Net-Zero America - tennessee state report

2021-03-05

These data underlie graphs and tables presented in the Princeton Net-Zero America study:

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Notes

- These data are all data from the study available at https://netzeroamerica.princeton.edu.
- The Net-Zero America study describes five pathways to reach net-zero emissions and one "no new policies" reference scenario. In this document, state-level results are grouped by scenario. For some scenarios, the study generated national, but not state-level results.
- Within results for a given scenario, data tables are organized into corresponding sections of the full net-zero study (e.g., Pillar 1, Pillar 2, etc.)
- For Pillar 6 (Land sinks), values shown are maximum carbon storage potentials.

Data by category and subcategory

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)	0	19,412	22,037	0	0	0	0
Sales of cooking units - Electric Resistance (%)	43.5	55.3	83.4	88.9	89.2	89.2	89.1
Sales of cooking units - Gas (%)	56.5	44.7	16.6	11.1	10.8	10.8	10.9
Sales of space heating units - Electric Heat Pump (%)	9.56	30.6	77.3	90.8	91.9	92	92
Sales of space heating units - Electric Resistance (%)	4.81	4.61	4.92	6.26	6.57	6.58	6.55
Sales of space heating units - Fossil (%)	0	2.83	0.549	0.023	0	0	0
Sales of space heating units - Gas Furnace (%)	85.6	62	17.3	2.94	1.48	1.43	1.43
Sales of water heating units - Electric Heat Pump (%)	0.155	10.6	55.7	65.7	66.1	66.2	66.1
Sales of water heating units - Electric Resistance (%)	5.74	9.97	28	32.1	32.3	32.3	32.3
Sales of water heating units - Gas Furnace (%)	92.5	77.8	14.7	0.62	0	0	0
Sales of water heating units - Other (%)	1.59	1.58	1.58	1.58	1.58	1.57	1.56

Table 2: *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)		4.81	4.94	6.83	7.17	5.85	5.99

Table 3: *E+ scenario - PILLAR 1: Efficiency/Electrification - Overview*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	171	171	165	155	148	145	145
Final energy use - Industry (PJ)	755	838	888	904	913	905	904
Final energy use - Residential (PJ)	260	243	223	197	176	163	157
Final energy use - Transportation (PJ)	679	622	545	451	367	315	293

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)	0	5.23	5.68	0	0	0	0
Sales of cooking units - Electric Resistance (%)	83.2	86.7	97.7	99.9	100	100	100
Sales of cooking units - Gas (%)	16.8	13.3	2.27	0.114	0	0	0
Sales of space heating units - Electric Heat Pump (%)	32.2	47.8	80.2	87.5	87.8	87.7	87.7
Sales of space heating units - Electric Resistance (%)	31.3	29.8	12.5	8.63	8.46	8.57	8.59
Sales of space heating units - Fossil (%)	4.13	4.49	1.84	1.23	1.19	1.17	1.17
Sales of space heating units - Gas (%)	32.4	17.9	5.43	2.67	2.55	2.52	2.52
Sales of water heating units - Electric Heat Pump (%)	0	9.08	48.1	56.8	57.1	57.2	57.2
Sales of water heating units - Electric Resistance (%)	68.9	73.7	46.7	40.6	40.3	40.3	40.3
Sales of water heating units - Gas Furnace (%)	27.4	14.7	2.75	0.116	0	0	0
Sales of water heating units - Other (%)	3.71	2.57	2.53	2.53	2.54	2.54	2.54

Table 5: *E+ scenario - PILLAR 1: Efficiency/Electrification - Transportation*

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr (million $2018)	0	1,105	2,839	4,591	6,958	7,569	7,219
Public EV charging plugs - DC Fast (1000 units)	0.165	0	2.15	0	9.36	0	15.1
Public EV charging plugs - L2 (1000 units)	0.888	0	51.7	0	225	0	363
Vehicle sales - Heavy-duty - diesel (%)	97.2	92.1	67	23.3	4.22	0.628	0
Vehicle sales - Heavy-duty - EV (%)	0.588	3.81	19	45.6	57.4	59.6	60
Vehicle sales - Heavy-duty - gasoline (%)	0.227	0.227	0.176	0.066	0.013	0.002	0
Vehicle sales - Heavy-duty - hybrid (%)	0.082	0.09	0.077	0.031	0.007	0.001	0
Vehicle sales - Heavy-duty - hydrogen FC (%)	0.392	2.54	12.7	30.4	38.2	39.7	40
Vehicle sales - Heavy-duty - other (%)	1.5	1.23	1.07	0.568	0.163	0.038	0
Vehicle sales - Light-duty - diesel (%)	1.55	1.81	1.26	0.402	0.074	0.013	0
Vehicle sales - Light-duty - EV (%)	3.92	15.2	46.5	81.8	96.3	99.3	100
Vehicle sales - Light-duty - gasoline (%)	89.9	78	48.8	16.5	3.29	0.59	0
Vehicle sales - Light-duty - hybrid (%)	4.42	4.54	3.21	1.19	0.291	0.064	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.11	0.34	0.203	0.063	0.013	0.002	0
Vehicle sales - Light-duty - other (%)	0.102	0.098	0.064	0.022	0.004	0.001	0
Vehicle sales - Medium-duty - diesel (%)	64.7	59.7	42.3	14.4	2.59	0.384	0
Vehicle sales - Medium-duty - EV (%)	0.784	5.07	25.3	60.8	76.5	79.5	80
Vehicle sales - Medium-duty - gasoline (%)	33.7	33.3	25.5	9.32	1.77	0.277	0
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.402	0.341	0.14	0.03	0.005	0
Vehicle sales - Medium-duty - hydrogen FC (%)	0.196	1.27	6.33	15.2	19.1	19.9	20
Vehicle sales - Medium-duty - other (%)	0.253	0.255	0.205	0.083	0.019	0.004	0

Table 6: *E+ scenario - PILLAR 2: Clean Electricity - Generating capacity*

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Biomass power plant (billion $2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion $2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	0	0	0	3.78	0
Capital invested - Solar PV - Base (billion $2018)	0	0.364	0.667	1.41	2.88	6.84	11
Capital invested - Solar PV - Constrained (billion $2018)	0	0.173	0	1.86	2.57	9.47	7
Capital invested - Wind - Base (billion $2018)	0	0.069	0.052	0	0	0	0
Installed (cumulative) - OffshoreWind - Base land use assumptions (MW)	0	0	0	0	0	0	0
Installed (cumulative) - Rooftop PV (MW)	127	205	290	412	585	809	1,096
Installed (cumulative) - Solar - Base land use assumptions (MW)	260	532	1,089	2,367	5,134	12,099	23,955
Installed (cumulative) - Wind - Base land use assumptions (MW)	29	75.6	115	115	115	115	115

Table 7: *E+ 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 allam power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu power plant (GWh)	0	0	0	0	0	4,245	4,245
Solar - Base land use assumptions (GWh)	538	517	1,060	2,417	5,226	12,990	22,023
Solar - Constrained land use assumptions (GWh)	282	0	293	4,856	5,444	10,756	13,520
Wind - Base land use assumptions (GWh)	106	139	116	0	0	0	0

