Net-Zero America - Oregon data

October 29, 2021 (updated November 17, 2023)

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		4.12	0.005	0.005	0.003	0.002	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		4.36	2.52	2.1	1.94	1.57	1.18
Premature deaths from air pollution - Mobile - On-Road (deaths)		46.6	43.5	33.1	19.1	8.76	3.52
Premature deaths from air pollution - Gas Stations (deaths)		3.25	2.99	2.26	1.34	0.669	0.333
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		4.99	3.84	2.42	1.22	0.511	0.171
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.791	0.611	0.415	0.252	0.135	0.061
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.443	0.377	0.287	0.202	0.132	0.089
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.062	0.059	0.056	0.053	0.049	0.046
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		3.93	3.51	2.58	1.62	0.942	0.486
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.717	0.568	0.444	0.336	0.239	0.153
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.293	0.242	0.195	0.151	0.109	0.071
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.068	0.009	0.008	0.007	0.006	0.006
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		10	9.33	8.42	6.51	4.8	2.95
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		36.5	0.043	0.043	0.027	0.016	0
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		38.6	22.4	18.6	17.2	14	10.5
Monetary damages from air pollution - Mobile - On-Road (million $2019)		414	387	294	170	77.9	31.3
Monetary damages from air pollution - Gas Stations (million $2019)		28.8	26.5	20	11.9	5.92	2.95
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		44.2	34	21.4	10.8	4.53	1.52
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		7.01	5.41	3.67	2.24	1.19	0.545
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		3.92	3.34	2.54	1.79	1.17	0.789
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		0.551	0.524	0.496	0.467	0.437	0.406
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		34.8	31.1	22.8	14.4	8.34	4.3

Table 1: *E+ scenario - IMPACTS - Health (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		6.35	5.02	3.93	2.97	2.11	1.36
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		2.59	2.14	1.73	1.34	0.966	0.625
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		0.596	0.076	0.069	0.061	0.055	0.053
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		88.8	82.8	74.7	57.8	42.6	26.2

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		183	298	156	105	256	520
By economic sector - Construction (jobs)		11,000	12,548	16,224	18,354	20,626	32,388
By economic sector - Manufacturing (jobs)		1,545	1,973	2,297	2,402	2,542	4,082
By economic sector - Mining (jobs)		1,109	788	503	297	160	80.2
By economic sector - Other (jobs)		1,607	1,842	2,397	2,993	3,590	6,343
By economic sector - Pipeline (jobs)		259	218	358	124	109	129
By economic sector - Professional (jobs)		5,114	6,754	9,041	11,555	14,129	21,422
By economic sector - Trade (jobs)		3,230	3,950	5,205	6,632	8,133	12,915
By economic sector - Utilities (jobs)		4,708	6,323	9,757	11,344	13,342	23,004
By resource sector - Biomass (jobs)		647	788	400	290	936	2,234
By resource sector - CO2 (jobs)		0	0	1,544	0	250	659
By resource sector - Coal (jobs)		86.9	0	0	0	0	0
By resource sector - Grid (jobs)		7,011	10,266	15,244	19,726	23,628	43,041
By resource sector - Natural Gas (jobs)		2,131	1,792	1,840	1,654	1,259	1,113
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		2,619	2,054	1,431	922	562	300
By resource sector - Solar (jobs)		10,881	10,280	11,623	12,847	14,013	25,967
By resource sector - Wind (jobs)		5,381	9,515	13,856	18,367	22,241	27,570
By education level - All sectors - High school diploma or less (jobs)		12,235	14,554	19,033	21,954	25,449	41,206
By education level - All sectors - Associates degree or some college (jobs)		9,095	11,028	14,825	17,370	20,279	32,601
By education level - All sectors - Bachelors degree (jobs)		5,724	6,991	9,258	11,046	13,054	20,641
By education level - All sectors - Masters or professional degree (jobs)		1,460	1,816	2,422	2,940	3,509	5,525
By education level - All sectors - Doctoral degree (jobs)		243	304	400	495	596	911
Related work experience - All sectors - None (jobs)		4,156	5,005	6,641	7,744	9,052	14,636
Related work experience - All sectors - Up to 1 year (jobs)		5,919	7,078	9,220	10,740	12,510	20,146
Related work experience - All sectors - 1 to 4 years (jobs)		10,268	12,419	16,472	19,350	22,660	36,330
Related work experience - All sectors - 4 to 10 years (jobs)		6,715	8,134	10,865	12,756	14,913	23,781
Related work experience - All sectors - Over 10 years (jobs)		1,698	2,058	2,739	3,215	3,753	5,992
On-the-Job Training - All sectors - None (jobs)		1,627	1,940	2,536	2,985	3,494	5,588
On-the-Job Training - All sectors - Up to 1 year (jobs)		18,537	22,406	29,503	34,633	40,578	65,174

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)		6,152	7,422	9,962	11,617	13,517	21,669
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,150	2,584	3,494	4,062	4,716	7,535
On-the-Job Training - All sectors - Over 10 years (jobs)		291	342	444	509	582	916
On-Site or In-Plant Training - All sectors - None (jobs)		4,747	5,735	7,562	8,896	10,421	16,601
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		16,855	20,347	26,826	31,460	36,825	59,209
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		4,751	5,722	7,650	8,916	10,373	16,663
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,150	2,582	3,480	4,045	4,697	7,492
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		253	309	420	490	571	919
Wage income - All (million $2019)		1,675	2,054	2,769	3,292	3,905	6,341

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

Item	2020	2025	2030	2035	2040	2045	2050
Oil consumption - Annual (million bbls)		58.9	50.4	38	26.4	17.2	9.78
Oil consumption - Cumulative (million bbls)							1,173
Oil production - Annual (million bbls)		0	0	0	0	0	0
Natural gas consumption - Annual (tcf)		198	167	134	101	63.4	44
Natural gas consumption - Cumulative (tcf)							4,030
Natural gas production - Annual (tcf)		0.609	0.576	0.502	0.424	0.336	0.261

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	334	313	278	236	197	173	163
Final energy use - Residential (PJ)	151	140	123	104	88.4	78.3	72.2
Final energy use - Commercial (PJ)	93.8	95	93.3	89	85.5	84.8	85.9
Final energy use - Industry (PJ)	209	215	214	219	226	230	236

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)		2.38	2.48	3.93	4.2	3.62	3.78

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	136	450	764	1,864	2,963	3,842	4,720
Vehicle stocks - LDV – All others (1000 units)	3,936	3,748	3,560	2,594	1,628	921	214
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		737	1,953	3,062	4,679	5,048	4,837
Public EV charging plugs - DC Fast (1000 units)	0.347		1.51		5.84		9.31
Public EV charging plugs - L2 (1000 units)	1.3		36.3		141		224

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 (%)	12.4	24.5	48.3	57.6	58.8	58.8	58.7
Sales of space heating units - Electric Resistance (%)	31	37.4	34.1	31.4	31	31.2	31.3
Sales of space heating units - Gas (%)	48.3	24.7	7.17	1.4	0.846	0.812	0.816
Sales of space heating units - Fossil (%)	8.35	13.5	10.5	9.63	9.42	9.21	9.21
Sales of water heating units - Electric Heat Pump (%)	0	7.68	41.4	51	51.8	51.8	51.8
Sales of water heating units - Electric Resistance (%)	40.2	54.8	44.8	43.1	43.1	43.1	43.1
Sales of water heating units - Gas Furnace (%)	53.4	32.3	8.69	0.78	0.033	0	0
Sales of water heating units - Other (%)	6.41	5.3	5.09	5.09	5.1	5.11	5.12
Sales of cooking units - Electric Resistance (%)	65.6	73	95.4	99.8	100	100	100
Sales of cooking units - Gas (%)	34.4	27	4.63	0.233	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		2.54	2.66				

