Net-Zero America - kansas state report

2021-03-18

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)		8,255	8,955				
Sales of cooking units - Electric Resistance (%)	44.8	57.1	84	89.3	89.6	89.6	89.6
Sales of cooking units - Gas (%)	55.2	42.9	16	10.7	10.4	10.4	10.4
Sales of space heating units - Electric Heat Pump (%)	2.13	24.7	71.3	88	89.8	89.9	89.8
Sales of space heating units - Electric Resistance (%)	4.54	5.67	7.02	9.23	9.68	9.7	9.71
Sales of space heating units - Fossil (%)	0	1.73	0.333	0.014	0	0	0
Sales of space heating units - Gas Furnace (%)	93.3	67.9	21.4	2.81	0.539	0.45	0.45
Sales of water heating units - Electric Heat Pump (%)	0.677	10.7	53.8	64.7	65.3	65.3	65.3
Sales of water heating units - Electric Resistance (%)	5.85	10.9	28.5	33.6	34	34	34
Sales of water heating units - Gas Furnace (%)	92.9	77.4	17	1.1	0.03	0	0
Sales of water heating units - Other (%)	0.567	0.935	0.728	0.68	0.677	0.679	0.679

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)		1.98	2.05	3.35	3.56	3.35	3.52

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

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

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

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)		515	1,320	2,139	3,240	3,527	3,363
Public EV charging plugs - DC Fast (1000 units)	0.119		0.964		4.24		6.85
Public EV charging plugs - L2 (1000 units)	0.786		23.3		102		165
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 (%)	1.63	1.89	1.29	0.414	0.076	0.013	0
Vehicle sales - Light-duty - EV (%)	3.63	14.3	45.1	81.3	96.3	99.3	100
Vehicle sales - Light-duty - gasoline (%)	90.4	79	50.2	17.1	3.36	0.592	0
Vehicle sales - Light-duty - hybrid (%)	4.15	4.34	3.12	1.17	0.283	0.061	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.111	0.344	0.21	0.065	0.013	0.002	0
Vehicle sales - Light-duty - other (%)	0.105	0.102	0.067	0.024	0.005	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	0.042
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	0	0	0	0	0.171
Capital invested - Solar PV - Base (billion $2018)		0	0	0	0	0	0.072
Capital invested - Solar PV - Constrained (billion $2018)		0.03	0	0.231	0	0	0.072
Capital invested - Wind - Base (billion $2018)		0	0.43	1.58	2.73	3.71	0.208
Capital invested - Wind - Constrained (billion $2018)		0.552	0.572	3.14	5.93	6.23	0.442
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)	318	560	817	1,203	1,752	2,467	3,398
Installed renewables - Solar - Base land use assumptions (MW)	26	26	26	26	26	26	117
Installed renewables - Solar - Constrained land use assumptions (MW)	20	20	20	266	266	266	266
Installed renewables - Wind - Base land use assumptions (MW)	7,594	7,594	7,917	9,189	11,497	14,802	14,998
Installed renewables - Wind - Constrained land use assumptions (MW)	7,594	7,594	8,086	9,880	14,223	19,337	19,704

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

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0.01	8.54	11.9	19.2	23
Annual - BECCS (MMT)		0	0	8.51	8.51	15.8	19.4
Annual - Cement and lime (MMT)		0	0	0	3.32	3.42	3.53
Annual - NGCC (MMT)		0	0.01	0.03	0.02	0.02	0.02
Cumulative - All (MMT)		0	0.01	8.55	20.4	39.6	62.6
Cumulative - BECCS (MMT)		0	0	8.51	17	32.8	52.2
Cumulative - Cement and lime (MMT)		0	0	0	3.32	6.74	10.3
Cumulative - NGCC (MMT)		0	0.01	0.04	0.06	0.08	0.1

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
CO2 storage (MMT)		0	0	1.76	2.71	4.3	5.59
Injection wells (wells)		0	1	3	6	10	12
Resource characterization, appraisal, permitting costs (million $2020)		77.2	185	216	216	216	216
Wells and facilities construction costs (million $2020)		0	25.7	100	178	298	371

