Net-Zero America - alabama state report

2021-03-15

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)		13,557	15,391				
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 (%)	11.7	29.4	77	90.8	91.9	92	92
Sales of space heating units - Electric Resistance (%)	5.83	4.63	4.92	6.27	6.62	6.6	6.56
Sales of space heating units - Fossil (%)	0	2.9	0.562	0.024	0	0	0
Sales of space heating units - Gas Furnace (%)	82.5	63.1	17.5	2.95	1.48	1.44	1.44
Sales of water heating units - Electric Heat Pump (%)	0.191	10.6	55.6	65.6	66.1	66.1	66.1
Sales of water heating units - Electric Resistance (%)	7.05	10.1	28.1	32.2	32.3	32.3	32.3
Sales of water heating units - Gas Furnace (%)	90.8	77.7	14.7	0.619	0	0	0
Sales of water heating units - Other (%)	1.97	1.59	1.58	1.59	1.59	1.58	1.57

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)		3.72	3.8	5.83	6.14	5	5.13

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	116	116	112	106	101	99.4	100
Final energy use - Industry (PJ)	551	582	615	609	632	649	656
Final energy use - Residential (PJ)	163	153	141	126	114	108	105
Final energy use - Transportation (PJ)	546	508	443	365	294	250	232

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)		3.86	4.57				
Sales of cooking units - Electric Resistance (%)	83.7	87.1	97.8	99.9	100	100	100
Sales of cooking units - Gas (%)	16.3	12.9	2.2	0.111	0	0	0
Sales of space heating units - Electric Heat Pump (%)	34.1	48.8	80.6	87.8	88.1	88	88
Sales of space heating units - Electric Resistance (%)	32.6	30.4	12.8	8.81	8.63	8.75	8.76
Sales of space heating units - Fossil (%)	6.33	6.33	2.2	1.25	1.2	1.18	1.18
Sales of space heating units - Gas (%)	27	14.4	4.38	2.16	2.08	2.05	2.05
Sales of water heating units - Electric Heat Pump (%)	0	12.1	64.3	75.9	76.4	76.4	76.4
Sales of water heating units - Electric Resistance (%)	72.5	72.8	30.8	21.4	21	21	21
Sales of water heating units - Gas Furnace (%)	23.5	12.5	2.34	0.099	0	0	0
Sales of water heating units - Other (%)	3.93	2.64	2.61	2.62	2.63	2.63	2.64

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)		1,020	2,605	4,234	6,409	6,981	6,653
Public EV charging plugs - DC Fast (1000 units)	0.07		2.03		9.05		14.7
Public EV charging plugs - L2 (1000 units)	0.285		48.9		217		352
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 (%)	1.51	1.78	1.24	0.397	0.074	0.013	0
Vehicle sales - Light-duty - EV (%)	4.04	15.6	47	82	96.4	99.3	100
Vehicle sales - Light-duty - gasoline (%)	89.7	77.6	48.2	16.3	3.26	0.589	0
Vehicle sales - Light-duty - hybrid (%)	4.55	4.63	3.26	1.2	0.294	0.064	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.11	0.337	0.2	0.062	0.012	0.002	0
Vehicle sales - Light-duty - other (%)	0.1	0.096	0.062	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	0.009	0	0
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	0	0	11.9	0	0
Capital invested - Solar PV - Base (billion $2018)		0	8.49	8.3	8.81	17.6	21.6
Capital invested - Solar PV - Constrained (billion $2018)		0.546	5.41	8.67	9.99	17.4	20.8
Installed renewables - OffshoreWind - Base land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - OffshoreWind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	15.5	25	35.4	50.4	71.6	98.9	134
Installed renewables - Solar - Base land use assumptions (MW)	392	392	8,695	17,503	27,426	48,486	75,812
Installed renewables - Solar - Constrained land use assumptions (MW)	392	392	5,061	14,117	23,635	48,340	76,251
Installed renewables - Wind - Base land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0

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	8.94	8.94	8.94
Biomass w/ccu power plant (GWh)	0	0	0	0	13,376	13,376	13,376

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

Item	2020	2025	2030	2035	2040	2045	2050
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Base land use assumptions (GWh)	762	762	14,423	28,932	45,233	79,691	124,456
Solar - Constrained land use assumptions (GWh)	762	762	8,438	23,326	38,878	79,153	124,840
Wind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Wind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass purchases (million $2018/year)		0	0	184	681	1,049	1,049
Conversion capital investment - Cumulative 5-yr (million $2018)		0	0	3,509	10,945	7,022	0
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	1	1	1
Number of facilities - Beccs hydrogen (quantity)	0	0	0	4	4	11	11
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	1	1	1
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu (quantity)	0	0	0	0	10	10	10
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	3.24	10.3	22.7	36	37.5
Annual - BECCS (MMT)		0	0	4.51	17.3	26.4	26.3
Annual - Cement and lime (MMT)		0	3.24	3.35	3.32	6.84	7.07
Annual - NGCC (MMT)		0	0	2.46	2.07	2.77	4.1
Cumulative - All (MMT)		0	3.24	13.6	36.2	72.2	110
Cumulative - BECCS (MMT)		0	0	4.51	21.8	48.2	74.5
Cumulative - Cement and lime (MMT)		0	3.24	6.59	9.91	16.8	23.8
Cumulative - NGCC (MMT)		0	0	2.46	4.53	7.3	11.4