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	2.5	16.7	41.2	54.8	56.6	56.7	56.7
Sales of space heating units - Electric Resistance (%)	16.7	17.5	36.3	42	42.6	42.6	42.6
Sales of space heating units - Gas (%)	80.8	65.8	22.5	3.25	0.79	0.695	0.695
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Heat Pump (%)	1	10.3	52.2	64.9	66	66	66
Sales of water heating units - Electric Resistance (%)	3.08	6.46	25	32.5	33.3	33.3	33.3
Sales of water heating units - Gas (%)	95.1	82.6	22.2	1.99	0.085	0	0
Sales of water heating units - Other (%)	0.791	0.625	0.628	0.63	0.63	0.629	0.629
Sales of cooking units - Electric Resistance (%)	27.5	41.7	78.2	85.4	85.8	85.8	85.8
Sales of cooking units - Gas (%)	72.5	58.3	21.8	14.6	14.2	14.2	14.2
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		13,358	14,518				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	642	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	2,857	2,832	2,832	3,764	4,078	4,320	5,770
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	2,443	3,766	5,029	6,555	8,366	10,477	12,977
Installed renewables - Solar - Base land use assumptions (MW)	837	837	837	837	837	837	837
Installed renewables - Wind - Base land use assumptions (MW)	4,154	4,154	5,605	6,394	7,175	7,762	7,889
Installed renewables - Offshore Wind - Base land use assumptions (MW)	0	109	109	109	197	197	9,353
Installed renewables - Solar - Constrained land use assumptions (MW)	728	728	728	728	728	728	728
Installed renewables - Wind - Constrained land use assumptions (MW)	4,154	4,154	5,500	7,117	11,811	16,223	16,552
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	120	120	120	120	261	10,816

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Solar PV - Base (billion $2018)		0	0	0	0	0	0
Capital invested - Wind - Base (billion $2018)		0	2.51	1.27	1.2	0.855	0.175
Capital invested - Offshore Wind - Base (billion $2018)		0.417	0	0	0.179	0	12.3
Capital invested - Solar PV - Constrained (billion $2018)		1.68	0	0	0	0	0
Capital invested - Wind - Constrained (billion $2018)		0	2.32	2.86	7.4	6.28	0.499
Capital invested - Offshore Wind - Constrained (billion $2018)		0.46	0	0	0	0.231	14.1
Capital invested - Biomass power plant (billion $2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion $2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	2,011	2,011	2,011	2,011	2,011	2,011	2,011
Wind - Base land use assumptions (GWh)	14,129	14,129	19,419	22,163	24,777	26,676	27,057
OffshoreWind - Base land use assumptions (GWh)	0	522	522	522	945	945	39,327
Solar - Constrained land use assumptions (GWh)	1,737	1,737	1,737	1,737	1,737	1,737	1,737
Wind - Constrained land use assumptions (GWh)	14,129	14,129	18,888	23,821	37,206	49,139	50,021
OffshoreWind - Constrained land use assumptions (GWh)	0	522	522	522	945	945	39,327
Biomass power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	0	4	11
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0
Conversion capital investment - Cumulative 5-yr (million $2018)		0	0	0	0	2,271	5,019
Biomass purchases (million $2018/y)		0	0	0	0	124	398

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	0	0	2.92	9.37
Annual - BECCS (MMT)		0	0	0	0	2.92	9.37
Annual - NGCC (MMT)		0	0	0	0	0	0
Annual - Cement and lime (MMT)		0	0	0	0	0	0
Cumulative - All (MMT)		0	0	0	0	2.92	12.3
Cumulative - BECCS (MMT)		0	0	0	0	2.92	12.3
Cumulative - NGCC (MMT)		0	0	0	0	0	0
Cumulative - Cement and lime (MMT)		0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	0	497	497	497	497
Spur (km)		0	0	0	0	373	926
All (km)		0	0	497	497	871	1,423
Cumulative investment - Trunk (million $2018)		0	0	1,561	1,561	1,561	1,561
Cumulative investment - Spur (million $2018)		0	0	0	0	234	583
Cumulative investment - All (million $2018)		0	0	1,561	1,561	1,794	2,143

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-1,538
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-211
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-4,235
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-2,923
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-6,699
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-231
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-3,282
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-286
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-2,705
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-22,111
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-2,304
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-739

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-7,630
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-4,284
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-13,398
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-446
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-4,923
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,033
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-5,365
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-41,121
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-3,070
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,267
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-11,025
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-5,746
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-20,097
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-660
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-6,564
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-3,779
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-60,233
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-8,025
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							251
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							161
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,154
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							1,058
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)							33
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							217
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							18.6
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,609

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							5,503
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							377
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							166
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,888
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							1,593
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)							47.9
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							325
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							135
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							3,241
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							9,773
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							502
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							172
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							5,622
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							2,117
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)							62.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							434
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							107
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							2,660
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							11,677

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-558
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-37
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-595
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-1,084
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-74.1
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-1,158
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)							926
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							62.8
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							988
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							1,788
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							126
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							1,914

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		4.12	0.005	0.005	0.003	0.002	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		4.58	2.37	1.55	1.12	0.854	0.853
Premature deaths from air pollution - Mobile - On-Road (deaths)		47.3	47.8	46.5	41.9	33.3	22.9
Premature deaths from air pollution - Gas Stations (deaths)		3.32	3.33	3.21	2.87	2.28	1.58

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		5.03	4.34	3.61	2.78	1.94	1.2
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.806	0.718	0.649	0.548	0.409	0.268
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.448	0.426	0.405	0.363	0.294	0.225
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.062	0.059	0.056	0.053	0.049	0.046
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		3.97	4.07	3.97	3.55	2.86	2.09
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.717	0.609	0.522	0.444	0.375	0.312
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.293	0.26	0.229	0.199	0.171	0.144
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.064	0.009	0.008	0.008	0.006	0.004
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		9.98	8.98	7.74	6.73	5.91	4.11
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		36.5	0.043	0.043	0.027	0.016	0
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		40.6	21	13.7	9.96	7.56	7.55
Monetary damages from air pollution - Mobile - On-Road (million $2019)		421	425	414	372	296	204
Monetary damages from air pollution - Gas Stations (million $2019)		29.4	29.5	28.4	25.4	20.2	14
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		44.6	38.4	32	24.6	17.2	10.6
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		7.14	6.36	5.75	4.86	3.62	2.37
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		3.97	3.78	3.59	3.21	2.61	1.99
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		0.551	0.524	0.496	0.467	0.437	0.406
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		35.1	36	35.1	31.4	25.3	18.5
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		6.35	5.39	4.62	3.93	3.32	2.76
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		2.59	2.3	2.03	1.77	1.51	1.27
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		0.562	0.078	0.074	0.069	0.056	0.037

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		88.6	79.8	68.8	59.7	52.5	36.5