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

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)							-149
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-41,112
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,700
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-983
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-44.9
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-536
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-3,607
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-26,772
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-6,646
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-674
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-74.7
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-16,316
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-283
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-378
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-22.8
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-179
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-1,263
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-13,386
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-503
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-227
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-112
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-28,714
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-992
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-680
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-33.4
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-357
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-2,435
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-20,079
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-3,575
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-451

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)							24.4
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							230
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							501
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							16.5
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							343
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							1,770
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							189
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							223
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							3,297
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							12.2
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							216
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							192
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							8.26
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							180
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							885
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							32.7
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							135
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,662
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							18.3

Table 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)							223
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							347
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							12.4
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							262
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							1,328
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							237
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							272
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							2,699

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		197	0.195	0.187	0.156	0.102	0.002
Monetary damages from air pollution - Natural Gas (million 2019$)		124	61.4	29	22	13.5	6.88
Monetary damages from air pollution - Transportation (million 2019$)		408	381	291	169	78.3	32.6
Premature deaths from air pollution - Coal (deaths)		22.2	0.022	0.021	0.018	0.011	0
Premature deaths from air pollution - Natural Gas (deaths)		14	6.93	3.27	2.48	1.53	0.776
Premature deaths from air pollution - Transportation (deaths)		45.8	42.9	32.7	19	8.81	3.67

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		859	862	1,542	1,069	1,011	967
By economic sector - Construction (jobs)		7,087	8,243	8,491	8,274	9,418	9,949
By economic sector - Manufacturing (jobs)		9,499	10,949	13,842	12,820	10,621	12,644
By economic sector - Mining (jobs)		5,896	4,715	3,680	2,449	1,671	1,018

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Other (jobs)		589	604	795	998	1,266	1,675
By economic sector - Pipeline (jobs)		462	898	638	333	282	285
By economic sector - Professional (jobs)		4,808	4,519	5,658	5,807	7,081	7,424
By economic sector - Trade (jobs)		3,966	3,634	3,760	3,632	4,017	4,200
By economic sector - Utilities (jobs)		5,314	6,897	6,851	6,241	7,443	7,285
By education level - All sectors - Associates degree or some college (jobs)		11,362	12,518	13,637	12,731	13,228	14,164
By education level - All sectors - Bachelors degree (jobs)		8,681	8,921	9,627	8,800	9,042	9,460
By education level - All sectors - Doctoral degree (jobs)		298	285	318	301	337	348
By education level - All sectors - High school diploma or less (jobs)		16,075	17,520	19,421	17,711	17,987	19,178
By education level - All sectors - Masters or professional degree (jobs)		2,063	2,078	2,254	2,080	2,213	2,296
By resource sector - Biomass (jobs)		2,016	1,965	3,877	2,915	3,727	4,270
By resource sector - CO2 (jobs)		40.2	4,051	2,478	673	946	1,523
By resource sector - Coal (jobs)		375	0	0	0	0	0
By resource sector - Grid (jobs)		6,177	6,527	8,658	9,892	12,196	11,959
By resource sector - Natural Gas (jobs)		4,634	3,727	3,007	2,479	1,988	1,210
By resource sector - Nuclear (jobs)		640	630	365	0.013	0.015	0.026
By resource sector - Oil (jobs)		11,916	10,519	9,106	6,609	4,912	3,139
By resource sector - Solar (jobs)		4,543	5,079	7,264	8,239	8,410	12,458
By resource sector - Wind (jobs)		8,138	8,823	10,502	10,816	10,627	10,886
Median wages - Annual - All ($2019 per job)		56,394	56,747	56,900	57,507	58,686	58,809
On-Site or In-Plant Training - Total jobs - 1 to 4 years (jobs)		5,990	6,559	7,079	6,552	6,789	7,192
On-Site or In-Plant Training - Total jobs - 4 to 10 years (jobs)		2,286	2,537	2,643	2,457	2,663	2,767
On-Site or In-Plant Training - Total jobs - None (jobs)		6,281	6,694	7,399	6,834	7,049	7,535
On-Site or In-Plant Training - Total jobs - Over 10 years (jobs)		296	334	362	338	356	378
On-Site or In-Plant Training - Total jobs - Up to 1 year (jobs)		23,626	25,197	27,774	25,442	25,951	27,574
On-the-Job Training - All sectors - 1 to 4 years (jobs)		7,616	8,369	8,993	8,342	8,687	9,197
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,124	2,390	2,494	2,341	2,572	2,684
On-the-Job Training - All sectors - None (jobs)		2,151	2,243	2,438	2,238	2,308	2,466
On-the-Job Training - All sectors - Over 10 years (jobs)		391	426	464	427	422	459
On-the-Job Training - All sectors - Up to 1 year (jobs)		26,198	27,894	30,868	28,275	28,818	30,640
Related work experience - All sectors - 1 to 4 years (jobs)		13,916	14,859	16,205	14,916	15,393	16,241
Related work experience - All sectors - 4 to 10 years (jobs)		8,861	9,535	10,294	9,513	9,860	10,418
Related work experience - All sectors - None (jobs)		5,414	5,885	6,454	5,918	6,112	6,499
Related work experience - All sectors - Over 10 years (jobs)		2,492	2,665	2,895	2,663	2,691	2,862
Related work experience - All sectors - Up to 1 year (jobs)		7,797	8,378	9,408	8,613	8,752	9,427
Wage income - All (million $2019)		2,170	2,345	2,575	2,394	2,512	2,673

