
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	42.5	58	57.9	57.7	57.7	57.6	57.5
Sales of water heating units - Gas Furnace (%)	57.4	42	42.1	42.3	42.3	42.4	42.4
Sales of water heating units - Other (%)	0.034	0.035	0.036	0.036	0.036	0.036	0.036
Sales of cooking units - Electric Resistance (%)	76.2	76.2	76.2	76.2	76.2	76.2	76.2
Sales of cooking units - Gas (%)	23.8	23.8	23.8	23.8	23.8	23.8	23.8
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		5.54	5.98				

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	4.52	20.5	48.3	71.1	74.8	75.2	75.2
Sales of space heating units - Electric Resistance (%)	8.06	6.43	10.8	18.4	23.5	24.2	24.3
Sales of space heating units - Gas Furnace (%)	87.4	71.1	39.3	9.83	1.63	0.522	0.461
Sales of space heating units - Fossil (%)	0	1.98	1.55	0.695	0.102	0.009	0
Sales of water heating units - Electric Heat Pump (%)	1.19	0.826	0.821	0.823	0.819	0.815	0.814
Sales of water heating units - Electric Resistance (%)	10.1	7.06	7.07	7.05	7.05	7.05	7.04
Sales of water heating units - Gas Furnace (%)	87.7	91.1	91.1	91.1	91.1	91.1	91.1

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Other (%)	0.996	0.996	0.994	0.993	0.993	0.997	0.996
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)		16,080	16,491				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	7,000	5,110	2,037	2,037	999	0	0
Installed thermal - Natural gas (MW)	6,687	4,262	4,724	4,828	1,659	3,268	3,730
Installed thermal - Nuclear (MW)	1,236	1,236	1,236	1,236	1,236	0	0
Installed renewables - Rooftop PV (MW)	153	269	400	605	898	1,277	1,767
Installed renewables - Solar - Base land use assumptions (MW)	33.6	33.6	33.6	3,454	10,567	15,905	20,289
Installed renewables - Wind - Base land use assumptions (MW)	12,646	13,206	13,883	13,883	20,577	25,228	34,849

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	72.4	72.4	72.4	6,548	19,946	29,977	38,210
Wind - Base land use assumptions (GWh)	44,187	46,024	48,266	48,266	70,093	85,166	116,445
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)	-4.2		-13.4				-12
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-0.874		-1.57				-1.63
Business-as-usual carbon sink - Total (Mt CO2e/y)	-5.07		-15				-13.6

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)							-82
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-379
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,973
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-77
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-1,071
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-787
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-5,328
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-1,597
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,244
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-13,537

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-123
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,326
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-5,357
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-113
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-2,141
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,517
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-7,992
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-11,338
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,467
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-32,374
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-164
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-2,274
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-7,741
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-151
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-3,212
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-2,247
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-10,656
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-21,079
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-51,213
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,690
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							13.4
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							289
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,512
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							27.9
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)							112
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							352

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 pasture (1000 hectares)							104
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							740
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,151
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							20.1
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							298
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							2,730
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							41.9
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)							163
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							528
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							751
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,490
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							6,022
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							26.8
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							308
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							3,947
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							55.7
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)							214
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							705
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							599
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,223

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 - Total impacted (over 30 years) (1000 hectares)							7,077