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

Item	2020	2025	2030	2035	2040	2045	2050
All (km)		0	648	2,591	3,732	4,532	4,874
Cumulative investment - All (million $2018)		0	2,094	4,991	6,149	6,901	7,104
Cumulative investment - Spur (million $2018)		0	222	1,248	2,405	3,157	3,361
Cumulative investment - Trunk (million $2018)		0	1,872	3,743	3,743	3,743	3,743
Spur (km)		0	313	1,922	3,063	3,862	4,205
Trunk (km)		0	335	669	669	669	669

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

Item	2020	2025	2030	2035	2040	2045	2050
CO2 storage (MMT)		0	2.19	8.81	16.3	27.5	35.4
Injection wells (wells)		0	2	10	18	32	38
Resource characterization, appraisal, permitting costs (million $2020)		14.6	263	417	417	417	417
Wells and facilities construction costs (million $2020)		0	80.8	315	561	938	1,164

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)							-57.1
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-2,225
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-58.1
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-2,340
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-57.1
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,171
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-29.1
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-1,257
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							33
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							1,003
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							106
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							1,142
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							33
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							528
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							52.8
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							614

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)							-340
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-58,635
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,902
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-11,580
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-6,158
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-22,452
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-592
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-3,048
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-7,006
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-5,558
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-170
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-19,687
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-317
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-4,448
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-3,133
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-7,484
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-207
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-1,524
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-531
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,873
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-255
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-39,107
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,110
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-8,014
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-4,591
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-14,968
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-400
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-2,286
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-3,768
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-3,715

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 - Accelerate regeneration (1000 hectares)							55.6
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							258
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							5,905
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							2,269
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)							56.3
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							201
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							199
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,842
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							10,786
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							27.8
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							242
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,262
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							1,134
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)							29.6
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							101
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							34.5
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,115
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							4,946
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							41.7

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 - Avoid deforestation (over 30 years) (1000 hectares)							250
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							4,084
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							1,707
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)							42.9
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							151
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							249
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,245
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							8,770

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

Item	2020	2025	2030	2035	2040	2045	2050
Natural gas consumption - Annual (tcf)		580	489	392	295	186	129
Natural gas consumption - Cumulative (tcf)							11,820
Natural gas production - Annual (tcf)		165	156	136	115	91.3	70.9
Oil consumption - Annual (million bbls)		87.1	73.9	54.9	37.3	23.4	12.6
Oil consumption - Cumulative (million bbls)							1,701
Oil production - Annual (million bbls)		10.5	10.6	10.6	8.36	6.8	4.52

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		353	0.481	0.436	0.278	0.171	0.012
Monetary damages from air pollution - Natural Gas (million 2019$)		178	153	88.5	71.5	32.5	11.9
Monetary damages from air pollution - Transportation (million 2019$)		985	912	688	394	178	68.5
Premature deaths from air pollution - Coal (deaths)		39.9	0.054	0.049	0.031	0.019	0.001
Premature deaths from air pollution - Natural Gas (deaths)		20.1	17.2	9.99	8.07	3.67	1.34
Premature deaths from air pollution - Transportation (deaths)		111	103	77.4	44.4	20	7.7

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		207	421	539	1,339	1,627	1,339
By economic sector - Construction (jobs)		5,929	12,364	14,210	16,054	22,563	29,736
By economic sector - Manufacturing (jobs)		8,956	10,678	13,714	13,720	12,169	15,204
By economic sector - Mining (jobs)		5,168	3,824	2,875	1,979	1,428	977