Table 7: *E+ scenario - PILLAR 2: Clean Electricity - Generation (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Wind - Constrained land use assumptions (GWh)	106	0	0	0	0	0	255

Table 8: *E+ scenario - PILLAR 3: Clean fuels - Bioenergy*

Item	2020	2025	2030	2035	2040	2045	2050
Biomass purchases (million $2018/year)	0	0	0	170	170	506	506
Conversion capital investment - Cumulative 5-yr (million $2018)	0	0	0	3,213	0	6,799	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	3	3	7	7
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 - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu (quantity)	0	0	0	0	0	2	2
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

Table 9: *E+ scenario - PILLAR 4: CCUS - CO2 capture*

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	5.99	5.7	17.2	16.5
Annual - BECCS (MMT)		0	0	4.13	4.13	12.5	12.5
Annual - Cement and lime (MMT)		0	0	0	0	0	0
Annual - NGCC (MMT)		0	0	1.86	1.57	4.69	4.06
Cumulative - All (MMT)		0	0	5.99	11.7	28.9	45.4
Cumulative - BECCS (MMT)		0	0	4.13	8.26	20.7	33.2
Cumulative - Cement and lime (MMT)		0	0	0	0	0	0
Cumulative - NGCC (MMT)		0	0	1.86	3.43	8.12	12.2

Table 10: *E+ scenario - PILLAR 4: CCUS - CO2 pipelines*

Item	2020	2025	2030	2035	2040	2045	2050
All (km)		0	181	832	1,089	1,872	1,662
Cumulative investment - All (million $2018)		0	1,110	2,685	2,984	3,656	3,492
Cumulative investment - Spur (million $2018)		0	0	464	763	1,435	1,271
Cumulative investment - Trunk (million $2018)		0	1,110	2,221	2,221	2,221	2,221
Spur (km)		0	0	470	727	1,511	1,301
Trunk (km)		0	181	362	362	362	362

Table 11: *E+ scenario - PILLAR 4: CCUS - CO2 storage*

Item	2020	2025	2030	2035	2040	2045	2050
CO2 storage (MMT)		0	0	0.88	1.81	2.58	3.73
Injection wells (wells)		0	1	2	4	7	8
Resource characterization, appraisal, permitting costs (million $2020)		25.4	71.2	91.5	91.5	91.5	91.5
Wells and facilities construction costs (million $2020)		0	16.9	66	118	197	244

Table 12: *E+ scenario - PILLAR 6: Land sinks - Agriculture*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-274
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-3,357
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-108
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-3,739
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-274
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,769
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-54
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-2,097
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							112
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							1,832
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							197
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							2,141
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							112
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							965
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							98.3
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,176

Table 13: *E+ scenario - PILLAR 6: Land sinks - Forests*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-116
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-31,364
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-2,178
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-5,783
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-591
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-6,834

Table 13: *E+ scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-928
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-1,525
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-9,586
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,823
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-57.9
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-8,323
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-363
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,221
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-301
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-2,278
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-325
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-763
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-726
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,289
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-86.8
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-19,839
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,271
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-4,002
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-441
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-4,556
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-626
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-1,144
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-5,156
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,556
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							18.9
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							295
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							2,949
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							218

Table 13: *E+ scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							88.2
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							101
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							272
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,267
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							5,209
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							9.46
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							277
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,130
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							109
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)							46.4
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							50.4
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							47.2
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							767
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							2,436
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							14.2
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							286
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							2,039
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							164
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)							67.3

Table 13: *E+ scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							75.6
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							341
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,544
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							4,532

Table 14: *E+ scenario - IMPACTS - Fossil fuel industries*

Item	2020	2025	2030	2035	2040	2045	2050
Natural gas consumption - Annual (tcf)		303	256	205	154	97.1	67.4
Natural gas consumption - Cumulative (tcf)		0	0	0	0	0	6,175
Natural gas production - Annual (tcf)		4.04	3.82	3.33	2.81	2.23	1.73
Oil consumption - Annual (million bbls)		123	105	78.9	54.7	35.5	20.6
Oil consumption - Cumulative (million bbls)		0	0	0	0	0	2,449
Oil production - Annual (million bbls)		0.272	0.273	0.273	0.216	0.176	0.117

Table 15: *E+ scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		678	0.89	0.865	0.635	0.43	0.035
Monetary damages from air pollution - Natural Gas (million 2019$)		231	165	93.7	75.4	30.8	12.1
Monetary damages from air pollution - Transportation (million 2019$)		1,540	1,435	1,091	632	291	118
Premature deaths from air pollution - Coal (deaths)		76.6	0.101	0.098	0.072	0.049	0.004
Premature deaths from air pollution - Natural Gas (deaths)		26.1	18.6	10.6	8.51	3.48	1.37
Premature deaths from air pollution - Transportation (deaths)		173	161	123	71.1	32.7	13.3

Table 16: *E+ scenario - IMPACTS - Jobs*

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		446	511	765	539	791	630
By economic sector - Construction (jobs)		4,928	5,282	6,728	7,188	9,183	13,635
By economic sector - Manufacturing (jobs)		8,493	10,165	13,466	12,832	10,500	13,560
By economic sector - Mining (jobs)		2,237	1,603	1,043	637	388	238
By economic sector - Other (jobs)		336	393	622	971	1,757	3,311
By economic sector - Pipeline (jobs)		452	517	487	296	258	237
By economic sector - Professional (jobs)		2,680	2,460	3,173	3,387	4,784	6,907
By economic sector - Trade (jobs)		2,315	2,009	2,093	2,174	2,915	4,617
By economic sector - Utilities (jobs)		7,809	7,736	9,463	8,714	7,834	9,365
By education level - All sectors - Associates degree or some college (jobs)		9,090	9,483	11,834	11,609	12,123	16,800
By education level - All sectors - Bachelors degree (jobs)		6,373	6,380	7,650	7,345	7,571	10,227
By education level - All sectors - Doctoral degree (jobs)		185	175	206	205	247	344
By education level - All sectors - High school diploma or less (jobs)		12,589	13,206	16,436	15,922	16,684	22,696