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		208	246	136	80.2	326	521
By economic sector - Construction (jobs)		10,990	12,604	15,900	17,714	22,054	36,973
By economic sector - Manufacturing (jobs)		1,550	1,989	2,106	2,335	3,025	4,889
By economic sector - Mining (jobs)		1,120	821	600	427	287	160
By economic sector - Other (jobs)		1,609	1,853	2,334	2,932	3,720	6,790
By economic sector - Pipeline (jobs)		260	215	499	149	172	220
By economic sector - Professional (jobs)		5,139	6,778	8,648	11,201	15,331	24,626
By economic sector - Trade (jobs)		3,242	4,016	5,081	6,537	8,801	14,711
By economic sector - Utilities (jobs)		4,570	6,177	9,006	10,356	14,419	27,546
By resource sector - Biomass (jobs)		683	632	375	267	1,390	2,160
By resource sector - CO2 (jobs)		0	0	2,647	0	429	1,130
By resource sector - Coal (jobs)		86.9	0	0	0	0	0
By resource sector - Grid (jobs)		6,698	9,879	13,118	17,757	25,431	51,533
By resource sector - Natural Gas (jobs)		2,131	1,781	1,330	1,591	1,324	1,152
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		2,650	2,214	1,857	1,481	1,111	670
By resource sector - Solar (jobs)		10,905	10,307	11,544	12,775	14,051	25,975
By resource sector - Wind (jobs)		5,535	9,886	13,440	17,860	24,401	33,815
By education level - All sectors - High school diploma or less (jobs)		12,209	14,534	18,387	21,091	27,567	47,465
By education level - All sectors - Associates degree or some college (jobs)		9,062	11,033	14,288	16,656	21,910	37,650
By education level - All sectors - Bachelors degree (jobs)		5,716	7,008	8,922	10,666	14,201	23,887
By education level - All sectors - Masters or professional degree (jobs)		1,458	1,819	2,327	2,837	3,811	6,387
By education level - All sectors - Doctoral degree (jobs)		244	306	386	481	647	1,046
Related work experience - All sectors - None (jobs)		4,144	5,000	6,409	7,437	9,801	16,872
Related work experience - All sectors - Up to 1 year (jobs)		5,913	7,074	8,899	10,337	13,552	23,142
Related work experience - All sectors - 1 to 4 years (jobs)		10,243	12,422	15,882	18,608	24,557	41,966
Related work experience - All sectors - 4 to 10 years (jobs)		6,695	8,143	10,483	12,259	16,153	27,512
Related work experience - All sectors - Over 10 years (jobs)		1,693	2,060	2,637	3,090	4,073	6,943
On-the-Job Training - All sectors - None (jobs)		1,625	1,945	2,454	2,886	3,784	6,411
On-the-Job Training - All sectors - Up to 1 year (jobs)		18,502	22,400	28,430	33,327	44,041	75,201
On-the-Job Training - All sectors - 1 to 4 years (jobs)		6,129	7,425	9,612	11,136	14,604	25,065
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,141	2,585	3,382	3,890	5,077	8,705
On-the-Job Training - All sectors - Over 10 years (jobs)		291	343	432	492	630	1,053
On-Site or In-Plant Training - All sectors - None (jobs)		4,742	5,741	7,302	8,569	11,286	19,114
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		16,818	20,343	25,853	30,263	39,954	68,331

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

Item	2020	2025	2030	2035	2040	2045	2050
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		4,734	5,723	7,382	8,552	11,213	19,263
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,142	2,584	3,370	3,878	5,066	8,663
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		252	308	404	468	617	1,065
Wage income - All (million $2019)		1,670	2,053	2,668	3,161	4,233	7,340

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	334	315	290	270	254	235	213
Final energy use - Residential (PJ)	151	140	128	117	105	92.8	81.8
Final energy use - Commercial (PJ)	93.8	95.2	96.6	96.8	95.9	94.4	93.4
Final energy use - Industry (PJ)	209	215	215	222	230	234	240

Table 20: *E- scenario - PILLAR 1: Efficiency/Electrification - Electricity demand*

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		1.88	1.92	2.22	2.29	3.56	3.78

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	105	197	289	715	1,140	2,082	3,023
Vehicle stocks - LDV – All others (1000 units)	3,952	3,952	3,952	3,749	3,545	2,732	1,919
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		0	130	249	865	2,649	3,885
Public EV charging plugs - DC Fast (1000 units)	0.347		0.57		2.25		5.96
Public EV charging plugs - L2 (1000 units)	1.3		13.7		54.1		144

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 (%)	12.4	20.2	22.9	30.9	43.8	53.4	57.2
Sales of space heating units - Electric Resistance (%)	31	37.9	37.5	36.3	34.2	32.4	31.5
Sales of space heating units - Gas (%)	48.3	27.9	25.9	20.1	10.9	4.35	1.81
Sales of space heating units - Fossil (%)	8.35	14	13.7	12.7	11	9.88	9.53
Sales of water heating units - Electric Heat Pump (%)	0	1.35	5.19	16.3	33.7	45.7	50.1
Sales of water heating units - Electric Resistance (%)	40.2	56.7	55.5	52.2	47.4	44.4	43.4
Sales of water heating units - Gas Furnace (%)	53.4	36.6	34	26.2	13.7	4.82	1.35
Sales of water heating units - Other (%)	6.41	5.35	5.33	5.3	5.21	5.14	5.13
Sales of cooking units - Electric Resistance (%)	65.5	66.4	69.6	77.9	89.5	96.6	99.1
Sales of cooking units - Gas (%)	34.5	33.6	30.4	22.1	10.5	3.4	0.915
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		2.53	2.65				

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	2.5	12.5	15.3	23.6	37.7	49.3	54.5
Sales of space heating units - Electric Resistance (%)	16.7	13.9	16.1	22.4	32.2	39	41.6
Sales of space heating units - Gas (%)	80.8	73.6	68.6	54	30.1	11.7	3.87
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Heat Pump (%)	1	2.5	7.27	21.1	42.9	58.1	63.8
Sales of water heating units - Electric Resistance (%)	3.08	3.16	5.27	11.4	21.5	29	32.1
Sales of water heating units - Gas (%)	95.1	93.7	86.8	66.8	35	12.3	3.44
Sales of water heating units - Other (%)	0.791	0.625	0.628	0.63	0.63	0.629	0.629
Sales of cooking units - Electric Resistance (%)	27.5	31	36.1	49.7	68.6	80.2	84.3
Sales of cooking units - Gas (%)	72.5	69	63.9	50.3	31.4	19.8	15.7
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		13,324	14,288				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	642	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	2,857	2,832	2,331	2,557	3,436	3,678	4,918
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-1,538
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-211
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-4,235
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-2,923
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-6,699
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-231
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-3,282
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-286
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-2,705
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-22,111
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-2,304
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-739
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-7,630
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-4,284
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-13,398
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-446

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-4,923
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,033
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-5,365
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-41,121
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-3,070
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,267
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-11,025
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-5,746
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-20,097
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-660
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-6,564
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-3,779
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-60,233
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-8,025
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							251
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							161
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,154
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							1,058
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)							33
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							217
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							18.6
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,609
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							5,503
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							377

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 - Avoid deforestation (over 30 years) (1000 hectares)							166
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,888
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							1,593
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)							47.9
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							325
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							135
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							3,241
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							9,773
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							502
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							172
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							5,622
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							2,117
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)							62.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							434
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							107
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							2,660
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							11,677

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

Table 26: *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)							-558
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-37
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-595
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-1,084
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-74.1
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-1,158
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)							926
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							62.8
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							988
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							1,788
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							126
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							1,914

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		4.12	0.005	0.005	0.003	0.002	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		4.02	1.85	1.11	0.958	0.786	0.143
Premature deaths from air pollution - Mobile - On-Road (deaths)		46.6	43.5	33.1	19.1	8.76	3.52
Premature deaths from air pollution - Gas Stations (deaths)		3.25	2.99	2.26	1.34	0.669	0.333
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		4.99	3.84	2.42	1.22	0.511	0.171
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.791	0.611	0.415	0.252	0.135	0.061

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.443	0.377	0.287	0.202	0.132	0.089
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.062	0.059	0.056	0.053	0.049	0.046
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		3.93	3.51	2.58	1.62	0.942	0.486
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.717	0.568	0.444	0.336	0.239	0.153
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.293	0.242	0.195	0.151	0.109	0.071
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.077	0.009	0.008	0.007	0.006	0.002
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		9.83	9.19	7.87	5.63	3.42	0.505
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		36.5	0.043	0.043	0.027	0.016	0
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		35.6	16.4	9.85	8.49	6.96	1.27
Monetary damages from air pollution - Mobile - On-Road (million $2019)		414	387	294	170	77.9	31.3
Monetary damages from air pollution - Gas Stations (million $2019)		28.8	26.5	20	11.9	5.92	2.95
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		44.2	34	21.4	10.8	4.53	1.52
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		7.01	5.41	3.67	2.24	1.19	0.545
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		3.92	3.34	2.54	1.79	1.17	0.789
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		0.551	0.524	0.496	0.467	0.437	0.406
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		34.8	31.1	22.8	14.4	8.34	4.3
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		6.35	5.02	3.93	2.97	2.11	1.36
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		2.59	2.14	1.73	1.34	0.966	0.625
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		0.683	0.076	0.069	0.06	0.055	0.018
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		87.3	81.6	69.9	50	30.4	4.49