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Other (jobs)		292	1,573	1,918	2,529	4,410	6,741
By economic sector - Pipeline (jobs)		667	817	856	628	561	568
By economic sector - Professional (jobs)		3,843	5,608	6,120	7,886	11,430	14,822
By economic sector - Trade (jobs)		2,898	3,909	4,098	4,796	7,083	9,798
By economic sector - Utilities (jobs)		10,656	12,382	13,961	15,065	18,246	22,436
By education level - All sectors - Associates degree or some college (jobs)		11,930	16,253	18,586	20,354	25,339	32,663
By education level - All sectors - Bachelors degree (jobs)		8,305	10,434	11,479	12,440	15,350	19,570
By education level - All sectors - Doctoral degree (jobs)		252	333	350	404	549	706
By education level - All sectors - High school diploma or less (jobs)		16,182	22,092	25,197	27,829	34,487	43,830
By education level - All sectors - Masters or professional degree (jobs)		1,950	2,464	2,680	2,970	3,792	4,853
By resource sector - Biomass (jobs)		890	1,161	1,535	4,031	5,935	5,718
By resource sector - CO2 (jobs)		5.69	2,217	3,546	2,622	3,152	3,827
By resource sector - Coal (jobs)		3,136	1,714	1,496	1,309	1,185	1,051
By resource sector - Grid (jobs)		10,559	13,544	18,082	21,853	29,969	39,050
By resource sector - Natural Gas (jobs)		9,132	8,036	6,638	7,116	5,084	3,801
By resource sector - Nuclear (jobs)		2,660	2,383	1,365	252	0	0
By resource sector - Oil (jobs)		6,244	5,177	4,041	2,741	1,846	1,054
By resource sector - Solar (jobs)		3,090	13,258	16,139	19,083	28,813	42,414
By resource sector - Wind (jobs)		2,900	4,086	5,449	4,989	3,533	4,707
Median wages - Annual - All ($2019 per job)		57,323	56,551	56,786	57,256	57,935	58,613
On-Site or In-Plant Training - Total jobs - 1 to 4 years (jobs)		6,220	8,438	9,583	10,455	13,005	16,678
On-Site or In-Plant Training - Total jobs - 4 to 10 years (jobs)		2,371	3,380	3,808	4,205	5,428	6,975
On-Site or In-Plant Training - Total jobs - None (jobs)		6,146	8,318	9,388	10,349	12,900	16,536
On-Site or In-Plant Training - Total jobs - Over 10 years (jobs)		307	431	500	554	698	898
On-Site or In-Plant Training - Total jobs - Up to 1 year (jobs)		23,574	31,009	35,013	38,434	47,485	60,535
On-the-Job Training - All sectors - 1 to 4 years (jobs)		7,977	10,848	12,314	13,422	16,716	21,450
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,256	3,298	3,738	4,156	5,414	6,983
On-the-Job Training - All sectors - None (jobs)		2,034	2,755	3,068	3,371	4,287	5,544
On-the-Job Training - All sectors - Over 10 years (jobs)		370	518	589	627	759	978
On-the-Job Training - All sectors - Up to 1 year (jobs)		25,981	34,158	38,582	42,421	52,341	66,667
Related work experience - All sectors - 1 to 4 years (jobs)		14,113	18,576	20,886	22,874	28,378	36,218
Related work experience - All sectors - 4 to 10 years (jobs)		8,971	11,929	13,442	14,648	18,180	23,272
Related work experience - All sectors - None (jobs)		5,446	7,402	8,425	9,341	11,688	14,944
Related work experience - All sectors - Over 10 years (jobs)		2,509	3,246	3,662	3,929	4,760	6,084
Related work experience - All sectors - Up to 1 year (jobs)		7,580	10,422	11,877	13,204	16,511	21,105
Wage income - All (million $2019)		2,214	2,917	3,310	3,665	4,607	5,957

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)		13,551	15,374				
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 (%)	11.7	20.3	25.7	41.5	66.1	83.2	89.6
Sales of space heating units - Electric Resistance (%)	5.83	4.63	4.65	4.79	5.28	5.94	6.33
Sales of space heating units - Fossil (%)	0	3.35	3.16	2.4	1.19	0.387	0.102
Sales of space heating units - Gas Furnace (%)	82.5	71.7	66.5	51.3	27.4	10.5	3.93
Sales of water heating units - Electric Heat Pump (%)	0.191	1.96	7.08	21.8	44.4	59.2	64.3
Sales of water heating units - Electric Resistance (%)	7.05	6.58	8.46	14.5	23.6	29.5	31.6
Sales of water heating units - Gas Furnace (%)	90.8	89.9	82.9	62.1	30.4	9.73	2.53
Sales of water heating units - Other (%)	1.97	1.59	1.58	1.59	1.59	1.58	1.57

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)		3.04	3.04	3.84	3.93	5.22	5.46

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	116	116	115	113	110	107	105
Final energy use - Industry (PJ)	551	582	616	613	638	655	660
Final energy use - Residential (PJ)	163	154	147	140	131	121	113
Final energy use - Transportation (PJ)	546	513	465	427	397	363	322

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)		3.81	4.31				
Sales of cooking units - Electric Resistance (%)	83.6	84	85.5	89.5	95	98.4	99.6
Sales of cooking units - Gas (%)	16.4	16	14.5	10.5	5.01	1.62	0.435
Sales of space heating units - Electric Heat Pump (%)	34.1	42.7	46.3	56.9	72.9	83.2	86.8
Sales of space heating units - Electric Resistance (%)	32.6	33.8	31.7	25.8	17	11.4	9.4
Sales of space heating units - Fossil (%)	6.33	7.13	6.71	5.24	3.12	1.79	1.34
Sales of space heating units - Gas (%)	27	16.4	15.2	12.1	7.04	3.65	2.47
Sales of water heating units - Electric Heat Pump (%)	0	2.09	8.02	25.1	51.3	68.4	74.3
Sales of water heating units - Electric Resistance (%)	72.5	80.9	76.2	62.3	41.2	27.4	22.6
Sales of water heating units - Gas Furnace (%)	23.5	14.4	13.2	9.97	4.91	1.56	0.408
Sales of water heating units - Other (%)	3.93	2.64	2.61	2.64	2.65	2.64	2.64