Table 16: *E+ scenario - IMPACTS - Jobs (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
By education level - All sectors - Masters or professional degree (jobs)		1,460	1,431	1,713	1,658	1,786	2,433
By resource sector - Biomass (jobs)		1,166	1,223	1,948	1,486	2,903	2,752
By resource sector - CO2 (jobs)		13.5	1,134	1,618	735	1,111	1,373
By resource sector - Coal (jobs)		519	20.5	17.8	15.6	14.1	12.5
By resource sector - Grid (jobs)		8,096	8,072	11,427	11,624	12,058	15,882
By resource sector - Natural Gas (jobs)		4,373	3,586	3,247	2,992	1,666	1,554
By resource sector - Nuclear (jobs)		2,514	2,474	2,435	1,914	956	349
By resource sector - Oil (jobs)		5,546	4,342	3,023	1,949	1,189	650
By resource sector - Solar (jobs)		4,257	5,307	8,129	10,534	14,614	25,062
By resource sector - Wind (jobs)		3,212	4,519	5,995	5,488	3,900	4,864
Median wages - Annual - All ($2019 per job)		55,958	55,914	55,961	56,362	56,704	56,970
On-Site or In-Plant Training - Total jobs - 1 to 4 years (jobs)		4,704	4,882	6,048	5,908	6,169	8,492
On-Site or In-Plant Training - Total jobs - 4 to 10 years (jobs)		1,750	1,779	2,182	2,152	2,370	3,310
On-Site or In-Plant Training - Total jobs - None (jobs)		4,817	4,982	6,159	6,000	6,318	8,666
On-Site or In-Plant Training - Total jobs - Over 10 years (jobs)		237	247	311	305	323	448
On-Site or In-Plant Training - Total jobs - Up to 1 year (jobs)		18,189	18,786	23,139	22,373	23,231	31,585
On-the-Job Training - All sectors - 1 to 4 years (jobs)		6,004	6,226	7,715	7,545	7,885	10,868
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,653	1,689	2,093	2,083	2,328	3,281
On-the-Job Training - All sectors - None (jobs)		1,614	1,643	1,994	1,944	2,077	2,876
On-the-Job Training - All sectors - Over 10 years (jobs)		301	321	399	389	394	542
On-the-Job Training - All sectors - Up to 1 year (jobs)		20,125	20,797	25,639	24,778	25,726	34,932
Related work experience - All sectors - 1 to 4 years (jobs)		10,664	10,940	13,433	13,036	13,630	18,607
Related work experience - All sectors - 4 to 10 years (jobs)		6,833	7,017	8,616	8,377	8,719	11,940
Related work experience - All sectors - None (jobs)		4,244	4,394	5,438	5,279	5,574	7,638
Related work experience - All sectors - Over 10 years (jobs)		1,936	2,007	2,467	2,384	2,396	3,245
Related work experience - All sectors - Up to 1 year (jobs)		6,019	6,318	7,885	7,662	8,093	11,071
Wage income - All (million $2019)		1,662	1,715	2,118	2,071	2,178	2,991

Table 17: *E- scenario - PILLAR 1: Efficiency/Electrification - Commercial*

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)	0	19,401	22,003	0	0	0	0
Sales of cooking units - Electric Resistance (%)	43.5	47.1	51.3	61.6	76.1	85	88
Sales of cooking units - Gas (%)	56.5	52.9	48.7	38.4	23.9	15	12
Sales of space heating units - Electric Heat Pump (%)	9.56	21.7	26.9	42.4	66.6	83.3	89.7
Sales of space heating units - Electric Resistance (%)	4.81	4.61	4.65	4.78	5.23	5.91	6.33
Sales of space heating units - Fossil (%)	0	3.27	3.09	2.34	1.17	0.379	0.099
Sales of space heating units - Gas Furnace (%)	85.6	70.4	65.3	50.5	27	10.4	3.89

Table 17: *E- scenario - PILLAR 1: Efficiency/Electrification - Commercial (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Electric Heat Pump (%)	0.155	1.96	7.08	21.8	44.4	59.2	64.3
Sales of water heating units - Electric Resistance (%)	5.74	6.48	8.39	14.4	23.5	29.5	31.6
Sales of water heating units - Gas Furnace (%)	92.5	90	83	62.2	30.4	9.74	2.53
Sales of water heating units - Other (%)	1.59	1.58	1.58	1.58	1.58	1.57	1.56

Table 18: *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)		4.14	4.18	4.77	4.88	5.83	6.04

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	171	171	169	166	161	156	153
Final energy use - Industry (PJ)	755	838	889	910	921	912	909
Final energy use - Residential (PJ)	260	244	232	219	204	187	173
Final energy use - Transportation (PJ)	680	628	570	525	490	449	400

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)	0	5.17	5.41	0	0	0	0
Sales of cooking units - Electric Resistance (%)	83.1	83.5	85.1	89.2	94.8	98.3	99.6
Sales of cooking units - Gas (%)	16.9	16.5	14.9	10.8	5.17	1.67	0.449
Sales of space heating units - Electric Heat Pump (%)	32.2	41.6	45.3	56	72.3	82.8	86.5
Sales of space heating units - Electric Resistance (%)	31.3	33.1	31	25.2	16.6	11.1	9.21
Sales of space heating units - Fossil (%)	4.13	5	4.74	3.81	2.44	1.57	1.28
Sales of space heating units - Gas (%)	32.4	20.3	18.9	14.9	8.67	4.49	3.04
Sales of water heating units - Electric Heat Pump (%)	0	1.56	6	18.8	38.4	51.1	55.6
Sales of water heating units - Electric Resistance (%)	68.9	78.9	75.9	67	53.3	44.5	41.4
Sales of water heating units - Gas Furnace (%)	27.4	17	15.5	11.7	5.76	1.83	0.477
Sales of water heating units - Other (%)	3.71	2.57	2.54	2.55	2.56	2.54	2.54

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr (million $2018)	0	0	180	376	1,271	3,991	5,817
Public EV charging plugs - DC Fast (1000 units)	0.165	0	0.677	0	3.48	0	9.69
Public EV charging plugs - L2 (1000 units)	0.888	0	16.3	0	83.7	0	233
Vehicle sales - Heavy-duty - diesel (%)	97.4	96	91.3	79.8	58.2	32.1	13.7
Vehicle sales - Heavy-duty - EV (%)	0.498	1.45	4.11	10.8	23.6	39.5	51
Vehicle sales - Heavy-duty - gasoline (%)	0.228	0.236	0.239	0.225	0.179	0.109	0.051
Vehicle sales - Heavy-duty - hybrid (%)	0.083	0.094	0.104	0.107	0.092	0.06	0.03
Vehicle sales - Heavy-duty - hydrogen FC (%)	0.332	0.969	2.74	7.17	15.7	26.3	34
Vehicle sales - Heavy-duty - other (%)	1.5	1.28	1.46	1.95	2.25	1.96	1.14
Vehicle sales - Light-duty - diesel (%)	1.56	1.97	2.06	1.64	1.05	0.537	0.23

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle sales - Light-duty - EV (%)	1.89	4.68	11.9	25.9	48.4	72	87.6
Vehicle sales - Light-duty - gasoline (%)	91.7	87.5	79.6	66.7	46.2	24.9	11
Vehicle sales - Light-duty - hybrid (%)	4.59	5.39	6.05	5.51	4.13	2.44	1.18
Vehicle sales - Light-duty - hydrogen FC (%)	0.113	0.38	0.326	0.249	0.177	0.098	0.046
Vehicle sales - Light-duty - other (%)	0.103	0.106	0.097	0.084	0.061	0.033	0.015
Vehicle sales - Medium-duty - diesel (%)	64.8	62.2	57.7	49.4	35.6	19.6	8.37
Vehicle sales - Medium-duty - EV (%)	0.664	1.94	5.49	14.3	31.4	52.6	68
Vehicle sales - Medium-duty - gasoline (%)	33.8	34.7	34.7	31.9	24.4	14.2	6.33
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.418	0.464	0.478	0.414	0.275	0.141
Vehicle sales - Medium-duty - hydrogen FC (%)	0.166	0.485	1.37	3.58	7.86	13.2	17
Vehicle sales - Medium-duty - other (%)	0.253	0.266	0.279	0.286	0.258	0.184	0.102