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)		8,253	8,961				
Sales of cooking units - Electric Resistance (%)	44.8	49.3	53.1	63	76.9	85.5	88.5
Sales of cooking units - Gas (%)	55.2	50.7	46.9	37	23.1	14.5	11.5
Sales of space heating units - Electric Heat Pump (%)	2.13	16	21.4	36.9	61.7	79.8	87
Sales of space heating units - Electric Resistance (%)	4.54	5.5	5.66	6.18	7.29	8.59	9.36
Sales of space heating units - Fossil (%)	0	2	1.88	1.4	0.684	0.222	0.059
Sales of space heating units - Gas Furnace (%)	93.3	76.5	71.1	55.5	30.3	11.4	3.55
Sales of water heating units - Electric Heat Pump (%)	0.677	2.54	7.44	21.6	43.5	58.2	63.4
Sales of water heating units - Electric Resistance (%)	5.85	7.67	9.68	15.4	24.5	30.8	33.1
Sales of water heating units - Gas Furnace (%)	92.9	88.8	81.9	62.1	31.2	10.4	2.79
Sales of water heating units - Other (%)	0.567	0.974	0.953	0.882	0.777	0.711	0.687

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)		1.64	1.66	2.05	2.12	3.02	3.19

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

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

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

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	83.3	175	591	1,861	2,710
Public EV charging plugs - DC Fast (1000 units)	0.119		0.298		1.57		4.39
Public EV charging plugs - L2 (1000 units)	0.786		7.18		37.9		106
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 (%)	1.65	2.04	2.07	1.65	1.06	0.548	0.234
Vehicle sales - Light-duty - EV (%)	1.79	4.46	11.4	25.1	47.6	71.5	87.4
Vehicle sales - Light-duty - gasoline (%)	92.1	87.9	80.3	67.6	47.1	25.4	11.2
Vehicle sales - Light-duty - hybrid (%)	4.29	5.12	5.77	5.3	4.01	2.39	1.17
Vehicle sales - Light-duty - hydrogen FC (%)	0.113	0.383	0.331	0.254	0.182	0.101	0.047
Vehicle sales - Light-duty - other (%)	0.107	0.11	0.101	0.088	0.064	0.035	0.016
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)							-696
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-10,263
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-624
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-11,583
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-696
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-5,387
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-312
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-6,395
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							413
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							10,336
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							1,047

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)							11,796
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							413
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							5,430
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							524
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							6,366

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)							-149
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-41,112
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,700
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-983
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-44.9
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-536
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-3,607
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-26,772
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-6,646
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-674
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-74.7
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-16,316
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-283
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-378
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-22.8
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-179
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-1,263
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-13,386
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-503
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-227
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-112

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)							-28,714
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-992
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-680
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-33.4
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-357
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-2,435
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-20,079
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-3,575
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-451
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							24.4
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							230
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							501
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							16.5
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							343
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							1,770
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							189
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							223
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							3,297
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							12.2
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							216
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							192
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							8.26
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0