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		184	305	155	92.3	221	518
By economic sector - Construction (jobs)		11,225	13,079	17,702	22,465	27,896	60,131
By economic sector - Manufacturing (jobs)		1,671	2,118	2,742	3,166	3,642	8,626
By economic sector - Mining (jobs)		1,099	770	463	241	93.9	14.1
By economic sector - Other (jobs)		1,629	1,894	2,609	3,436	4,426	11,029
By economic sector - Pipeline (jobs)		252	210	146	92.4	47.7	19.9
By economic sector - Professional (jobs)		5,258	7,194	10,712	14,965	20,368	38,878
By economic sector - Trade (jobs)		3,293	4,142	6,008	8,332	11,364	23,339
By economic sector - Utilities (jobs)		4,827	6,646	10,434	14,297	18,923	46,925
By resource sector - Biomass (jobs)		604	820	386	266	823	2,292
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Coal (jobs)		86.9	0	0	0	0	0
By resource sector - Grid (jobs)		7,250	10,866	17,850	25,162	34,124	91,553
By resource sector - Natural Gas (jobs)		2,061	1,711	1,617	1,388	1,068	819
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		2,619	2,027	1,374	791	321	0.052
By resource sector - Solar (jobs)		10,960	10,375	11,676	12,991	14,218	42,480
By resource sector - Wind (jobs)		5,855	10,556	18,069	26,487	36,426	52,335
By education level - All sectors - High school diploma or less (jobs)		12,513	15,208	20,935	27,141	34,803	77,481
By education level - All sectors - Associates degree or some college (jobs)		9,316	11,560	16,392	21,659	28,072	61,454
By education level - All sectors - Bachelors degree (jobs)		5,863	7,352	10,427	13,927	18,308	38,600
By education level - All sectors - Masters or professional degree (jobs)		1,496	1,914	2,754	3,727	4,952	10,288
By education level - All sectors - Doctoral degree (jobs)		249	322	464	633	847	1,657
Related work experience - All sectors - None (jobs)		4,250	5,237	7,322	9,613	12,449	27,476
Related work experience - All sectors - Up to 1 year (jobs)		6,057	7,408	10,231	13,325	17,163	37,653
Related work experience - All sectors - 1 to 4 years (jobs)		10,512	13,018	18,299	24,153	31,396	68,275
Related work experience - All sectors - 4 to 10 years (jobs)		6,877	8,533	12,068	15,963	20,741	44,751
Related work experience - All sectors - Over 10 years (jobs)		1,741	2,160	3,052	4,031	5,232	11,325
On-the-Job Training - All sectors - None (jobs)		1,663	2,032	2,826	3,712	4,811	10,382
On-the-Job Training - All sectors - Up to 1 year (jobs)		18,978	23,485	32,833	43,210	56,133	122,291
On-the-Job Training - All sectors - 1 to 4 years (jobs)		6,299	7,777	10,990	14,481	18,721	40,919
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,198	2,705	3,832	5,051	6,517	14,180
On-the-Job Training - All sectors - Over 10 years (jobs)		299	358	490	631	800	1,708
On-Site or In-Plant Training - All sectors - None (jobs)		4,861	6,016	8,429	11,112	14,432	30,983
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		17,254	21,321	29,819	39,225	50,914	111,209
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		4,864	5,993	8,441	11,103	14,343	31,455
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,198	2,703	3,821	5,034	6,499	14,094
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		259	324	462	612	793	1,739
Wage income - All (million $2019)		1,714	2,154	3,074	4,115	5,426	11,946

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	334	313	278	236	197	173	163
Final energy use - Residential (PJ)	151	140	123	104	88.4	78.3	72.2
Final energy use - Commercial (PJ)	93.8	95	93.3	89	85.5	84.8	85.9
Final energy use - Industry (PJ)	209	215	214	219	226	230	236

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)		2.38	2.48	3.93	4.2	3.62	3.78

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	136	450	764	1,864	2,963	3,842	4,720
Vehicle stocks - LDV – All others (1000 units)	3,936	3,748	3,560	2,594	1,628	921	214
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		737	1,953	3,062	4,679	5,048	4,837
Public EV charging plugs - DC Fast (1000 units)	0.347		1.51		5.84		9.31
Public EV charging plugs - L2 (1000 units)	1.3		36.3		141		224

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 (%)	12.4	24.5	48.3	57.6	58.8	58.8	58.7
Sales of space heating units - Electric Resistance (%)	31	37.4	34.1	31.4	31	31.2	31.3
Sales of space heating units - Gas (%)	48.3	24.7	7.17	1.4	0.846	0.812	0.816
Sales of space heating units - Fossil (%)	8.35	13.5	10.5	9.63	9.42	9.21	9.21
Sales of water heating units - Electric Heat Pump (%)	0	7.68	41.4	51	51.8	51.8	51.8
Sales of water heating units - Electric Resistance (%)	40.2	54.8	44.8	43.1	43.1	43.1	43.1
Sales of water heating units - Gas Furnace (%)	53.4	32.3	8.69	0.78	0.033	0	0
Sales of water heating units - Other (%)	6.41	5.3	5.09	5.09	5.1	5.11	5.12
Sales of cooking units - Electric Resistance (%)	65.6	73	95.4	99.8	100	100	100
Sales of cooking units - Gas (%)	34.4	27	4.63	0.233	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		2.54	2.66				

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	2.5	16.7	41.2	54.8	56.6	56.7	56.7
Sales of space heating units - Electric Resistance (%)	16.7	17.5	36.3	42	42.6	42.6	42.6
Sales of space heating units - Gas (%)	80.8	65.8	22.5	3.25	0.79	0.695	0.695
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Heat Pump (%)	1	10.3	52.2	64.9	66	66	66
Sales of water heating units - Electric Resistance (%)	3.08	6.46	25	32.5	33.3	33.3	33.3
Sales of water heating units - Gas (%)	95.1	82.6	22.2	1.99	0.085	0	0
Sales of water heating units - Other (%)	0.791	0.625	0.628	0.63	0.63	0.629	0.629

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of cooking units - Electric Resistance (%)	27.5	41.7	78.2	85.4	85.8	85.8	85.8
Sales of cooking units - Gas (%)	72.5	58.3	21.8	14.6	14.2	14.2	14.2
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		13,358	14,518				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	642	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	2,857	2,832	2,832	3,789	4,078	4,320	4,918
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	2,443	3,766	5,029	6,555	8,366	10,477	12,977
Installed renewables - Solar - Base land use assumptions (MW)	837	837	837	837	837	837	19,062
Installed renewables - Wind - Base land use assumptions (MW)	4,188	4,188	5,678	7,051	9,692	13,427	17,751
Installed renewables - Offshore Wind - Base land use assumptions (MW)	0	109	109	109	197	330	20,274
Installed renewables - Solar - Constrained land use assumptions (MW)	838	838	838	838	838	838	20,578
Installed renewables - Wind - Constrained land use assumptions (MW)	4,629	4,629	6,085	11,190	22,983	32,823	57,406
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	120	120	120	157	1,593	20,347
Capital invested - Solar PV - Base (billion $2018)		0	0	0	0	0	16.9
Capital invested - Wind - Base (billion $2018)		0	2.58	2.21	4.06	5.44	5.95
Capital invested - Offshore Wind - Base (billion $2018)		0.417	0	0	0.179	0.218	26.6

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	2,011	2,011	2,011	2,011	2,011	2,011	38,275
Wind - Base land use assumptions (GWh)	14,258	14,258	19,673	24,363	32,645	43,716	56,058
OffshoreWind - Base land use assumptions (GWh)	0	522	522	522	945	1,574	90,985
Solar - Constrained land use assumptions (GWh)	4,022	4,022	4,022	4,022	4,022	4,022	83,079
Wind - Constrained land use assumptions (GWh)	28,258	28,258	38,434	68,294	130,933	179,695	279,622
OffshoreWind - Constrained land use assumptions (GWh)	0	1,136	1,136	1,136	1,446	14,844	179,881

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)							-1,538
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-211
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-4,235
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-2,923
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-6,699