Table 22: *E- scenario - PILLAR 6: Land sinks - Agriculture*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-274
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-3,357
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-108
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-3,739
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-274
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,769
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-54
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-2,097
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							112
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							1,832
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							197
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							2,141
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							112
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							965
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							98.3

Table 22: *E- scenario - PILLAR 6: Land sinks - Agriculture (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,176

Table 23: *E- scenario - PILLAR 6: Land sinks - Forests*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-116
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-31,364
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-2,178
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-5,783
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-591
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-6,834
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-928
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-1,525
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-9,586
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,823
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-57.9
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-8,323
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-363
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,221
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-301
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-2,278
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-325
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-763
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-726
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,289
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-86.8
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-19,839
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,271
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-4,002
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-441
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-4,556
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-626

Table 23: *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)							-1,144
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-5,156
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,556
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							18.9
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							295
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							2,949
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							218
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)							88.2
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							101
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							272
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,267
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							5,209
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							9.46
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							277
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,130
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							109
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)							46.4
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							50.4
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							47.2
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							767

Table 23: *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)							2,436
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							14.2
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							286
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							2,039
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							164
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)							67.3
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							75.6
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							341
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,544
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							4,532

Table 24: *E- scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		678	0.89	0.865	0.635	0.43	0.035
Monetary damages from air pollution - Natural Gas (million 2019$)		175	109	45	18.5	6.58	4.21
Monetary damages from air pollution - Transportation (million 2019$)		1,565	1,579	1,538	1,387	1,106	761
Premature deaths from air pollution - Coal (deaths)		76.6	0.101	0.098	0.072	0.049	0.004
Premature deaths from air pollution - Natural Gas (deaths)		19.8	12.3	5.08	2.09	0.743	0.475
Premature deaths from air pollution - Transportation (deaths)		176	178	173	156	124	85.5

Table 25: *E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Commercial*

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)	0	19,412	22,037	0	0	0	0
Sales of cooking units - Electric Resistance (%)	43.5	55.3	83.4	88.9	89.2	89.2	89.1
Sales of cooking units - Gas (%)	56.5	44.7	16.6	11.1	10.8	10.8	10.9
Sales of space heating units - Electric Heat Pump (%)	9.56	30.6	77.3	90.8	91.9	92	92
Sales of space heating units - Electric Resistance (%)	4.81	4.61	4.92	6.26	6.57	6.58	6.55
Sales of space heating units - Fossil (%)	0	2.83	0.549	0.023	0	0	0

Table 25: *E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Commercial (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Gas Furnace (%)	85.6	62	17.3	2.94	1.48	1.43	1.43
Sales of water heating units - Electric Heat Pump (%)	0.155	10.6	55.7	65.7	66.1	66.2	66.1
Sales of water heating units - Electric Resistance (%)	5.74	9.97	28	32.1	32.3	32.3	32.3
Sales of water heating units - Gas Furnace (%)	92.5	77.8	14.7	0.62	0	0	0
Sales of water heating units - Other (%)	1.59	1.58	1.58	1.58	1.58	1.57	1.56

Table 26: *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)		4.81	4.94	6.83	7.17	5.85	5.99

Table 27: *E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Overview*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	171	171	165	155	148	145	145
Final energy use - Industry (PJ)	755	838	888	904	913	905	904
Final energy use - Residential (PJ)	260	243	223	197	176	163	157
Final energy use - Transportation (PJ)	679	622	545	451	367	315	293

Table 28: *E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Residential*

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)	0	5.23	5.68	0	0	0	0
Sales of cooking units - Electric Resistance (%)	83.2	86.7	97.7	99.9	100	100	100
Sales of cooking units - Gas (%)	16.8	13.3	2.27	0.114	0	0	0
Sales of space heating units - Electric Heat Pump (%)	32.2	47.8	80.2	87.5	87.8	87.7	87.7
Sales of space heating units - Electric Resistance (%)	31.3	29.8	12.5	8.63	8.46	8.57	8.59
Sales of space heating units - Fossil (%)	4.13	4.49	1.84	1.23	1.19	1.17	1.17
Sales of space heating units - Gas (%)	32.4	17.9	5.43	2.67	2.55	2.52	2.52
Sales of water heating units - Electric Heat Pump (%)	0	9.08	48.1	56.8	57.1	57.2	57.2
Sales of water heating units - Electric Resistance (%)	68.9	73.7	46.7	40.6	40.3	40.3	40.3
Sales of water heating units - Gas Furnace (%)	27.4	14.7	2.75	0.116	0	0	0
Sales of water heating units - Other (%)	3.71	2.57	2.53	2.53	2.54	2.54	2.54

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr (million $2018)	0	1,105	2,839	4,591	6,958	7,569	7,219
Public EV charging plugs - DC Fast (1000 units)	0.165	0	2.15	0	9.36	0	15.1
Public EV charging plugs - L2 (1000 units)	0.888	0	51.7	0	225	0	363
Vehicle sales - Heavy-duty - diesel (%)	97.2	92.1	67	23.3	4.22	0.628	0
Vehicle sales - Heavy-duty - EV (%)	0.588	3.81	19	45.6	57.4	59.6	60
Vehicle sales - Heavy-duty - gasoline (%)	0.227	0.227	0.176	0.066	0.013	0.002	0
Vehicle sales - Heavy-duty - hybrid (%)	0.082	0.09	0.077	0.031	0.007	0.001	0
Vehicle sales - Heavy-duty - hydrogen FC (%)	0.392	2.54	12.7	30.4	38.2	39.7	40

Table 29: *E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Transportation (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle sales - Heavy-duty - other (%)	1.5	1.23	1.07	0.568	0.163	0.038	0
Vehicle sales - Light-duty - diesel (%)	1.55	1.81	1.26	0.402	0.074	0.013	0
Vehicle sales - Light-duty - EV (%)	3.92	15.2	46.5	81.8	96.3	99.3	100
Vehicle sales - Light-duty - gasoline (%)	89.9	78	48.8	16.5	3.29	0.59	0
Vehicle sales - Light-duty - hybrid (%)	4.42	4.54	3.21	1.19	0.291	0.064	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.11	0.34	0.203	0.063	0.013	0.002	0
Vehicle sales - Light-duty - other (%)	0.102	0.098	0.064	0.022	0.004	0.001	0
Vehicle sales - Medium-duty - diesel (%)	64.7	59.7	42.3	14.4	2.59	0.384	0
Vehicle sales - Medium-duty - EV (%)	0.784	5.07	25.3	60.8	76.5	79.5	80
Vehicle sales - Medium-duty - gasoline (%)	33.7	33.3	25.5	9.32	1.77	0.277	0
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.402	0.341	0.14	0.03	0.005	0
Vehicle sales - Medium-duty - hydrogen FC (%)	0.196	1.27	6.33	15.2	19.1	19.9	20
Vehicle sales - Medium-duty - other (%)	0.253	0.255	0.205	0.083	0.019	0.004	0