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)							180
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							885
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							32.7
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							135
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,662
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							18.3
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							223
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							347
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							12.4
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							262
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							1,328
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							237
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							272
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							2,699

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		197	0.195	0.187	0.156	0.102	0.002
Monetary damages from air pollution - Natural Gas (million 2019$)		122	51.1	25.4	13.5	5.35	4.06
Monetary damages from air pollution - Transportation (million 2019$)		414	419	410	371	297	205
Premature deaths from air pollution - Coal (deaths)		22.2	0.022	0.021	0.018	0.011	0
Premature deaths from air pollution - Natural Gas (deaths)		13.8	5.77	2.87	1.52	0.604	0.459
Premature deaths from air pollution - Transportation (deaths)		46.6	47.1	46.1	41.7	33.4	23

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)		8,255	8,955				
Sales of cooking units - Electric Resistance (%)	44.8	57.1	84	89.3	89.6	89.6	89.6
Sales of cooking units - Gas (%)	55.2	42.9	16	10.7	10.4	10.4	10.4
Sales of space heating units - Electric Heat Pump (%)	2.13	24.7	71.3	88	89.8	89.9	89.8
Sales of space heating units - Electric Resistance (%)	4.54	5.67	7.02	9.23	9.68	9.7	9.71
Sales of space heating units - Fossil (%)	0	1.73	0.333	0.014	0	0	0
Sales of space heating units - Gas Furnace (%)	93.3	67.9	21.4	2.81	0.539	0.45	0.45
Sales of water heating units - Electric Heat Pump (%)	0.677	10.7	53.8	64.7	65.3	65.3	65.3
Sales of water heating units - Electric Resistance (%)	5.85	10.9	28.5	33.6	34	34	34
Sales of water heating units - Gas Furnace (%)	92.9	77.4	17	1.1	0.03	0	0
Sales of water heating units - Other (%)	0.567	0.935	0.728	0.68	0.677	0.679	0.679

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)		1.98	2.05	3.35	3.56	3.35	3.52

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

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

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

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)		515	1,320	2,139	3,240	3,527	3,363
Public EV charging plugs - DC Fast (1000 units)	0.119		0.964		4.24		6.85
Public EV charging plugs - L2 (1000 units)	0.786		23.3		102		165
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 (%)	1.63	1.89	1.29	0.414	0.076	0.013	0
Vehicle sales - Light-duty - EV (%)	3.63	14.3	45.1	81.3	96.3	99.3	100
Vehicle sales - Light-duty - gasoline (%)	90.4	79	50.2	17.1	3.36	0.592	0
Vehicle sales - Light-duty - hybrid (%)	4.15	4.34	3.12	1.17	0.283	0.061	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.111	0.344	0.21	0.065	0.013	0.002	0
Vehicle sales - Light-duty - other (%)	0.105	0.102	0.067	0.024	0.005	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	0	0	0	0.093
Capital invested - Wind - Base (billion $2018)		0.117	0.849	4.31	12.7	27.9	36.6
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)	26	26	26	26	26	26	143
Installed renewables - Solar - Constrained land use assumptions (MW)	52	52	52	52	52	1,222	2,797
Installed renewables - Wind - Base land use assumptions (MW)	7,594	7,674	8,312	11,783	22,490	47,346	81,940
Installed renewables - Wind - Constrained land use assumptions (MW)	15,189	15,634	16,728	29,620	57,464	112,400	164,577

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	0
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Base land use assumptions (GWh)	58.5	58.5	58.5	58.5	58.5	58.5	274
Solar - Constrained land use assumptions (GWh)	117	117	117	117	117	2,193	4,951
Wind - Base land use assumptions (GWh)	31,394	31,691	34,060	46,683	84,776	171,754	291,098
Wind - Constrained land use assumptions (GWh)	62,787	64,440	68,416	114,196	210,095	394,449	561,516

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

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)							-149
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-41,112
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,700
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-983
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-44.9
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-536

Table 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)							-3,607
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-26,772
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-6,646
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-674
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-74.7
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-16,316
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-283
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-378
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-22.8
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-179
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-1,263
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-13,386
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-503
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-227
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-112
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-28,714
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-992
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-680
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-33.4
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-357
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-2,435
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-20,079
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-3,575
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-451
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							24.4
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							230
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							501
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							16.5