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-231
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-3,282
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-286
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-2,705
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-22,111
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-2,304
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-739
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-7,630
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-4,284
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-13,398
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-446
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-4,923
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,033
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-5,365
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-41,121
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-3,070
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,267
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-11,025
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-5,746
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-20,097
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-660
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-6,564
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-3,779
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-60,233
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-8,025
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							251
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							161
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,154

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 - Improve plantations (1000 hectares)							1,058
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)							33
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							217
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							18.6
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,609
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							5,503
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							377
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							166
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,888
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							1,593
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)							47.9
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							325
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							135
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							3,241
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							9,773
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							502
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							172
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							5,622
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							2,117
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0

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 - Increase trees outside forests (1000 hectares)							62.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							434
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							107
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							2,660
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							11,677

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)							-558
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-37
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-595
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-1,084
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-74.1
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-1,158
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)							926
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							62.8
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							988
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							1,788
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							126

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							1,914

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		4.12	0.005	0.005	0.003	0.002	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		4.29	1.96	2.25	2.57	1.64	0.748
Premature deaths from air pollution - Mobile - On-Road (deaths)		46.6	43.5	33.1	19.1	8.76	3.52
Premature deaths from air pollution - Gas Stations (deaths)		3.25	2.99	2.26	1.34	0.669	0.333
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		4.99	3.84	2.42	1.22	0.511	0.171
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.791	0.611	0.415	0.252	0.135	0.061
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.443	0.377	0.287	0.202	0.132	0.089
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.062	0.059	0.056	0.053	0.049	0.046
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		3.93	3.51	2.58	1.62	0.942	0.486
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.717	0.568	0.444	0.336	0.239	0.153
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.293	0.242	0.195	0.151	0.109	0.071
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.058	0.009	0.008	0.007	0.006	0.002
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		10.1	9.72	9.44	7.92	6.56	4.84
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		36.5	0.043	0.043	0.027	0.016	0
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		38	17.4	20	22.8	14.5	6.62
Monetary damages from air pollution - Mobile - On-Road (million $2019)		414	387	294	170	77.9	31.3
Monetary damages from air pollution - Gas Stations (million $2019)		28.8	26.5	20	11.9	5.92	2.95
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		44.2	34	21.4	10.8	4.53	1.52
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		7.01	5.41	3.67	2.24	1.19	0.545
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		3.92	3.34	2.54	1.79	1.17	0.789

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 - Coal (million $2019)		0.551	0.524	0.496	0.467	0.437	0.406
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		34.8	31.1	22.8	14.4	8.34	4.3
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		6.35	5.02	3.93	2.97	2.11	1.36
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		2.59	2.14	1.73	1.34	0.966	0.625
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		0.51	0.075	0.069	0.06	0.056	0.018
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		89.9	86.3	83.8	70.4	58.2	43

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		199	254	130	87.8	278	522
By economic sector - Construction (jobs)		12,264	11,819	14,211	14,459	16,290	22,533
By economic sector - Manufacturing (jobs)		1,664	1,696	1,893	1,891	1,898	2,375
By economic sector - Mining (jobs)		1,120	805	541	342	209	132
By economic sector - Other (jobs)		1,868	1,860	2,207	2,681	3,302	5,567
By economic sector - Pipeline (jobs)		265	230	566	169	189	256
By economic sector - Professional (jobs)		5,427	5,801	6,604	7,867	9,590	13,427
By economic sector - Trade (jobs)		3,462	3,584	4,083	4,857	5,908	8,748
By economic sector - Utilities (jobs)		5,068	5,739	8,780	8,466	9,852	12,251
By resource sector - Biomass (jobs)		615	632	363	276	1,091	2,183
By resource sector - CO2 (jobs)		0	0	2,990	0	484	1,276
By resource sector - Coal (jobs)		86.9	0	0	0	0	0
By resource sector - Grid (jobs)		7,716	9,222	12,367	14,601	17,077	21,274
By resource sector - Natural Gas (jobs)		2,202	1,998	2,147	1,992	1,723	1,464
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		2,618	2,054	1,431	922	590	394
By resource sector - Solar (jobs)		13,193	11,418	12,456	14,038	16,301	28,464
By resource sector - Wind (jobs)		4,908	6,465	7,261	8,993	10,252	10,755
By education level - All sectors - High school diploma or less (jobs)		13,417	13,478	16,479	17,000	19,692	27,348
By education level - All sectors - Associates degree or some college (jobs)		9,936	10,120	12,670	13,201	15,337	21,221
By education level - All sectors - Bachelors degree (jobs)		6,159	6,301	7,610	8,139	9,544	13,157
By education level - All sectors - Masters or professional degree (jobs)		1,566	1,622	1,950	2,132	2,527	3,499
By education level - All sectors - Doctoral degree (jobs)		259	268	307	349	418	585
Related work experience - All sectors - None (jobs)		4,539	4,610	5,708	5,933	6,922	9,639
Related work experience - All sectors - Up to 1 year (jobs)		6,483	6,522	7,864	8,249	9,603	13,435
Related work experience - All sectors - 1 to 4 years (jobs)		11,172	11,360	13,949	14,631	17,052	23,588
Related work experience - All sectors - 4 to 10 years (jobs)		7,300	7,423	9,187	9,592	11,144	15,321

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

Item	2020	2025	2030	2035	2040	2045	2050
Related work experience - All sectors - Over 10 years (jobs)		1,844	1,874	2,309	2,416	2,797	3,828
On-the-Job Training - All sectors - None (jobs)		1,773	1,783	2,140	2,275	2,657	3,740
On-the-Job Training - All sectors - Up to 1 year (jobs)		20,168	20,491	24,947	26,238	30,627	42,511
On-the-Job Training - All sectors - 1 to 4 years (jobs)		6,720	6,816	8,534	8,824	10,211	14,029
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,357	2,383	3,013	3,092	3,577	4,914
On-the-Job Training - All sectors - Over 10 years (jobs)		320	315	381	391	446	617
On-Site or In-Plant Training - All sectors - None (jobs)		5,170	5,238	6,365	6,715	7,838	10,915
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		18,348	18,631	22,737	23,873	27,836	38,614
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		5,192	5,260	6,560	6,792	7,862	10,823
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,351	2,377	2,994	3,071	3,551	4,868
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		276	283	360	371	431	590
Wage income - All (million $2019)		1,820	1,876	2,344	2,478	2,924	4,073

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	334	313	278	236	197	173	163
Final energy use - Residential (PJ)	151	140	123	104	88.4	78.3	72.2
Final energy use - Commercial (PJ)	93.8	95	93.3	89	85.5	84.8	85.9
Final energy use - Industry (PJ)	209	215	214	219	226	230	236

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)		2.38	2.48	3.93	4.2	3.62	3.78

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	136	450	764	1,864	2,963	3,842	4,720
Vehicle stocks - LDV – All others (1000 units)	3,936	3,748	3,560	2,594	1,628	921	214
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		737	1,953	3,062	4,679	5,048	4,837
Public EV charging plugs - DC Fast (1000 units)	0.347		1.51		5.84		9.31
Public EV charging plugs - L2 (1000 units)	1.3		36.3		141		224

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 (%)	12.4	24.5	48.3	57.6	58.8	58.8	58.7
Sales of space heating units - Electric Resistance (%)	31	37.4	34.1	31.4	31	31.2	31.3
Sales of space heating units - Gas (%)	48.3	24.7	7.17	1.4	0.846	0.812	0.816
Sales of space heating units - Fossil (%)	8.35	13.5	10.5	9.63	9.42	9.21	9.21

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Electric Heat Pump (%)	0	7.68	41.4	51	51.8	51.8	51.8
Sales of water heating units - Electric Resistance (%)	40.2	54.8	44.8	43.1	43.1	43.1	43.1
Sales of water heating units - Gas Furnace (%)	53.4	32.3	8.69	0.78	0.033	0	0
Sales of water heating units - Other (%)	6.41	5.3	5.09	5.09	5.1	5.11	5.12
Sales of cooking units - Electric Resistance (%)	65.6	73	95.4	99.8	100	100	100
Sales of cooking units - Gas (%)	34.4	27	4.63	0.233	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		2.54	2.66				