Table 30: *E+RE+ scenario - PILLAR 2: Clean Electricity - Generating capacity*

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Solar PV - Base (billion $2018)	0	0	1.82	5.34	15	16.4	37.2
Capital invested - Wind - Base (billion $2018)	0	0.069	0.052	0	0	0	0
Installed (cumulative) - OffshoreWind - Base land use assumptions (MW)	0	0	0	0	0	0	0
Installed (cumulative) - Solar - Base land use assumptions (MW)	163	163	1,681	6,524	20,916	37,604	77,802
Installed (cumulative) - Wind - Base land use assumptions (MW)	29	75.6	115	115	115	115	115

Table 31: *E+RE+ scenario - PILLAR 2: Clean Electricity - Generation*

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	355	0	2,871	9,024	26,849	31,008	74,393
Solar - Constrained land use assumptions (GWh)	501	0	1,591	8,838	22,244	30,754	59,291
Wind - Base land use assumptions (GWh)	106	139	116	0	0	0	0
Wind - Constrained land use assumptions (GWh)	106	0	0	0	0	0	255

Table 32: *E+RE+ scenario - PILLAR 6: Land sinks - Agriculture*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-274
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-3,357
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-108
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-3,739
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-274
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,769

Table 32: *E+RE+ scenario - PILLAR 6: Land sinks - Agriculture (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-54
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-2,097
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							112
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							1,832
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							197
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							2,141
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							112
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							965
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							98.3
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,176

Table 33: *E+RE+ scenario - PILLAR 6: Land sinks - Forests*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-116
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-31,364
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-2,178
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-5,783
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-591
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-6,834
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-928
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-1,525
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-9,586
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,823
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-57.9
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-8,323
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-363
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,221

Table 33: *E+RE+ scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-301
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-2,278
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-325
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-763
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-726
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,289
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-86.8
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-19,839
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,271
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-4,002
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-441
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-4,556
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-626
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-1,144
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-5,156
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,556
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							18.9
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							295
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							2,949
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							218
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)							88.2
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							101
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							272
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,267
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							5,209

Table 33: *E+RE+ scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							9.46
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							277
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,130
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							109
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)							46.4
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							50.4
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							47.2
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							767
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							2,436
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							14.2
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							286
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							2,039
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							164
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)							67.3
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							75.6
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							341
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,544
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							4,532

Table 34: *E+RE+ scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		678	0.89	0.865	0.635	0.43	0.035

Table 34: *E+RE+ scenario - IMPACTS - Health (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Natural Gas (million 2019$)		188	134	70	43.8	12.3	4.63
Monetary damages from air pollution - Transportation (million 2019$)		1,540	1,435	1,091	632	291	118
Premature deaths from air pollution - Coal (deaths)		76.6	0.101	0.098	0.072	0.049	0.004
Premature deaths from air pollution - Natural Gas (deaths)		21.2	15.1	7.9	4.95	1.39	0.523
Premature deaths from air pollution - Transportation (deaths)		173	161	123	71.1	32.7	13.3

Table 35: *E+RE- scenario - PILLAR 1: Efficiency/Electrification - Commercial*

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)	0	19,412	22,037	0	0	0	0
Sales of cooking units - Electric Resistance (%)	43.5	55.3	83.4	88.9	89.2	89.2	89.1
Sales of cooking units - Gas (%)	56.5	44.7	16.6	11.1	10.8	10.8	10.9
Sales of space heating units - Electric Heat Pump (%)	9.56	30.6	77.3	90.8	91.9	92	92
Sales of space heating units - Electric Resistance (%)	4.81	4.61	4.92	6.26	6.57	6.58	6.55
Sales of space heating units - Fossil (%)	0	2.83	0.549	0.023	0	0	0
Sales of space heating units - Gas Furnace (%)	85.6	62	17.3	2.94	1.48	1.43	1.43
Sales of water heating units - Electric Heat Pump (%)	0.155	10.6	55.7	65.7	66.1	66.2	66.1
Sales of water heating units - Electric Resistance (%)	5.74	9.97	28	32.1	32.3	32.3	32.3
Sales of water heating units - Gas Furnace (%)	92.5	77.8	14.7	0.62	0	0	0
Sales of water heating units - Other (%)	1.59	1.58	1.58	1.58	1.58	1.57	1.56

Table 36: *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)		4.81	4.94	6.83	7.17	5.85	5.99

Table 37: *E+RE- scenario - PILLAR 1: Efficiency/Electrification - Overview*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	171	171	165	155	148	145	145
Final energy use - Industry (PJ)	755	838	888	904	913	905	904
Final energy use - Residential (PJ)	260	243	223	197	176	163	157
Final energy use - Transportation (PJ)	679	622	545	451	367	315	293

Table 38: *E+RE- scenario - PILLAR 1: Efficiency/Electrification - Residential*

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)	0	5.23	5.68	0	0	0	0
Sales of cooking units - Electric Resistance (%)	83.2	86.7	97.7	99.9	100	100	100
Sales of cooking units - Gas (%)	16.8	13.3	2.27	0.114	0	0	0
Sales of space heating units - Electric Heat Pump (%)	32.2	47.8	80.2	87.5	87.8	87.7	87.7
Sales of space heating units - Electric Resistance (%)	31.3	29.8	12.5	8.63	8.46	8.57	8.59

Table 38: *E+RE- scenario - PILLAR 1: Efficiency/Electrification - Residential (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Fossil (%)	4.13	4.49	1.84	1.23	1.19	1.17	1.17
Sales of space heating units - Gas (%)	32.4	17.9	5.43	2.67	2.55	2.52	2.52
Sales of water heating units - Electric Heat Pump (%)	0	9.08	48.1	56.8	57.1	57.2	57.2
Sales of water heating units - Electric Resistance (%)	68.9	73.7	46.7	40.6	40.3	40.3	40.3
Sales of water heating units - Gas Furnace (%)	27.4	14.7	2.75	0.116	0	0	0
Sales of water heating units - Other (%)	3.71	2.57	2.53	2.53	2.54	2.54	2.54

Table 39: *E+RE- scenario - PILLAR 1: Efficiency/Electrification - Transportation*