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)							343
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							1,770
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							189
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							223
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							3,297
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							12.2
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							216
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							192
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							8.26
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							180
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							885
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							32.7
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							135
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,662
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							18.3
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							223
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							347
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							12.4
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							262

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)							1,328
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							237
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							272
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							2,699

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		197	0.195	0.187	0.156	0.102	0.002
Monetary damages from air pollution - Natural Gas (million 2019$)		116	56.4	17.7	12.2	5.66	3.59
Monetary damages from air pollution - Transportation (million 2019$)		408	381	291	169	78.3	32.6
Premature deaths from air pollution - Coal (deaths)		22.2	0.022	0.021	0.018	0.011	0
Premature deaths from air pollution - Natural Gas (deaths)		13.1	6.36	2	1.38	0.639	0.405
Premature deaths from air pollution - Transportation (deaths)		45.8	42.9	32.7	19	8.81	3.67

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)		8,255	8,955				
Sales of cooking units - Electric Resistance (%)	44.8	57.1	84	89.3	89.6	89.6	89.6
Sales of cooking units - Gas (%)	55.2	42.9	16	10.7	10.4	10.4	10.4
Sales of space heating units - Electric Heat Pump (%)	2.13	24.7	71.3	88	89.8	89.9	89.8
Sales of space heating units - Electric Resistance (%)	4.54	5.67	7.02	9.23	9.68	9.7	9.71
Sales of space heating units - Fossil (%)	0	1.73	0.333	0.014	0	0	0
Sales of space heating units - Gas Furnace (%)	93.3	67.9	21.4	2.81	0.539	0.45	0.45
Sales of water heating units - Electric Heat Pump (%)	0.677	10.7	53.8	64.7	65.3	65.3	65.3
Sales of water heating units - Electric Resistance (%)	5.85	10.9	28.5	33.6	34	34	34
Sales of water heating units - Gas Furnace (%)	92.9	77.4	17	1.1	0.03	0	0
Sales of water heating units - Other (%)	0.567	0.935	0.728	0.68	0.677	0.679	0.679

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)		1.98	2.05	3.35	3.56	3.35	3.52

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	110	107	101	92.6	85.5	81	78.6

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

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

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

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)		515	1,320	2,139	3,240	3,527	3,363
Public EV charging plugs - DC Fast (1000 units)	0.119		0.964		4.24		6.85
Public EV charging plugs - L2 (1000 units)	0.786		23.3		102		165
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 (%)	1.63	1.89	1.29	0.414	0.076	0.013	0
Vehicle sales - Light-duty - EV (%)	3.63	14.3	45.1	81.3	96.3	99.3	100
Vehicle sales - Light-duty - gasoline (%)	90.4	79	50.2	17.1	3.36	0.592	0
Vehicle sales - Light-duty - hybrid (%)	4.15	4.34	3.12	1.17	0.283	0.061	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.111	0.344	0.21	0.065	0.013	0.002	0
Vehicle sales - Light-duty - other (%)	0.105	0.102	0.067	0.024	0.005	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	0	0	0
Capital invested - Solar PV - Constrained (billion $2018)		0	0	0	0	0	0
Capital invested - Wind - Base (billion $2018)		0	0	0.447	0.999	0.435	0
Capital invested - Wind - Constrained (billion $2018)		0	0	0.7	1.06	0.879	0
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)	26	26	26	26	26	26	26
Installed renewables - Solar - Constrained land use assumptions (MW)	26	26	26	26	26	26	26
Installed renewables - Wind - Base land use assumptions (MW)	7,594	7,594	7,594	7,955	8,801	9,189	9,189
Installed renewables - Wind - Constrained land use assumptions (MW)	7,594	7,594	7,594	8,159	9,059	9,844	9,844

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)	58.5	58.5	58.5	58.5	58.5	58.5	58.5
Solar - Constrained land use assumptions (GWh)	58.5	58.5	58.5	58.5	58.5	58.5	58.5
Wind - Base land use assumptions (GWh)	31,394	31,394	31,394	32,737	35,854	37,276	37,276
Wind - Constrained land use assumptions (GWh)	31,394	31,394	31,394	33,470	36,713	39,536	39,536