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	163	347	1,168	3,685	5,365
Public EV charging plugs - DC Fast (1000 units)	0.07		0.612		3.34		9.39
Public EV charging plugs - L2 (1000 units)	0.285		14.7		80.3		225
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 (%)	1.52	1.94	2.05	1.63	1.04	0.533	0.228
Vehicle sales - Light-duty - EV (%)	1.93	4.78	12.1	26.2	48.7	72.3	87.7
Vehicle sales - Light-duty - gasoline (%)	91.6	87.3	79.3	66.3	45.8	24.6	10.9
Vehicle sales - Light-duty - hybrid (%)	4.72	5.51	6.18	5.61	4.18	2.46	1.19
Vehicle sales - Light-duty - hydrogen FC (%)	0.113	0.379	0.324	0.246	0.174	0.097	0.045
Vehicle sales - Light-duty - other (%)	0.101	0.105	0.095	0.083	0.059	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)							-57.1
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-2,225
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-58.1
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-2,340
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-57.1
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,171
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-29.1
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-1,257
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							33
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							1,003
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							106

Table 22: *E- 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)							1,142
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							33
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							528
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							52.8
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							614

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)							-340
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-58,635
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,902
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-11,580
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-6,158
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-22,452
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-592
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-3,048
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-7,006
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-5,558
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-170
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-19,687
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-317
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-4,448
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-3,133
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-7,484
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-207
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-1,524
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-531
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,873
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-255

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-39,107
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,110
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-8,014
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-4,591
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-14,968
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-400
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-2,286
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-3,768
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-3,715
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							55.6
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							258
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							5,905
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							2,269
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)							56.3
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							201
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							199
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,842
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							10,786
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							27.8
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							242
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,262
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							1,134
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0

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 - Increase trees outside forests (1000 hectares)							29.6
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							101
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							34.5
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,115
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							4,946
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							41.7
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							250
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							4,084
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							1,707
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)							42.9
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							151
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							249
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,245
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							8,770

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		353	0.481	0.436	0.278	0.171	0.012
Monetary damages from air pollution - Natural Gas (million 2019$)		173	114	47.3	18.7	6	3.52
Monetary damages from air pollution - Transportation (million 2019$)		1,002	1,004	970	869	687	468
Premature deaths from air pollution - Coal (deaths)		39.9	0.054	0.049	0.031	0.019	0.001
Premature deaths from air pollution - Natural Gas (deaths)		19.5	12.9	5.33	2.12	0.677	0.397
Premature deaths from air pollution - Transportation (deaths)		113	113	109	97.7	77.3	52.6

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)		13,557	15,391				
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 (%)	11.7	29.4	77	90.8	91.9	92	92
Sales of space heating units - Electric Resistance (%)	5.83	4.63	4.92	6.27	6.62	6.6	6.56
Sales of space heating units - Fossil (%)	0	2.9	0.562	0.024	0	0	0
Sales of space heating units - Gas Furnace (%)	82.5	63.1	17.5	2.95	1.48	1.44	1.44
Sales of water heating units - Electric Heat Pump (%)	0.191	10.6	55.6	65.6	66.1	66.1	66.1
Sales of water heating units - Electric Resistance (%)	7.05	10.1	28.1	32.2	32.3	32.3	32.3
Sales of water heating units - Gas Furnace (%)	90.8	77.7	14.7	0.619	0	0	0
Sales of water heating units - Other (%)	1.97	1.59	1.58	1.59	1.59	1.58	1.57

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)		3.72	3.8	5.83	6.14	5	5.13

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	116	116	112	106	101	99.4	100
Final energy use - Industry (PJ)	551	582	615	609	632	649	656
Final energy use - Residential (PJ)	163	153	141	126	114	108	105
Final energy use - Transportation (PJ)	546	508	443	365	294	250	232

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)		3.86	4.57				
Sales of cooking units - Electric Resistance (%)	83.7	87.1	97.8	99.9	100	100	100
Sales of cooking units - Gas (%)	16.3	12.9	2.2	0.111	0	0	0
Sales of space heating units - Electric Heat Pump (%)	34.1	48.8	80.6	87.8	88.1	88	88
Sales of space heating units - Electric Resistance (%)	32.6	30.4	12.8	8.81	8.63	8.75	8.76
Sales of space heating units - Fossil (%)	6.33	6.33	2.2	1.25	1.2	1.18	1.18
Sales of space heating units - Gas (%)	27	14.4	4.38	2.16	2.08	2.05	2.05
Sales of water heating units - Electric Heat Pump (%)	0	12.1	64.3	75.9	76.4	76.4	76.4
Sales of water heating units - Electric Resistance (%)	72.5	72.8	30.8	21.4	21	21	21
Sales of water heating units - Gas Furnace (%)	23.5	12.5	2.34	0.099	0	0	0
Sales of water heating units - Other (%)	3.93	2.64	2.61	2.62	2.63	2.63	2.64