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr (million $2018)	0	1,105	2,839	4,591	6,958	7,569	7,219
Public EV charging plugs - DC Fast (1000 units)	0.165	0	2.15	0	9.36	0	15.1
Public EV charging plugs - L2 (1000 units)	0.888	0	51.7	0	225	0	363
Vehicle sales - Heavy-duty - diesel (%)	97.2	92.1	67	23.3	4.22	0.628	0
Vehicle sales - Heavy-duty - EV (%)	0.588	3.81	19	45.6	57.4	59.6	60
Vehicle sales - Heavy-duty - gasoline (%)	0.227	0.227	0.176	0.066	0.013	0.002	0
Vehicle sales - Heavy-duty - hybrid (%)	0.082	0.09	0.077	0.031	0.007	0.001	0
Vehicle sales - Heavy-duty - hydrogen FC (%)	0.392	2.54	12.7	30.4	38.2	39.7	40
Vehicle sales - Heavy-duty - other (%)	1.5	1.23	1.07	0.568	0.163	0.038	0
Vehicle sales - Light-duty - diesel (%)	1.55	1.81	1.26	0.402	0.074	0.013	0
Vehicle sales - Light-duty - EV (%)	3.92	15.2	46.5	81.8	96.3	99.3	100
Vehicle sales - Light-duty - gasoline (%)	89.9	78	48.8	16.5	3.29	0.59	0
Vehicle sales - Light-duty - hybrid (%)	4.42	4.54	3.21	1.19	0.291	0.064	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.11	0.34	0.203	0.063	0.013	0.002	0
Vehicle sales - Light-duty - other (%)	0.102	0.098	0.064	0.022	0.004	0.001	0
Vehicle sales - Medium-duty - diesel (%)	64.7	59.7	42.3	14.4	2.59	0.384	0
Vehicle sales - Medium-duty - EV (%)	0.784	5.07	25.3	60.8	76.5	79.5	80
Vehicle sales - Medium-duty - gasoline (%)	33.7	33.3	25.5	9.32	1.77	0.277	0
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.402	0.341	0.14	0.03	0.005	0
Vehicle sales - Medium-duty - hydrogen FC (%)	0.196	1.27	6.33	15.2	19.1	19.9	20
Vehicle sales - Medium-duty - other (%)	0.253	0.255	0.205	0.083	0.019	0.004	0

Table 40: *E+RE- scenario - PILLAR 2: Clean Electricity - Generating capacity*

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Solar PV - Base (billion $2018)		0	0	0	1.03	1.06	0.107
Capital invested - Solar PV - Constrained (billion $2018)		0	0	0.233	0.639	1.71	0
Capital invested - Wind - Base (billion $2018)		0.069	0	0	0.046	0	0
Capital invested - Wind - Constrained (billion $2018)		0	0	0	0	0	0

Table 41: *E+RE- scenario - PILLAR 2: Clean Electricity - Generation*

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	1,029	0		0	1,871	2,014	219
Solar - Constrained land use assumptions (GWh)	501	0		401	1,150	3,257	0
Wind - Base land use assumptions (GWh)	106	139		0	116	0	0
Wind - Constrained land use assumptions (GWh)	106	0		0	0	0	0

Table 42: *E+RE- scenario - PILLAR 6: Land sinks - Agriculture*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-274
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-3,357
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-108
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-3,739
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-274
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,769
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-54
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-2,097
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							112
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							1,832
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							197
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							2,141
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							112
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							965
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							98.3
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,176

Table 43: *E+RE- scenario - PILLAR 6: Land sinks - Forests*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-116
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-31,364
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-2,178
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-5,783
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-591
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-6,834

Table 43: *E+RE- scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-928
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-1,525
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-9,586
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,823
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-57.9
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-8,323
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-363
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,221
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-301
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-2,278
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-325
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-763
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-726
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,289
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-86.8
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-19,839
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,271
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-4,002
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-441
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-4,556
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-626
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-1,144
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-5,156
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,556
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							18.9
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							295
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							2,949
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							218

Table 43: *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 retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							88.2
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							101
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							272
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,267
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							5,209
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							9.46
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							277
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,130
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							109
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)							46.4
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							50.4
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							47.2
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							767
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							2,436
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							14.2
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							286
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							2,039
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							164
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)							67.3

Table 43: *E+RE- 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)							75.6
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							341
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,544
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							4,532

Table 44: *E+RE- scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		678	0.89	0.865	0.635	0.43	0.035
Monetary damages from air pollution - Natural Gas (million 2019$)		214	151	156	120	41.1	13.4
Monetary damages from air pollution - Transportation (million 2019$)		1,540	1,435	1,091	632	291	118
Premature deaths from air pollution - Coal (deaths)		76.6	0.101	0.098	0.072	0.049	0.004
Premature deaths from air pollution - Natural Gas (deaths)		24.1	17	17.6	13.5	4.64	1.51
Premature deaths from air pollution - Transportation (deaths)		173	161	123	71.1	32.7	13.3

Table 45: *E-B+ scenario - PILLAR 1: Efficiency/Electrification - Commercial*

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)	0	19,401	22,003	0	0	0	0
Sales of cooking units - Electric Resistance (%)	43.5	47.1	51.3	61.6	76.1	85	88
Sales of cooking units - Gas (%)	56.5	52.9	48.7	38.4	23.9	15	12
Sales of space heating units - Electric Heat Pump (%)	9.56	21.7	26.9	42.4	66.6	83.3	89.7
Sales of space heating units - Electric Resistance (%)	4.81	4.61	4.65	4.78	5.23	5.91	6.33
Sales of space heating units - Fossil (%)	0	3.27	3.09	2.34	1.17	0.379	0.099
Sales of space heating units - Gas Furnace (%)	85.6	70.4	65.3	50.5	27	10.4	3.89
Sales of water heating units - Electric Heat Pump (%)	0.155	1.96	7.08	21.8	44.4	59.2	64.3
Sales of water heating units - Electric Resistance (%)	5.74	6.48	8.39	14.4	23.5	29.5	31.6
Sales of water heating units - Gas Furnace (%)	92.5	90	83	62.2	30.4	9.74	2.53
Sales of water heating units - Other (%)	1.59	1.58	1.58	1.58	1.58	1.57	1.56

Table 46: *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)		4.14	4.18	4.77	4.88	5.83	6.04

Table 47: *E-B+ scenario - PILLAR 1: Efficiency/Electrification - Overview*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	171	171	169	166	161	156	153

Table 47: *E-B+ scenario - PILLAR 1: Efficiency/Electrification - Overview (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Industry (PJ)	755	838	889	910	921	912	909
Final energy use - Residential (PJ)	260	244	232	219	204	187	173
Final energy use - Transportation (PJ)	680	628	570	525	490	449	400

Table 48: *E-B+ scenario - PILLAR 1: Efficiency/Electrification - Residential*

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)	0	5.17	5.41	0	0	0	0
Sales of cooking units - Electric Resistance (%)	83.1	83.5	85.1	89.2	94.8	98.3	99.6
Sales of cooking units - Gas (%)	16.9	16.5	14.9	10.8	5.17	1.67	0.449
Sales of space heating units - Electric Heat Pump (%)	32.2	41.6	45.3	56	72.3	82.8	86.5
Sales of space heating units - Electric Resistance (%)	31.3	33.1	31	25.2	16.6	11.1	9.21
Sales of space heating units - Fossil (%)	4.13	5	4.74	3.81	2.44	1.57	1.28
Sales of space heating units - Gas (%)	32.4	20.3	18.9	14.9	8.67	4.49	3.04
Sales of water heating units - Electric Heat Pump (%)	0	1.56	6	18.8	38.4	51.1	55.6
Sales of water heating units - Electric Resistance (%)	68.9	78.9	75.9	67	53.3	44.5	41.4
Sales of water heating units - Gas Furnace (%)	27.4	17	15.5	11.7	5.76	1.83	0.477
Sales of water heating units - Other (%)	3.71	2.57	2.54	2.55	2.56	2.54	2.54