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

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

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)							-149
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-41,112
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,700
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-983
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-44.9
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-536
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-3,607
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-26,772
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-6,646
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-674
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-74.7
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-16,316
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-283
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-378
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-22.8
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-179
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-1,263

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-13,386
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-503
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-227
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-112
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-28,714
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-992
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-680
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-33.4
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-357
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-2,435
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-20,079
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-3,575
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-451
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							24.4
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							230
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							501
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							16.5
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							343
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							1,770
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							189
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							223
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							3,297
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							12.2
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							216

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 - Extend rotation length (1000 hectares)							192
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							8.26
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							180
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							885
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							32.7
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							135
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,662
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							18.3
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							223
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							347
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							12.4
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							262
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							1,328
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							237
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							272
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							2,699

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		197	0.195	0.187	0.156	0.102	0.002
Monetary damages from air pollution - Natural Gas (million 2019$)		129	56.7	58.2	44.1	18.6	7.41
Monetary damages from air pollution - Transportation (million 2019$)		408	381	291	169	78.3	32.6
Premature deaths from air pollution - Coal (deaths)		22.2	0.022	0.021	0.018	0.011	0

Table 44: *E+RE- scenario - IMPACTS - Health (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Natural Gas (deaths)		14.6	6.4	6.57	4.98	2.1	0.837
Premature deaths from air pollution - Transportation (deaths)		45.8	42.9	32.7	19	8.81	3.67

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)		8,253	8,961				
Sales of cooking units - Electric Resistance (%)	44.8	49.3	53.1	63	76.9	85.5	88.5
Sales of cooking units - Gas (%)	55.2	50.7	46.9	37	23.1	14.5	11.5
Sales of space heating units - Electric Heat Pump (%)	2.13	16	21.4	36.9	61.7	79.8	87
Sales of space heating units - Electric Resistance (%)	4.54	5.5	5.66	6.18	7.29	8.59	9.36
Sales of space heating units - Fossil (%)	0	2	1.88	1.4	0.684	0.222	0.059
Sales of space heating units - Gas Furnace (%)	93.3	76.5	71.1	55.5	30.3	11.4	3.55
Sales of water heating units - Electric Heat Pump (%)	0.677	2.54	7.44	21.6	43.5	58.2	63.4
Sales of water heating units - Electric Resistance (%)	5.85	7.67	9.68	15.4	24.5	30.8	33.1
Sales of water heating units - Gas Furnace (%)	92.9	88.8	81.9	62.1	31.2	10.4	2.79
Sales of water heating units - Other (%)	0.567	0.974	0.953	0.882	0.777	0.711	0.687

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)		1.64	1.66	2.05	2.12	3.02	3.19

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

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

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)		2.99	4.02				
Sales of cooking units - Electric Resistance (%)	66.3	67.2	70.2	78.4	89.7	96.7	99.1
Sales of cooking units - Gas (%)	33.7	32.8	29.8	21.6	10.3	3.33	0.895
Sales of space heating units - Electric Heat Pump (%)	4.79	10.1	16.5	34.7	63.2	82.5	89.3
Sales of space heating units - Electric Resistance (%)	11.9	16.6	15.6	12.9	8.54	5.65	4.74
Sales of space heating units - Fossil (%)	5.87	10.2	9.69	7.94	5.1	3.2	2.63
Sales of space heating units - Gas (%)	77.4	63	58.2	44.5	23.1	8.65	3.34
Sales of water heating units - Electric Heat Pump (%)	0	1.62	6.21	19.5	40	53.6	58.5
Sales of water heating units - Electric Resistance (%)	27.3	42.3	42	41.2	40.3	39.8	39.7

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Gas Furnace (%)	72.7	56	51.8	39.3	19.8	6.56	1.76
Sales of water heating units - Other (%)	0.024	0.027	0.027	0.027	0.027	0.027	0.027