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)		1,020	2,605	4,234	6,409	6,981	6,653
Public EV charging plugs - DC Fast (1000 units)	0.07		2.03		9.05		14.7
Public EV charging plugs - L2 (1000 units)	0.285		48.9		217		352
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 (%)	1.51	1.78	1.24	0.397	0.074	0.013	0
Vehicle sales - Light-duty - EV (%)	4.04	15.6	47	82	96.4	99.3	100
Vehicle sales - Light-duty - gasoline (%)	89.7	77.6	48.2	16.3	3.26	0.589	0
Vehicle sales - Light-duty - hybrid (%)	4.55	4.63	3.26	1.2	0.294	0.064	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.11	0.337	0.2	0.062	0.012	0.002	0
Vehicle sales - Light-duty - other (%)	0.1	0.096	0.062	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 - Offshore Wind - Base (billion $2018)		0	0	0	0	0	3.29
Capital invested - Solar PV - Base (billion $2018)		2.39	5.53	18.1	24.6	35.5	53.9
Installed renewables - OffshoreWind - Base land use assumptions (MW)	0	0	0	0	0	0	2,629
Installed renewables - OffshoreWind - Constrained land use assumptions (MW)	0	0	0	0	0	0	4,505
Installed renewables - Solar - Base land use assumptions (MW)	392	2,485	7,896	27,167	54,926	97,316	165,389
Installed renewables - Solar - Constrained land use assumptions (MW)	784	784	15,409	52,039	110,774	187,296	322,386
Installed renewables - Wind - Base land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	7,836
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	13,386
Solar - Base land use assumptions (GWh)	762	4,206	13,083	44,797	90,138	159,581	271,134
Solar - Constrained land use assumptions (GWh)	1,525	1,525	25,563	85,807	181,940	307,228	528,729
Wind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Wind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0

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)							-57.1
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-2,225
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-58.1
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-2,340
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-57.1
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,171
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-29.1
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-1,257
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							33
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							1,003
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							106
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							1,142
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							33
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							528
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							52.8
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							614

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)							-340
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-58,635
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,902
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-11,580
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-6,158
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-22,452

Table 33: *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)							-592
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-3,048
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-7,006
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-5,558
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-170
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-19,687
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-317
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-4,448
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-3,133
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-7,484
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-207
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-1,524
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-531
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,873
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-255
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-39,107
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,110
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-8,014
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-4,591
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-14,968
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-400
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-2,286
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-3,768
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-3,715
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							55.6
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							258
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							5,905
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							2,269

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 - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							56.3
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							201
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							199
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,842
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							10,786
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							27.8
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							242
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,262
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							1,134
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)							29.6
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							101
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							34.5
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,115
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							4,946
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							41.7
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							250
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							4,084
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							1,707
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)							42.9

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 - Mid - Reforest cropland (1000 hectares)							151
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							249
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,245
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							8,770

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		353	0.481	0.436	0.278	0.171	0.012
Monetary damages from air pollution - Natural Gas (million 2019$)		207	156	86.3	52.2	11.5	3.95
Monetary damages from air pollution - Transportation (million 2019$)		985	912	688	394	178	68.5
Premature deaths from air pollution - Coal (deaths)		39.9	0.054	0.049	0.031	0.019	0.001
Premature deaths from air pollution - Natural Gas (deaths)		23.4	17.6	9.74	5.9	1.29	0.446
Premature deaths from air pollution - Transportation (deaths)		111	103	77.4	44.4	20	7.7

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)		13,557	15,391				
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 (%)	11.7	29.4	77	90.8	91.9	92	92
Sales of space heating units - Electric Resistance (%)	5.83	4.63	4.92	6.27	6.62	6.6	6.56
Sales of space heating units - Fossil (%)	0	2.9	0.562	0.024	0	0	0
Sales of space heating units - Gas Furnace (%)	82.5	63.1	17.5	2.95	1.48	1.44	1.44
Sales of water heating units - Electric Heat Pump (%)	0.191	10.6	55.6	65.6	66.1	66.1	66.1
Sales of water heating units - Electric Resistance (%)	7.05	10.1	28.1	32.2	32.3	32.3	32.3
Sales of water heating units - Gas Furnace (%)	90.8	77.7	14.7	0.619	0	0	0
Sales of water heating units - Other (%)	1.97	1.59	1.58	1.59	1.59	1.58	1.57

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)		3.72	3.8	5.83	6.14	5	5.13

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	116	116	112	106	101	99.4	100

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Industry (PJ)	551	582	615	609	632	649	656
Final energy use - Residential (PJ)	163	153	141	126	114	108	105
Final energy use - Transportation (PJ)	546	508	443	365	294	250	232

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)		3.86	4.57				
Sales of cooking units - Electric Resistance (%)	83.7	87.1	97.8	99.9	100	100	100
Sales of cooking units - Gas (%)	16.3	12.9	2.2	0.111	0	0	0
Sales of space heating units - Electric Heat Pump (%)	34.1	48.8	80.6	87.8	88.1	88	88
Sales of space heating units - Electric Resistance (%)	32.6	30.4	12.8	8.81	8.63	8.75	8.76
Sales of space heating units - Fossil (%)	6.33	6.33	2.2	1.25	1.2	1.18	1.18
Sales of space heating units - Gas (%)	27	14.4	4.38	2.16	2.08	2.05	2.05
Sales of water heating units - Electric Heat Pump (%)	0	12.1	64.3	75.9	76.4	76.4	76.4
Sales of water heating units - Electric Resistance (%)	72.5	72.8	30.8	21.4	21	21	21
Sales of water heating units - Gas Furnace (%)	23.5	12.5	2.34	0.099	0	0	0
Sales of water heating units - Other (%)	3.93	2.64	2.61	2.62	2.63	2.63	2.64