Table 49: *E-B+ scenario - PILLAR 1: Efficiency/Electrification - Transportation*

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr (million $2018)	0	0	180	376	1,271	3,991	5,817
Public EV charging plugs - DC Fast (1000 units)	0.165	0	0.677	0	3.48	0	9.69
Public EV charging plugs - L2 (1000 units)	0.888	0	16.3	0	83.7	0	233
Vehicle sales - Heavy-duty - diesel (%)	97.4	96	91.3	79.8	58.2	32.1	13.7
Vehicle sales - Heavy-duty - EV (%)	0.498	1.45	4.11	10.8	23.6	39.5	51
Vehicle sales - Heavy-duty - gasoline (%)	0.228	0.236	0.239	0.225	0.179	0.109	0.051
Vehicle sales - Heavy-duty - hybrid (%)	0.083	0.094	0.104	0.107	0.092	0.06	0.03
Vehicle sales - Heavy-duty - hydrogen FC (%)	0.332	0.969	2.74	7.17	15.7	26.3	34
Vehicle sales - Heavy-duty - other (%)	1.5	1.28	1.46	1.95	2.25	1.96	1.14
Vehicle sales - Light-duty - diesel (%)	1.56	1.97	2.06	1.64	1.05	0.537	0.23
Vehicle sales - Light-duty - EV (%)	1.89	4.68	11.9	25.9	48.4	72	87.6
Vehicle sales - Light-duty - gasoline (%)	91.7	87.5	79.6	66.7	46.2	24.9	11
Vehicle sales - Light-duty - hybrid (%)	4.59	5.39	6.05	5.51	4.13	2.44	1.18
Vehicle sales - Light-duty - hydrogen FC (%)	0.113	0.38	0.326	0.249	0.177	0.098	0.046
Vehicle sales - Light-duty - other (%)	0.103	0.106	0.097	0.084	0.061	0.033	0.015
Vehicle sales - Medium-duty - diesel (%)	64.8	62.2	57.7	49.4	35.6	19.6	8.37
Vehicle sales - Medium-duty - EV (%)	0.664	1.94	5.49	14.3	31.4	52.6	68
Vehicle sales - Medium-duty - gasoline (%)	33.8	34.7	34.7	31.9	24.4	14.2	6.33
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.418	0.464	0.478	0.414	0.275	0.141
Vehicle sales - Medium-duty - hydrogen FC (%)	0.166	0.485	1.37	3.58	7.86	13.2	17
Vehicle sales - Medium-duty - other (%)	0.253	0.266	0.279	0.286	0.258	0.184	0.102

Table 50: *E-B+ scenario - PILLAR 2: Clean Electricity - Generating capacity*

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Biomass power plant (billion $2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion $2018)	0	0	0	0.046	0	0	0
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	2.97	0.004	6.62	0	0

Table 51: *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 allam power plant (GWh)	0	0	0	45.5	45.5	45.5	45.5
Biomass w/ccu power plant (GWh)	0	0	3,332	3,337	10,762	10,762	10,762

Table 52: *E-B+ scenario - PILLAR 3: Clean fuels - Bioenergy*

Item	2020	2025	2030	2035	2040	2045	2050
Biomass purchases (million $2018/year)	0	0	214	575	1,886	2,174	2,174
Conversion capital investment - Cumulative 5-yr (million $2018)	0	0	2,724	4,018	15,288	3,181	0
Number of facilities - Allam power w ccu (quantity)	0	0	0	1	1	1	1
Number of facilities - Beccs hydrogen (quantity)	0	0	0	4	15	18	18
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	1	1	1	1
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu (quantity)	0	0	2	3	9	9	9
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	1	1	1	1	1

Table 53: *E-B+ scenario - PILLAR 4: CCUS - CO2 capture*

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	3.3	8.41	27.6	31.7	31.7
Annual - BECCS (MMT)		0	3.3	8.41	27.6	31.7	31.7
Annual - Cement and lime (MMT)		0	0	0	0	0	0
Annual - NGCC (MMT)		0	0	0	0	0	0.01
Cumulative - All (MMT)		0	3.3	11.7	39.3	71	103
Cumulative - BECCS (MMT)		0	3.3	11.7	39.3	71	103
Cumulative - Cement and lime (MMT)		0	0	0	0	0	0
Cumulative - NGCC (MMT)		0	0	0	0	0	0.01

Table 54: *E-B+ scenario - PILLAR 4: CCUS - CO2 pipelines*

Item	2020	2025	2030	2035	2040	2045	2050
All (km)		0	499	1,390	2,745	2,186	2,944
Cumulative investment - All (million $2018)		0	1,603	3,872	6,641	6,309	6,854
Cumulative investment - Spur (million $2018)		0	310	1,287	2,763	2,431	2,976
Cumulative investment - Trunk (million $2018)		0	1,293	2,585	3,878	3,878	3,878
Spur (km)		0	318	1,029	2,203	1,644	2,401
Trunk (km)		0	181	362	543	543	543

Table 55: *E-B+ scenario - PILLAR 4: CCUS - CO2 storage*

Item	2020	2025	2030	2035	2040	2045	2050
CO2 storage (MMT)		0	0.92	3.21	7.13	9.85	10
Injection wells (wells)		0	2	7	12	20	24
Resource characterization, appraisal, permitting costs (million $2020)		25.4	112	173	173	173	173
Wells and facilities construction costs (million $2020)		0	50.8	198	353	590	732

Table 56: *E-B+ scenario - PILLAR 6: Land sinks - Agriculture*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-652
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-3,109
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 - Permanent conservation cover (1000 tCO2e/y)							-97.8
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-3,859
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-652
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,638
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 - Permanent conservation cover (1000 tCO2e/y)							-48.9
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-2,339
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							292
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							4,110
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)							110
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)							442
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							178
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							5,132

Table 56: *E-B+ scenario - PILLAR 6: Land sinks - Agriculture (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							292
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							877
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)							110
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)							442
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							89
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,810

Table 57: *E-B+ scenario - PILLAR 6: Land sinks - Forests*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-116
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-31,364
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-2,178
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-5,783
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-591
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-6,834
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-928
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-1,525
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-9,586
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,823
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-57.9
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-8,323
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-363
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,221
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-301
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-2,278
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-325
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-763
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-726
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,289

Table 57: *E-B+ scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-86.8
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-19,839
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,271
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-4,002
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-441
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-4,556
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-626
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-1,144
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-5,156
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,556
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							18.9
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							295
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							2,949
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							218
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)							88.2
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							101
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							272
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,267
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							5,209
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							9.46
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							277
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,130
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							109

Table 57: *E-B+ scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
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)							46.4
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							50.4
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							47.2
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							767
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							2,436
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							14.2
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							286
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							2,039
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							164
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)							67.3
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							75.6
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							341
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,544
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							4,532