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	83.3	175	591	1,861	2,710
Public EV charging plugs - DC Fast (1000 units)	0.119		0.298		1.57		4.39
Public EV charging plugs - L2 (1000 units)	0.786		7.18		37.9		106
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 (%)	1.65	2.04	2.07	1.65	1.06	0.548	0.234
Vehicle sales - Light-duty - EV (%)	1.79	4.46	11.4	25.1	47.6	71.5	87.4
Vehicle sales - Light-duty - gasoline (%)	92.1	87.9	80.3	67.6	47.1	25.4	11.2
Vehicle sales - Light-duty - hybrid (%)	4.29	5.12	5.77	5.3	4.01	2.39	1.17
Vehicle sales - Light-duty - hydrogen FC (%)	0.113	0.383	0.331	0.254	0.182	0.101	0.047
Vehicle sales - Light-duty - other (%)	0.107	0.11	0.101	0.088	0.064	0.035	0.016
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	0.004	0.02	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion $2018)	0	0	0	0	0	0.009	0
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	0	0	13.7	21.5	9.82

Table 51: *E-B+ scenario - PILLAR 2: Clean Electricity - Generation*

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass purchases (million $2018/year)		60	154	156	1,144	3,772	4,531
Conversion capital investment - Cumulative 5-yr (million $2018)		4.25	22.2	27.7	12,551	31,594	9,940
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	0	1	1

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

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	0	14	14
Number of facilities - Diesel (quantity)	0	0	0	1	1	1	1
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	1	1
Number of facilities - Power (quantity)	0	1	1	1	1	1	1
Number of facilities - Power ccu (quantity)	0	0	0	0	12	32	40
Number of facilities - Pyrolysis (quantity)	0	0	0	1	1	1	1
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	0	1	2
Number of facilities - Sng (quantity)	0	1	1	1	1	1	1
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0

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

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

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

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

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	25
Resource characterization, appraisal, permitting costs (million $2020)		77.2	216	278	278	278	278
Wells and facilities construction costs (million $2020)		0	51.4	200	357	597	741

Table 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)							-2,596
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-9,241
Carbon sink potential - Aggressive deployment - Cropland to woody energy crops (1000 tCO2e/y)							0

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Pasture to energy crops (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-556
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-12,393
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-2,596
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-4,848
Carbon sink potential - Moderate deployment - 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)							-278
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-7,721
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							1,528
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							22,937
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)							496
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)							1,272
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							931
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							27,165
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							1,528
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							4,878
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)							496
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)							1,272
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							466
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							8,639

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)							-149
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-41,112
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,700
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-983
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-44.9
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-536
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-3,607
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-26,772
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-6,646
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-674
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-74.7
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-16,316
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-283
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-378
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-22.8
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-179
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-1,263
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-13,386
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-503
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-227
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-112
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-28,714
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-992
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-680
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-33.4
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-357
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-2,435
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-20,079
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-3,575
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-451

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 - Accelerate regeneration (1000 hectares)							24.4
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							230
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							501
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							16.5
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							343
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							1,770
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							189
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							223
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							3,297
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							12.2
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							216
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							192
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							8.26
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							180
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							885
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							32.7
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							135
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,662
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							18.3

Table 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 - Avoid deforestation (over 30 years) (1000 hectares)							223
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							347
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							12.4
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							262
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							1,328
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							237
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							272
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							2,699

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		197	0.195	0.187	0.156	0.102	0.002
Monetary damages from air pollution - Natural Gas (million 2019$)		120	47.4	31.6	20.3	9.2	4.77
Monetary damages from air pollution - Transportation (million 2019$)		414	419	410	371	297	205
Premature deaths from air pollution - Coal (deaths)		22.2	0.022	0.021	0.018	0.011	0
Premature deaths from air pollution - Natural Gas (deaths)		13.5	5.35	3.57	2.3	1.04	0.539
Premature deaths from air pollution - Transportation (deaths)		46.6	47.1	46.1	41.7	33.4	23