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	2.5	16.7	41.2	54.8	56.6	56.7	56.7
Sales of space heating units - Electric Resistance (%)	16.7	17.5	36.3	42	42.6	42.6	42.6
Sales of space heating units - Gas (%)	80.8	65.8	22.5	3.25	0.79	0.695	0.695
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Heat Pump (%)	1	10.3	52.2	64.9	66	66	66
Sales of water heating units - Electric Resistance (%)	3.08	6.46	25	32.5	33.3	33.3	33.3
Sales of water heating units - Gas (%)	95.1	82.6	22.2	1.99	0.085	0	0
Sales of water heating units - Other (%)	0.791	0.625	0.628	0.63	0.63	0.629	0.629
Sales of cooking units - Electric Resistance (%)	27.5	41.7	78.2	85.4	85.8	85.8	85.8
Sales of cooking units - Gas (%)	72.5	58.3	21.8	14.6	14.2	14.2	14.2
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		13,358	14,518				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	642	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	2,857	2,832	2,561	4,176	3,483	3,724	4,725
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	2,443	3,766	5,029	6,555	8,366	10,477	12,977
Installed renewables - Solar - Base land use assumptions (MW)	2,047	3,815	4,305	4,497	5,179	7,255	8,850
Installed renewables - Wind - Base land use assumptions (MW)	4,188	4,223	5,042	5,605	6,554	6,911	6,911
Installed renewables - Offshore Wind - Base land use assumptions (MW)	0	109	109	109	109	109	895
Installed renewables - Solar - Constrained land use assumptions (MW)	1,616	2,607	3,866	5,088	6,116	9,059	10,972
Installed renewables - Wind - Constrained land use assumptions (MW)	4,154	4,198	5,392	5,500	7,353	9,465	9,465
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	120	120	120	120	120	959
Capital invested - Solar PV - Base (billion $2018)		2.37	0.587	0.212	0.709	2.04	1.48
Capital invested - Wind - Base (billion $2018)		0.067	1.42	0.908	1.46	0.52	0
Capital invested - Offshore Wind - Base (billion $2018)		0.417	0	0	0	0	1.04

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Solar PV - Constrained (billion $2018)		1.33	1.51	1.35	1.07	2.88	1.77
Capital invested - Wind - Constrained (billion $2018)		0.084	2.07	0.174	2.85	3.08	0
Capital invested - Offshore Wind - Constrained (billion $2018)		0.46	0	0	0	0	1.11

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	4,444	7,991	8,949	9,331	10,695	14,809	17,995
Wind - Base land use assumptions (GWh)	14,258	14,389	17,413	19,419	22,707	23,920	23,920
OffshoreWind - Base land use assumptions (GWh)	0	522	522	522	522	522	4,290
Solar - Constrained land use assumptions (GWh)	3,569	5,552	8,076	10,473	12,506	18,343	22,220
Wind - Constrained land use assumptions (GWh)	14,129	14,288	18,527	18,888	24,515	30,552	30,552
OffshoreWind - Constrained land use assumptions (GWh)	0	568	568	568	568	568	3,822

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)							-1,538
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-211
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-4,235
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-2,923
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-6,699
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-231
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-3,282
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-286
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-2,705
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-22,111
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-2,304
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-739
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-7,630
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-4,284
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-13,398
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-446
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-4,923
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,033

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-5,365
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-41,121
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-3,070
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,267
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-11,025
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-5,746
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-20,097
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-660
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-6,564
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-3,779
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-60,233
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-8,025
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							251
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							161
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,154
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							1,058
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)							33
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							217
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							18.6
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,609
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							5,503
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							377
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							166
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,888

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 - Improve plantations (1000 hectares)							1,593
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)							47.9
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							325
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							135
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							3,241
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							9,773
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							502
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							172
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							5,622
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							2,117
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)							62.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							434
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							107
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							2,660
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							11,677

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)							-558
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-37
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-595

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-1,084
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-74.1
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-1,158
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)							926
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							62.8
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							988
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							1,788
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							126
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							1,914

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		4.12	0.005	0.005	0.003	0.002	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		4.43	2.27	1.63	1.5	1.24	1
Premature deaths from air pollution - Mobile - On-Road (deaths)		47.3	47.8	46.5	41.9	33.3	22.9
Premature deaths from air pollution - Gas Stations (deaths)		3.32	3.33	3.21	2.87	2.28	1.58
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		5.03	4.34	3.61	2.78	1.94	1.2
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.806	0.718	0.649	0.548	0.409	0.268
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.448	0.426	0.405	0.363	0.294	0.225
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.062	0.059	0.056	0.053	0.049	0.046
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		3.97	4.07	3.97	3.55	2.86	2.09

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.717	0.609	0.522	0.444	0.375	0.312
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.293	0.26	0.229	0.199	0.171	0.144
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.067	0.009	0.008	0.008	0.007	0.006
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		9.98	8.98	7.74	6.73	5.91	4.11
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		36.5	0.043	0.043	0.027	0.016	0
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		39.2	20.1	14.5	13.3	11	8.87
Monetary damages from air pollution - Mobile - On-Road (million $2019)		421	425	414	372	296	204
Monetary damages from air pollution - Gas Stations (million $2019)		29.4	29.5	28.4	25.4	20.2	14
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		44.6	38.4	32	24.6	17.2	10.6
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		7.14	6.36	5.75	4.86	3.62	2.37
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		3.97	3.78	3.59	3.21	2.61	1.99
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		0.551	0.524	0.496	0.467	0.437	0.406
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		35.1	36	35.1	31.4	25.3	18.5
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		6.35	5.39	4.62	3.93	3.32	2.76
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		2.59	2.3	2.03	1.77	1.51	1.27
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		0.591	0.077	0.074	0.069	0.064	0.057
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		88.6	79.8	68.8	59.7	52.5	36.5

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		196	246	134	360	637	601
By economic sector - Construction (jobs)		11,040	12,741	15,701	16,231	19,086	31,116
By economic sector - Manufacturing (jobs)		1,556	2,012	2,013	2,173	2,750	4,166
By economic sector - Mining (jobs)		1,116	820	603	445	286	150
By economic sector - Other (jobs)		1,613	1,865	2,308	2,763	3,368	6,132
By economic sector - Pipeline (jobs)		258	215	510	154	171	219
By economic sector - Professional (jobs)		5,174	6,883	8,459	10,325	13,272	20,177

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Trade (jobs)		3,260	4,065	4,990	6,005	7,582	12,228
By economic sector - Utilities (jobs)		4,595	6,262	8,950	9,469	12,393	22,273
By resource sector - Biomass (jobs)		662	632	374	1,443	2,947	2,848
By resource sector - CO2 (jobs)		0	0	2,716	0	440	1,159
By resource sector - Coal (jobs)		86.9	0	0	0	0	0
By resource sector - Grid (jobs)		6,753	10,022	12,910	16,149	21,782	41,253
By resource sector - Natural Gas (jobs)		2,105	1,778	1,414	1,692	1,365	1,293
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		2,650	2,214	1,857	1,551	1,119	629
By resource sector - Solar (jobs)		10,898	10,299	11,488	12,655	13,864	25,915
By resource sector - Wind (jobs)		5,652	10,163	12,907	14,435	18,030	23,966
By education level - All sectors - High school diploma or less (jobs)		12,252	14,695	18,136	19,695	24,327	39,835
By education level - All sectors - Associates degree or some college (jobs)		9,103	11,165	14,087	15,318	19,002	31,322
By education level - All sectors - Bachelors degree (jobs)		5,743	7,096	8,778	9,849	12,348	19,771
By education level - All sectors - Masters or professional degree (jobs)		1,466	1,843	2,287	2,617	3,308	5,271
By education level - All sectors - Doctoral degree (jobs)		245	310	378	445	562	864
Related work experience - All sectors - None (jobs)		4,160	5,058	6,322	6,918	8,606	14,114
Related work experience - All sectors - Up to 1 year (jobs)		5,935	7,155	8,768	9,661	11,978	19,444
Related work experience - All sectors - 1 to 4 years (jobs)		10,286	12,570	15,650	17,219	21,419	34,923
Related work experience - All sectors - 4 to 10 years (jobs)		6,726	8,242	10,330	11,284	14,011	22,827
Related work experience - All sectors - Over 10 years (jobs)		1,701	2,086	2,597	2,842	3,532	5,755
On-the-Job Training - All sectors - None (jobs)		1,632	1,968	2,417	2,682	3,323	5,377
On-the-Job Training - All sectors - Up to 1 year (jobs)		18,576	22,665	28,004	30,996	38,654	62,761
On-the-Job Training - All sectors - 1 to 4 years (jobs)		6,156	7,514	9,480	10,229	12,641	20,814
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,151	2,616	3,339	3,565	4,381	7,229
On-the-Job Training - All sectors - Over 10 years (jobs)		293	347	426	452	547	882
On-Site or In-Plant Training - All sectors - None (jobs)		4,762	5,810	7,190	7,940	9,863	15,946
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		16,886	20,582	25,471	28,125	35,042	57,024
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		4,755	5,790	7,280	7,872	9,730	16,019
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,152	2,615	3,327	3,558	4,377	7,191
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		253	312	399	430	535	883
Wage income - All (million $2019)		1,677	2,078	2,630	2,922	3,687	6,093