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)		1,020	2,605	4,234	6,409	6,981	6,653
Public EV charging plugs - DC Fast (1000 units)	0.07		2.03		9.05		14.7
Public EV charging plugs - L2 (1000 units)	0.285		48.9		217		352
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 (%)	1.51	1.78	1.24	0.397	0.074	0.013	0
Vehicle sales - Light-duty - EV (%)	4.04	15.6	47	82	96.4	99.3	100
Vehicle sales - Light-duty - gasoline (%)	89.7	77.6	48.2	16.3	3.26	0.589	0
Vehicle sales - Light-duty - hybrid (%)	4.55	4.63	3.26	1.2	0.294	0.064	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.11	0.337	0.2	0.062	0.012	0.002	0
Vehicle sales - Light-duty - other (%)	0.1	0.096	0.062	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	0.69	3.37	4.54	3.65	0
Capital invested - Solar PV - Constrained (billion $2018)		0	0.748	2.12	3.82	3.34	1.22
Installed renewables - OffshoreWind - Base land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - OffshoreWind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - Solar - Base land use assumptions (MW)	392	392	1,067	4,645	9,763	14,117	14,117
Installed renewables - Solar - Constrained land use assumptions (MW)	392	392	1,123	3,373	7,671	11,653	13,195
Installed renewables - Wind - Base land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Base land use assumptions (GWh)	762	762	1,865	7,748	16,195	23,323	23,323
Solar - Constrained land use assumptions (GWh)	762	762	1,957	5,634	12,672	19,247	21,780
Wind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Wind - Constrained land use assumptions (GWh)	0	0	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)							-57.1
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-2,225
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-58.1
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-2,340
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-57.1
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,171
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-29.1
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-1,257
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							33

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							1,003
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							106
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							1,142
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							33
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							528
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							52.8
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							614

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)							-340
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-58,635
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,902
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-11,580
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-6,158
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-22,452
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-592
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-3,048
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-7,006
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-5,558
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-170
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-19,687
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-317
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-4,448
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-3,133
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-7,484
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-207
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-1,524

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-531
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,873
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-255
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-39,107
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,110
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-8,014
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-4,591
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-14,968
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-400
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-2,286
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-3,768
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-3,715
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							55.6
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							258
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							5,905
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							2,269
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)							56.3
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							201
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							199
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,842
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							10,786
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							27.8
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							242
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,262

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 - Low - Improve plantations (1000 hectares)							1,134
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)							29.6
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							101
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							34.5
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,115
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							4,946
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							41.7
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							250
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							4,084
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							1,707
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)							42.9
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							151
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							249
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,245
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							8,770

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		353	0.481	0.436	0.278	0.171	0.012
Monetary damages from air pollution - Natural Gas (million 2019$)		160	144	133	103	36.1	12.4
Monetary damages from air pollution - Transportation (million 2019$)		985	912	688	394	178	68.5
Premature deaths from air pollution - Coal (deaths)		39.9	0.054	0.049	0.031	0.019	0.001
Premature deaths from air pollution - Natural Gas (deaths)		18.1	16.3	15	11.6	4.07	1.39
Premature deaths from air pollution - Transportation (deaths)		111	103	77.4	44.4	20	7.7

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)		13,551	15,374				
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 (%)	11.7	20.3	25.7	41.5	66.1	83.2	89.6
Sales of space heating units - Electric Resistance (%)	5.83	4.63	4.65	4.79	5.28	5.94	6.33
Sales of space heating units - Fossil (%)	0	3.35	3.16	2.4	1.19	0.387	0.102
Sales of space heating units - Gas Furnace (%)	82.5	71.7	66.5	51.3	27.4	10.5	3.93
Sales of water heating units - Electric Heat Pump (%)	0.191	1.96	7.08	21.8	44.4	59.2	64.3
Sales of water heating units - Electric Resistance (%)	7.05	6.58	8.46	14.5	23.6	29.5	31.6
Sales of water heating units - Gas Furnace (%)	90.8	89.9	82.9	62.1	30.4	9.73	2.53
Sales of water heating units - Other (%)	1.97	1.59	1.58	1.59	1.59	1.58	1.57

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)		3.04	3.04	3.84	3.93	5.22	5.46

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	116	116	115	113	110	107	105
Final energy use - Industry (PJ)	551	582	616	613	638	655	660
Final energy use - Residential (PJ)	163	154	147	140	131	121	113
Final energy use - Transportation (PJ)	546	513	465	427	397	363	322