Table 58: *E-B+ scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		678	0.89	0.865	0.635	0.43	0.035
Monetary damages from air pollution - Natural Gas (million 2019$)		200	118	59.1	37.9	19.1	8.1
Monetary damages from air pollution - Transportation (million 2019$)		1,565	1,579	1,538	1,387	1,106	761
Premature deaths from air pollution - Coal (deaths)		76.6	0.101	0.098	0.072	0.049	0.004
Premature deaths from air pollution - Natural Gas (deaths)		22.6	13.3	6.67	4.27	2.16	0.915
Premature deaths from air pollution - Transportation (deaths)		176	178	173	156	124	85.5

Table 59: *REF scenario - PILLAR 1: Efficiency/Electrification - Commercial*

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)	0	19,056	19,846	0	0	0	0
Sales of cooking units - Electric Resistance (%)	43.5	45.6	45.9	45.7	46	45.9	45.7
Sales of cooking units - Gas (%)	56.5	54.4	54.1	54.3	54	54.1	54.3
Sales of space heating units - Electric Heat Pump (%)	9.56	27.5	56.9	76.1	79	79.4	79.4
Sales of space heating units - Electric Resistance (%)	4.81	5.67	10	15.4	18.7	19.2	19.2
Sales of space heating units - Fossil (%)	0	2.93	1.3	0.192	0.019	0	0
Sales of space heating units - Gas Furnace (%)	85.6	63.9	31.8	8.33	2.28	1.48	1.43
Sales of water heating units - Electric Heat Pump (%)	0.155	0.153	0.147	0.149	0.149	0.146	0.148
Sales of water heating units - Electric Resistance (%)	5.74	5.75	5.58	5.66	5.62	5.56	5.61
Sales of water heating units - Gas Furnace (%)	92.5	92.5	92.7	92.6	92.7	92.7	92.7
Sales of water heating units - Other (%)	1.59	1.58	1.58	1.58	1.58	1.57	1.56

Table 60: *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)		4.86	5	5.95	6.18	5.74	5.89

Table 61: *REF scenario - PILLAR 1: Efficiency/Electrification - Overview*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	171	174	176	176	177	181	190
Final energy use - Industry (PJ)	755	847	903	938	959	961	976
Final energy use - Residential (PJ)	260	244	236	230	227	228	229
Final energy use - Transportation (PJ)	680	628	576	545	545	562	584

Table 62: *REF scenario - PILLAR 1: Efficiency/Electrification - Residential*

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)	0	5.15	4.97	0	0	0	0
Sales of cooking units - Electric Resistance (%)	82.9	82.9	82.9	82.9	82.9	82.9	82.9
Sales of cooking units - Gas (%)	17.1	17.1	17.1	17.1	17.1	17.1	17.1
Sales of space heating units - Electric Heat Pump (%)	30.6	53.8	54.6	55.9	57.2	58.9	61.6
Sales of space heating units - Electric Resistance (%)	32	27.2	26.7	25.9	24.9	23.3	20.6
Sales of space heating units - Fossil (%)	4.21	3.29	3.32	3.27	3.22	3.18	3.2
Sales of space heating units - Gas (%)	33.2	15.8	15.4	14.9	14.7	14.6	14.6
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	68.9	80	80.1	80	79.9	79.9	79.9
Sales of water heating units - Gas Furnace (%)	27.4	17.5	17.3	17.5	17.6	17.5	17.6
Sales of water heating units - Other (%)	3.71	2.57	2.54	2.55	2.57	2.56	2.57

Table 63: *REF scenario - PILLAR 1: Efficiency/Electrification - Transportation*

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle sales - Heavy-duty - diesel (%)	98.1	98.2	97.9	97	95.6	93.5	91.6
Vehicle sales - Heavy-duty - EV (%)	0	0	0	0	0	0	0
Vehicle sales - Heavy-duty - gasoline (%)	0.229	0.242	0.257	0.274	0.294	0.317	0.343
Vehicle sales - Heavy-duty - hybrid (%)	0.083	0.096	0.112	0.13	0.15	0.174	0.202
Vehicle sales - Heavy-duty - hydrogen FC (%)	0.119	0.138	0.16	0.186	0.216	0.25	0.29
Vehicle sales - Heavy-duty - other (%)	1.51	1.31	1.57	2.37	3.69	5.71	7.57
Vehicle sales - Light-duty - diesel (%)	1.55	1.97	2.18	2.03	1.83	1.71	1.62
Vehicle sales - Light-duty - EV (%)	3.56	5.6	6.38	7.84	9.55	11.1	12.2
Vehicle sales - Light-duty - gasoline (%)	90.2	86.7	84.5	82.7	80.6	78.7	77.1
Vehicle sales - Light-duty - hybrid (%)	4.44	5.28	6.47	7.04	7.6	8.18	8.63
Vehicle sales - Light-duty - hydrogen FC (%)	0.111	0.377	0.346	0.307	0.304	0.305	0.315
Vehicle sales - Light-duty - other (%)	0.102	0.106	0.102	0.103	0.102	0.101	0.104
Vehicle sales - Medium-duty - diesel (%)	65.2	63.5	61.6	59.6	58	56.5	55.2
Vehicle sales - Medium-duty - EV (%)	0.027	0.105	0.329	0.671	0.895	0.973	0.993
Vehicle sales - Medium-duty - gasoline (%)	34	35.5	37	38.5	39.7	40.8	41.7
Vehicle sales - Medium-duty - hybrid (%)	0.365	0.427	0.496	0.577	0.674	0.793	0.929
Vehicle sales - Medium-duty - hydrogen FC (%)	0.175	0.208	0.242	0.285	0.339	0.409	0.487
Vehicle sales - Medium-duty - other (%)	0.255	0.271	0.298	0.345	0.42	0.528	0.671

Table 64: *REF scenario - PILLAR 6: Land sinks - Forests*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-116
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-31,364
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-2,178
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-5,783
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-591
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-6,834
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-928
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-1,525
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-9,586
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,823
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-57.9
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-8,323
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-363
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,221
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-301
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-2,278
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-325
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-763

Table 64: *REF scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-726
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,289
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-86.8
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-19,839
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,271
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-4,002
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-441
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-4,556
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-626
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-1,144
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-5,156
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,556
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							18.9
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							295
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							2,949
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							218
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)							88.2
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							101
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							272
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,267
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							5,209
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							9.46
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							277
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,130

Table 64: *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)							109
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)							46.4
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							50.4
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							47.2
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							767
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							2,436
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							14.2
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							286
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							2,039
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							164
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)							67.3
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							75.6
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							341
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,544
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							4,532

Table 65: *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)	-8.29		-10.7				-8.71
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-1.86		-3.1				-3.26
Business-as-usual carbon sink - Total (Mt CO2e/y)	-10.1		-13.8				-12

Table 66: *REF scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		2,413	1,652	1,307	1,127	1,062	1,052
Monetary damages from air pollution - Natural Gas (million 2019$)		191	205	222	261	220	209
Monetary damages from air pollution - Transportation (million 2019$)		1,564	1,601	1,639	1,685	1,732	1,780
Premature deaths from air pollution - Coal (deaths)		273	187	148	127	120	119
Premature deaths from air pollution - Natural Gas (deaths)		21.5	23.2	25.1	29.4	24.8	23.6
Premature deaths from air pollution - Transportation (deaths)		176	180	184	190	195	200