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	334	315	290	270	254	235	213
Final energy use - Residential (PJ)	151	140	128	117	105	92.8	81.8
Final energy use - Commercial (PJ)	93.8	95.2	96.6	96.8	95.9	94.4	93.4
Final energy use - Industry (PJ)	209	215	215	222	230	234	240

Table 52: *E-B+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand*

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		1.88	1.92	2.22	2.29	3.56	3.78

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	105	197	289	715	1,140	2,082	3,023
Vehicle stocks - LDV – All others (1000 units)	3,952	3,952	3,952	3,749	3,545	2,732	1,919
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		0	130	249	865	2,649	3,885
Public EV charging plugs - DC Fast (1000 units)	0.347		0.57		2.25		5.96
Public EV charging plugs - L2 (1000 units)	1.3		13.7		54.1		144

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 (%)	12.4	20.2	22.9	30.9	43.8	53.4	57.2
Sales of space heating units - Electric Resistance (%)	31	37.9	37.5	36.3	34.2	32.4	31.5
Sales of space heating units - Gas (%)	48.3	27.9	25.9	20.1	10.9	4.35	1.81
Sales of space heating units - Fossil (%)	8.35	14	13.7	12.7	11	9.88	9.53
Sales of water heating units - Electric Heat Pump (%)	0	1.35	5.19	16.3	33.7	45.7	50.1
Sales of water heating units - Electric Resistance (%)	40.2	56.7	55.5	52.2	47.4	44.4	43.4
Sales of water heating units - Gas Furnace (%)	53.4	36.6	34	26.2	13.7	4.82	1.35
Sales of water heating units - Other (%)	6.41	5.35	5.33	5.3	5.21	5.14	5.13
Sales of cooking units - Electric Resistance (%)	65.5	66.4	69.6	77.9	89.5	96.6	99.1
Sales of cooking units - Gas (%)	34.5	33.6	30.4	22.1	10.5	3.4	0.915
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		2.53	2.65				

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	2.5	12.5	15.3	23.6	37.7	49.3	54.5
Sales of space heating units - Electric Resistance (%)	16.7	13.9	16.1	22.4	32.2	39	41.6
Sales of space heating units - Gas (%)	80.8	73.6	68.6	54	30.1	11.7	3.87
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Heat Pump (%)	1	2.5	7.27	21.1	42.9	58.1	63.8
Sales of water heating units - Electric Resistance (%)	3.08	3.16	5.27	11.4	21.5	29	32.1
Sales of water heating units - Gas (%)	95.1	93.7	86.8	66.8	35	12.3	3.44
Sales of water heating units - Other (%)	0.791	0.625	0.628	0.63	0.63	0.629	0.629
Sales of cooking units - Electric Resistance (%)	27.5	31	36.1	49.7	68.6	80.2	84.3
Sales of cooking units - Gas (%)	72.5	69	63.9	50.3	31.4	19.8	15.7
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		13,324	14,288				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	642	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	2,857	2,832	2,320	2,898	4,031	4,285	6,097
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Capital invested - Biomass power plant (billion $2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion $2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	0	0	0	0	0

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	4	9	10
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0
Conversion capital investment - Cumulative 5-yr (million $2018)		0	0	0	3,120	4,937	607
Biomass purchases (million $2018/y)		0	0	0	234	604	650

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	0	4.01	10.4	11.1
Annual - BECCS (MMT)		0	0	0	4.01	10.4	11.1
Annual - NGCC (MMT)		0	0	0	0	0	0
Annual - Cement and lime (MMT)		0	0	0	0	0	0
Cumulative - All (MMT)		0	0	0	4.01	14.4	25.5
Cumulative - BECCS (MMT)		0	0	0	4.01	14.4	25.5
Cumulative - NGCC (MMT)		0	0	0	0	0	0
Cumulative - Cement and lime (MMT)		0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	0	497	497	497	497
Spur (km)		0	0	0	373	662	737
All (km)		0	0	497	871	1,159	1,234
Cumulative investment - Trunk (million $2018)		0	0	1,561	1,561	1,561	1,561
Cumulative investment - Spur (million $2018)		0	0	0	248	460	507

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

Item	2020	2025	2030	2035	2040	2045	2050
Cumulative investment - All (million $2018)		0	0	1,561	1,809	2,020	2,068

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-1,538
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-211
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-4,235
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-2,923
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-6,699
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-231
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-3,282
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-286
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-2,705
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-22,111
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-2,304
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-739
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-7,630
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-4,284
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-13,398
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-446
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-4,923
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,033
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-5,365
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-41,121
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-3,070
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,267

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-11,025
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-5,746
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-20,097
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-660
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-6,564
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-3,779
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-60,233
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-8,025
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							251
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							161
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,154
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							1,058
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)							33
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							217
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							18.6
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,609
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							5,503
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							377
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							166
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,888
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							1,593
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)							47.9

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 - Reforest cropland (1000 hectares)							325
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							135
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							3,241
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							9,773
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							502
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							172
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							5,622
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							2,117
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)							62.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							434
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							107
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							2,660
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							11,677

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-558
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-37
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)							-595

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-1,084
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-74.1
Carbon sink potential - Aggressive deployment - Cropland to woody energy crops (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Pasture to energy crops (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-1,158
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)							926
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							62.8
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)							0.006
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)							4.06
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							993
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)							4,416
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							126
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)							0.006
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)							4.06
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							4,546

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)		11.3	7.2	2.07	1.56	1.42	1.34

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		5.32	5.06	4.75	4	3.72	3.6
Premature deaths from air pollution - Mobile - On-Road (deaths)		47.3	48.5	49.6	50.9	52.2	53.6
Premature deaths from air pollution - Gas Stations (deaths)		3.31	3.36	3.4	3.47	3.52	3.57
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		4.98	4.36	3.84	3.49	3.3	3.16
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.795	0.66	0.509	0.382	0.288	0.229
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.444	0.432	0.434	0.442	0.45	0.457
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.065	0.065	0.064	0.064	0.063	0.062
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		3.99	4.07	3.99	3.98	4.16	4.46
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.749	0.72	0.707	0.697	0.69	0.684
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.306	0.308	0.312	0.314	0.316	0.317
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.18	0.116	0.087	0.081	0.075	0.068
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		10	10.5	10.7	10.1	9.99	9.28
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		100	63.8	18.3	13.8	12.6	11.8
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		47.2	44.8	42	35.4	32.9	31.9
Monetary damages from air pollution - Mobile - On-Road (million $2019)		421	431	441	453	464	476
Monetary damages from air pollution - Gas Stations (million $2019)		29.3	29.8	30.1	30.7	31.2	31.6
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		44.1	38.7	34	30.9	29.3	28
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		7.04	5.85	4.51	3.38	2.55	2.03
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		3.93	3.83	3.84	3.92	3.98	4.05
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		0.575	0.573	0.57	0.564	0.556	0.547
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		35.3	36	35.3	35.2	36.8	39.5
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		6.63	6.38	6.26	6.17	6.11	6.05