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)		3.81	4.31				
Sales of cooking units - Electric Resistance (%)	83.6	84	85.5	89.5	95	98.4	99.6
Sales of cooking units - Gas (%)	16.4	16	14.5	10.5	5.01	1.62	0.435
Sales of space heating units - Electric Heat Pump (%)	34.1	42.7	46.3	56.9	72.9	83.2	86.8
Sales of space heating units - Electric Resistance (%)	32.6	33.8	31.7	25.8	17	11.4	9.4
Sales of space heating units - Fossil (%)	6.33	7.13	6.71	5.24	3.12	1.79	1.34
Sales of space heating units - Gas (%)	27	16.4	15.2	12.1	7.04	3.65	2.47
Sales of water heating units - Electric Heat Pump (%)	0	2.09	8.02	25.1	51.3	68.4	74.3
Sales of water heating units - Electric Resistance (%)	72.5	80.9	76.2	62.3	41.2	27.4	22.6
Sales of water heating units - Gas Furnace (%)	23.5	14.4	13.2	9.97	4.91	1.56	0.408
Sales of water heating units - Other (%)	3.93	2.64	2.61	2.64	2.65	2.64	2.64

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	163	347	1,168	3,685	5,365
Public EV charging plugs - DC Fast (1000 units)	0.07		0.612		3.34		9.39
Public EV charging plugs - L2 (1000 units)	0.285		14.7		80.3		225
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 (%)	1.52	1.94	2.05	1.63	1.04	0.533	0.228
Vehicle sales - Light-duty - EV (%)	1.93	4.78	12.1	26.2	48.7	72.3	87.7
Vehicle sales - Light-duty - gasoline (%)	91.6	87.3	79.3	66.3	45.8	24.6	10.9
Vehicle sales - Light-duty - hybrid (%)	4.72	5.51	6.18	5.61	4.18	2.46	1.19
Vehicle sales - Light-duty - hydrogen FC (%)	0.113	0.379	0.324	0.246	0.174	0.097	0.045
Vehicle sales - Light-duty - other (%)	0.101	0.105	0.095	0.083	0.059	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	0	0	0
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	0	7.01	16.4	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	0	0	0	0
Biomass w/ccu power plant (GWh)	0	0	0	7,863	26,215	26,215	26,215

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	479	2,220	3,039	3,039
Conversion capital investment - Cumulative 5-yr (million $2018)		0	0	6,531	22,561	9,661	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	1	10	21	21
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	6	20	20	20
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	1	2	2	2
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	3.24	11.2	39.1	55	55.8
Annual - BECCS (MMT)		0	0	7.89	35.8	48.2	48.1
Annual - Cement and lime (MMT)		0	3.24	3.35	3.32	6.84	7.07
Annual - NGCC (MMT)		0	0	0	0	0	0.69
Cumulative - All (MMT)		0	3.24	14.5	53.6	109	164
Cumulative - BECCS (MMT)		0	0	7.89	43.6	91.8	140
Cumulative - Cement and lime (MMT)		0	3.24	6.59	9.91	16.8	23.8
Cumulative - NGCC (MMT)		0	0	0	0	0	0.69

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

Item	2020	2025	2030	2035	2040	2045	2050
All (km)		0	648	2,004	2,846	4,113	4,308
Cumulative investment - All (million $2018)		0	2,093	5,131	6,675	7,991	8,051
Cumulative investment - Spur (million $2018)		0	221	1,388	2,806	4,123	4,183
Cumulative investment - Trunk (million $2018)		0	1,872	3,743	3,869	3,869	3,869
Spur (km)		0	313	1,335	2,177	3,443	3,639
Trunk (km)		0	335	669	669	669	669

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

Item	2020	2025	2030	2035	2040	2045	2050
CO2 storage (MMT)		0	3.69	15	30.9	43.3	46.8
Injection wells (wells)		0	4	14	26	44	56
Resource characterization, appraisal, permitting costs (million $2020)		14.6	361	580	580	580	580
Wells and facilities construction costs (million $2020)		0	114	446	795	1,330	1,651

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)							-216
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-2,063
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)							-53.1
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-2,332

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-216
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,085
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)							-26.6
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-1,328
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							118
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							2,276
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)							45.6
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)							327
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							96.7
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							2,863
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							118
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							485
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)							45.6
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)							327
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							48.3
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,024

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)							-340
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-58,635
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,902

Table 57: *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)							-11,580
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-6,158
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-22,452
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-592
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-3,048
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-7,006
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-5,558
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-170
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-19,687
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-317
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-4,448
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-3,133
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-7,484
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-207
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-1,524
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-531
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,873
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-255
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-39,107
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,110
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-8,014
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-4,591
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-14,968
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-400
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-2,286
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-3,768
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-3,715
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							55.6
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							258

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 - High - Extend rotation length (1000 hectares)							5,905
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							2,269
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)							56.3
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							201
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							199
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,842
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							10,786
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							27.8
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							242
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,262
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							1,134
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)							29.6
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							101
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							34.5
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,115
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							4,946
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							41.7
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							250
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							4,084
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							1,707

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 - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							42.9
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							151
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							249
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,245
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							8,770