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)		8,160	8,377				
Sales of cooking units - Electric Resistance (%)	44.8	47.8	47.9	47.8	47.9	47.9	48
Sales of cooking units - Gas (%)	55.2	52.2	52.1	52.2	52.1	52.1	52
Sales of space heating units - Electric Heat Pump (%)	2.13	20.6	48.3	71.1	74.8	75.3	75.3
Sales of space heating units - Electric Resistance (%)	4.54	6.37	10.8	18.4	23.4	24.2	24.3
Sales of space heating units - Fossil (%)	0	1.96	1.54	0.687	0.101	0.009	0
Sales of space heating units - Gas Furnace (%)	93.3	71.1	39.4	9.85	1.63	0.515	0.452
Sales of water heating units - Electric Heat Pump (%)	0.677	0.816	0.812	0.813	0.809	0.806	0.805
Sales of water heating units - Electric Resistance (%)	5.85	6.96	6.99	6.96	6.96	6.97	6.97

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Gas Furnace (%)	92.9	91.2	91.2	91.2	91.2	91.2	91.2
Sales of water heating units - Other (%)	0.567	0.983	0.985	0.982	0.982	0.985	0.986

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)		1.74	1.77	1.9	1.95	2.5	2.61

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

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

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)		2.83	3.07				
Sales of cooking units - Electric Resistance (%)	66	66	66	66	66	66	66
Sales of cooking units - Gas (%)	34	34	34	34	34	34	34
Sales of space heating units - Electric Heat Pump (%)	2.8	27.6	29.1	31.3	32.6	33.7	35
Sales of space heating units - Electric Resistance (%)	12.4	13.9	13.6	13.3	13.1	12.1	10.6
Sales of space heating units - Fossil (%)	6.08	6.99	7.07	7.06	6.83	6.72	6.86
Sales of space heating units - Gas (%)	78.7	51.5	50.2	48.4	47.5	47.5	47.5
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	27.3	42.4	42.3	42.2	42.2	42.2	42.1
Sales of water heating units - Gas Furnace (%)	72.7	57.5	57.6	57.7	57.7	57.8	57.8
Sales of water heating units - Other (%)	0.024	0.027	0.027	0.027	0.027	0.027	0.027

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 (%)	1.64	2.04	2.2	2.05	1.85	1.72	1.64
Vehicle sales - Light-duty - EV (%)	3.28	5.24	5.99	7.34	8.97	10.4	11.6
Vehicle sales - Light-duty - gasoline (%)	90.7	87.2	85.2	83.5	81.4	79.5	77.9
Vehicle sales - Light-duty - hybrid (%)	4.16	5.02	6.16	6.74	7.32	7.94	8.45
Vehicle sales - Light-duty - hydrogen FC (%)	0.111	0.38	0.351	0.313	0.311	0.312	0.323
Vehicle sales - Light-duty - other (%)	0.106	0.11	0.106	0.107	0.107	0.105	0.108
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

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

Item	2020	2025	2030	2035	2040	2045	2050
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)							-149
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-41,112
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,700
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-983
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-44.9
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-536
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-3,607
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-26,772
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-6,646
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-674
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-74.7
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-16,316
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-283
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-378
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-22.8
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-179
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-1,263
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-13,386
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-503
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-227
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-112
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-28,714
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-992
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-680
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-33.4
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-357

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-2,435
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-20,079
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-3,575
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-451
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							24.4
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							230
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							501
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							16.5
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							343
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							1,770
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							189
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							223
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							3,297
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							12.2
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							216
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							192
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							8.26
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							180
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							885
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							32.7
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							135

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 - Total impacted (over 30 years) (1000 hectares)							1,662
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							18.3
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							223
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							347
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							12.4
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							262
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							1,328
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							237
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							272
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							2,699

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)	-6.75		0.507				0.145
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-0.146		-0.303				-0.319
Business-as-usual carbon sink - Total (Mt CO2e/y)	-6.9		0.204				-0.174

Table 66: *REF scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		687	345	217	172	151	147
Monetary damages from air pollution - Natural Gas (million 2019$)		127	113	117	81.4	73.6	62.3
Monetary damages from air pollution - Transportation (million 2019$)		414	425	437	452	465	479
Premature deaths from air pollution - Coal (deaths)		77.6	39	24.5	19.5	17	16.6
Premature deaths from air pollution - Natural Gas (deaths)		14.4	12.7	13.2	9.19	8.31	7.03
Premature deaths from air pollution - Transportation (deaths)		46.6	47.8	49.2	50.8	52.3	53.9