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		2.71	2.73	2.76	2.78	2.8	2.81
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		1.59	1.02	0.771	0.711	0.665	0.603
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		89.1	93.2	94.6	90	88.7	82.4

Table 65: *REF scenario - IMPACTS - Jobs*

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		190	177	176	157	157	164
By economic sector - Construction (jobs)		3,653	9,212	9,926	11,165	11,967	17,580
By economic sector - Manufacturing (jobs)		1,080	1,290	1,488	1,583	1,497	1,748
By economic sector - Mining (jobs)		1,135	918	749	611	520	442
By economic sector - Other (jobs)		218	1,510	1,814	2,203	2,573	4,755
By economic sector - Pipeline (jobs)		265	273	276	262	265	264
By economic sector - Professional (jobs)		2,184	4,226	4,768	5,834	6,634	9,909
By economic sector - Trade (jobs)		1,459	2,803	3,161	3,835	4,422	7,024
By economic sector - Utilities (jobs)		3,656	4,153	4,618	5,520	6,160	7,612
By resource sector - Biomass (jobs)		623	589	555	509	514	517
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Coal (jobs)		86.9	0	0	0	0	0
By resource sector - Grid (jobs)		5,456	6,153	6,815	8,642	10,107	12,690
By resource sector - Natural Gas (jobs)		2,177	2,288	2,517	2,351	2,167	2,288
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		2,675	2,278	2,005	1,860	1,779	1,724
By resource sector - Solar (jobs)			9,934	11,294	12,507	13,647	25,620
By resource sector - Wind (jobs)		2,821	3,320	3,788	5,301	5,984	6,660
By education level - All sectors - High school diploma or less (jobs)		5,736	10,477	11,447	13,089	14,261	20,607
By education level - All sectors - Associates degree or some college (jobs)		4,301	7,785	8,600	9,981	10,975	15,954
By education level - All sectors - Bachelors degree (jobs)		2,952	4,861	5,336	6,220	6,865	9,885
By education level - All sectors - Masters or professional degree (jobs)		741	1,237	1,367	1,613	1,797	2,611
By education level - All sectors - Doctoral degree (jobs)		110	203	224	267	298	442
Related work experience - All sectors - None (jobs)		2,001	3,571	3,929	4,539	4,986	7,250
Related work experience - All sectors - Up to 1 year (jobs)		2,693	5,049	5,533	6,354	6,943	10,136
Related work experience - All sectors - 1 to 4 years (jobs)		5,031	8,779	9,645	11,166	12,273	17,747
Related work experience - All sectors - 4 to 10 years (jobs)		3,267	5,719	6,283	7,278	7,989	11,499
Related work experience - All sectors - Over 10 years (jobs)		847	1,445	1,585	1,833	2,006	2,867
On-the-Job Training - All sectors - None (jobs)		747	1,388	1,523	1,760	1,935	2,859
On-the-Job Training - All sectors - Up to 1 year (jobs)		9,081	15,844	17,398	20,107	22,070	31,937
On-the-Job Training - All sectors - 1 to 4 years (jobs)		2,922	5,252	5,772	6,671	7,311	10,533
On-the-Job Training - All sectors - 4 to 10 years (jobs)		964	1,833	2,013	2,328	2,553	3,695

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

Item	2020	2025	2030	2035	2040	2045	2050
On-the-Job Training - All sectors - Over 10 years (jobs)		125	246	268	304	328	476
On-Site or In-Plant Training - All sectors - None (jobs)		2,221	4,040	4,444	5,143	5,645	8,240
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		8,248	14,413	15,822	18,280	20,062	29,021
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		2,260	4,060	4,460	5,150	5,642	8,138
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		989	1,833	2,009	2,320	2,542	3,661
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		121	217	239	278	306	439
Wage income - All (million $2019)		833	1,446	1,605	1,881	2,094	3,043

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	334	316	295	284	286	295	308
Final energy use - Residential (PJ)	151	140	129	121	115	111	107
Final energy use - Commercial (PJ)	93.8	96.3	99.1	101	104	110	118
Final energy use - Industry (PJ)	209	222	230	240	253	268	285

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)		2.31	2.4	2.04	2.08	2.23	2.28

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 (%)	10.6	29.2	30	31.3	32.8	34.9	37.8
Sales of space heating units - Electric Resistance (%)	31.7	33	32.6	31.9	30.8	28.9	25.7
Sales of space heating units - Gas (%)	49.2	24.7	25.6	25.8	25.6	25.6	25.6
Sales of space heating units - Fossil (%)	8.51	13	11.8	11	10.8	10.7	10.8
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	40.2	57.1	57	57	56.9	56.9	56.9
Sales of water heating units - Gas Furnace (%)	53.4	37.5	37.6	37.6	37.6	37.7	37.7
Sales of water heating units - Other (%)	6.41	5.36	5.36	5.41	5.42	5.43	5.44
Sales of cooking units - Electric Resistance (%)	65.2	65.2	65.2	65.2	65.2	65.2	65.2
Sales of cooking units - Gas (%)	34.8	34.8	34.8	34.8	34.8	34.8	34.8
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		2.54	2.44				

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	2.5	22.4	55	63.9	64.6	64.7	64.7
Sales of space heating units - Electric Resistance (%)	16.7	16.3	26	31	34.1	34.6	34.6
Sales of space heating units - Gas (%)	80.8	61.3	19	5.16	1.26	0.741	0.694
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Electric Heat Pump (%)	1	0.818	0.818	0.822	0.828	0.831	0.832
Sales of water heating units - Electric Resistance (%)	3.08	2.41	2.42	2.43	2.43	2.43	2.43
Sales of water heating units - Gas (%)	95.1	96.1	96.1	96.1	96.1	96.1	96.1
Sales of water heating units - Other (%)	0.791	0.625	0.628	0.63	0.63	0.629	0.629
Sales of cooking units - Electric Resistance (%)	27.5	29	29	29	29	28.9	28.9
Sales of cooking units - Gas (%)	72.5	71	71	71	71	71.1	71.1
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		13,236	13,602				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	642	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	2,857	2,832	2,832	2,830	2,249	1,596	3,623
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	2,443	3,766	5,029	6,555	8,366	10,477	12,977
Installed renewables - Solar - Base land use assumptions (MW)	703	703	703	703	703	703	703
Installed renewables - Wind - Base land use assumptions (MW)	4,154	4,154	4,154	4,154	5,001	5,440	5,440
Installed renewables - Offshore Wind - Base land use assumptions (MW)	0	109	109	109	109	197	352
Installed renewables - Solar - Constrained land use assumptions (MW)	133	133	133	133	133	133	133

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	2,011	2,011	2,011	2,011	2,011	2,011	2,011
Wind - Base land use assumptions (GWh)	14,129	14,129	14,129	14,129	17,259	18,842	18,842
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)	-34.3		-7.18				-5.98
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-5.47		-9.18				-9.66
Business-as-usual carbon sink - Total (Mt CO2e/y)	-39.7		-16.4				-15.6

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)							-1,538
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-211
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-4,235
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-2,923
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-6,699

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-231
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-3,282
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-286
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-2,705
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-22,111
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-2,304
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-739
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-7,630
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-4,284
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-13,398
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-446
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-4,923
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,033
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-5,365
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-41,121
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-3,070
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,267
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-11,025
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-5,746
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-20,097
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-660
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-6,564
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-3,779
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-60,233
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-8,025
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							251
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							161
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,154

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 - Improve plantations (1000 hectares)							1,058
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)							33
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							217
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							18.6
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,609
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							5,503
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							377
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							166
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,888
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							1,593
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)							47.9
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							325
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							135
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							3,241
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							9,773
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							502
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							172
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							5,622
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							2,117
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0

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 - Increase trees outside forests (1000 hectares)							62.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							434
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							107
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							2,660
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							11,677