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		353	0.481	0.436	0.278	0.171	0.012
Monetary damages from air pollution - Natural Gas (million 2019$)		215	138	58.7	36.8	18.5	7.59
Monetary damages from air pollution - Transportation (million 2019$)		1,002	1,004	970	869	687	468
Premature deaths from air pollution - Coal (deaths)		39.9	0.054	0.049	0.031	0.019	0.001
Premature deaths from air pollution - Natural Gas (deaths)		24.3	15.6	6.62	4.15	2.09	0.857
Premature deaths from air pollution - Transportation (deaths)		113	113	109	97.7	77.3	52.6

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)		13,308	13,855				
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 (%)	11.7	32	71.2	79	79.3	79.3	79.4
Sales of space heating units - Electric Resistance (%)	5.83	6.42	12	15.8	18.7	19.2	19.2
Sales of space heating units - Fossil (%)	0	2.68	0.471	0.024	0	0	0
Sales of space heating units - Gas Furnace (%)	82.5	58.9	16.3	5.24	1.95	1.49	1.44
Sales of water heating units - Electric Heat Pump (%)	0.191	0.157	0.15	0.153	0.152	0.148	0.15
Sales of water heating units - Electric Resistance (%)	7.05	5.85	5.67	5.75	5.7	5.62	5.68
Sales of water heating units - Gas Furnace (%)	90.8	92.4	92.6	92.5	92.6	92.7	92.6
Sales of water heating units - Other (%)	1.97	1.59	1.58	1.59	1.59	1.58	1.57

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)		4.01	4.13	5.56	5.83	5.01	5.15

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	116	118	119	119	120	124	129
Final energy use - Industry (PJ)	551	594	623	639	664	684	709
Final energy use - Residential (PJ)	163	154	151	149	149	150	153
Final energy use - Transportation (PJ)	546	512	468	441	440	453	469

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)		3.76	3.8				
Sales of cooking units - Electric Resistance (%)	83.5	83.5	83.5	83.5	83.5	83.5	83.5
Sales of cooking units - Gas (%)	16.5	16.5	16.5	16.5	16.5	16.5	16.5
Sales of space heating units - Electric Heat Pump (%)	32.1	57	57.8	59.1	60.4	62.1	64.7
Sales of space heating units - Electric Resistance (%)	33.6	26.8	26.4	25.6	24.5	23	20.3
Sales of space heating units - Fossil (%)	6.48	4.04	4.09	4.01	3.92	3.88	3.9
Sales of space heating units - Gas (%)	27.8	12.1	11.7	11.3	11.2	11.1	11.1
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	72.5	82.6	82.7	82.5	82.4	82.4	82.3
Sales of water heating units - Gas Furnace (%)	23.5	14.8	14.7	14.9	15	15	15
Sales of water heating units - Other (%)	3.93	2.64	2.61	2.64	2.66	2.66	2.66

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 (%)	1.52	1.94	2.18	2.03	1.82	1.7	1.62
Vehicle sales - Light-duty - EV (%)	3.69	5.76	6.55	8.07	9.81	11.3	12.5
Vehicle sales - Light-duty - gasoline (%)	90	86.4	84.2	82.3	80.2	78.3	76.7
Vehicle sales - Light-duty - hybrid (%)	4.56	5.4	6.6	7.17	7.73	8.29	8.72
Vehicle sales - Light-duty - hydrogen FC (%)	0.111	0.375	0.344	0.305	0.301	0.302	0.312
Vehicle sales - Light-duty - other (%)	0.1	0.104	0.101	0.101	0.1	0.099	0.102
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)							-340
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-58,635
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,902
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-11,580
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-6,158
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-22,452
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-592
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-3,048
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-7,006
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-5,558
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-170
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-19,687
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-317
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-4,448
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-3,133
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-7,484
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-207
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-1,524
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-531
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,873
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-255
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-39,107
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,110
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-8,014
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-4,591
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-14,968
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-400
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-2,286
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-3,768
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-3,715

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							55.6
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							258
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							5,905
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							2,269
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)							56.3
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							201
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							199
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,842
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							10,786
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							27.8
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							242
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,262
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							1,134
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)							29.6
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							101
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							34.5
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,115
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							4,946
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							41.7

Table 64: *REF 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)							250
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							4,084
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							1,707
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)							42.9
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							151
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							249
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,245
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							8,770

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)	-56.9		-17.8				-14.4
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-6.11		-10.2				-10.7
Business-as-usual carbon sink - Total (Mt CO2e/y)	-63		-28				-25.1

Table 66: *REF scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		1,441	977	746	655	618	614
Monetary damages from air pollution - Natural Gas (million 2019$)		206	214	222	247	242	262
Monetary damages from air pollution - Transportation (million 2019$)		1,001	1,017	1,034	1,055	1,077	1,099
Premature deaths from air pollution - Coal (deaths)		163	110	84.2	74	69.8	69.4
Premature deaths from air pollution - Natural Gas (deaths)		23.3	24.2	25	27.9	27.4	29.6
Premature deaths from air pollution - Transportation (deaths)		113	114	116	119	121	124