Net-Zero America - iowa 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)		9,055	9,857				
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 (%)	2.46	7.62	30.1	77.9	86.5	87	87
Sales of space heating units - Electric Resistance (%)	4.11	5.76	8.25	11.9	12.5	12.5	12.5
Sales of space heating units - Fossil (%)	2.55	1.96	0.38	0.016	0	0	0
Sales of space heating units - Gas Furnace (%)	90.9	84.7	61.3	10.2	1.03	0.455	0.455
Sales of water heating units - Electric Heat Pump (%)	0.634	1.83	14.5	42	47	47.3	47.3
Sales of water heating units - Electric Resistance (%)	5.5	7.95	20.3	47	51.7	52	52
Sales of water heating units - Gas Furnace (%)	93	89.3	64.5	10.3	0.611	0	0
Sales of water heating units - Other (%)	0.862	0.936	0.728	0.68	0.676	0.678	0.678

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)		3.02	3.15	5.47	5.86	5.07	5.32

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	119	116	111	104	96.2	90.2	86.6
Final energy use - Industry (PJ)	698	727	740	738	743	749	755
Final energy use - Residential (PJ)	158	149	141	125	107	92.3	82.5
Final energy use - Transportation (PJ)	288	269	235	195	158	136	127

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)		2.73	3.43				
Sales of cooking units - Electric Resistance (%)	62.2	70.3	94.9	99.7	100	100	100
Sales of cooking units - Gas (%)	37.8	29.7	5.08	0.256	0	0	0
Sales of space heating units - Electric Heat Pump (%)	4.32	9.3	34.2	83.1	91.9	92.5	92.3
Sales of space heating units - Electric Resistance (%)	10.7	14.9	11.7	5.07	3.86	3.82	4.03
Sales of space heating units - Fossil (%)	10.9	17.4	12.6	4.14	2.53	2.35	2.41
Sales of space heating units - Gas (%)	74.1	58.4	41.4	7.68	1.69	1.31	1.28
Sales of water heating units - Electric Heat Pump (%)	0	0.81	11.1	33.7	37.7	37.9	37.9
Sales of water heating units - Electric Resistance (%)	25.3	40.6	46.5	59.5	61.9	62.1	62
Sales of water heating units - Gas Furnace (%)	74.7	58.5	42.4	6.78	0.4	0	0
Sales of water heating units - Other (%)	0.023	0.026	0.026	0.026	0.025	0.025	0.025

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)		710	1,814	2,950	4,464	4,863	4,634
Public EV charging plugs - DC Fast (1000 units)	0.103		1.41		6.29		10.2
Public EV charging plugs - L2 (1000 units)	0.26		34		151		245
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 (%)	1.71	1.95	1.32	0.425	0.077	0.013	0
Vehicle sales - Light-duty - EV (%)	3.38	13.6	43.9	80.8	96.2	99.3	100
Vehicle sales - Light-duty - gasoline (%)	90.8	79.9	51.4	17.5	3.42	0.594	0
Vehicle sales - Light-duty - hybrid (%)	3.9	4.16	3.03	1.15	0.275	0.059	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.111	0.349	0.216	0.068	0.013	0.002	0
Vehicle sales - Light-duty - other (%)	0.109	0.105	0.07	0.025	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	0.005	0.145	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion $2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion $2018)		0.206	3.13	1.6	4.19	3.71	12.2
Capital invested - Solar PV - Constrained (billion $2018)		1.52	5.68	4.23	7.07	2.88	9.72
Capital invested - Wind - Base (billion $2018)		5.86	8.69	23.4	24.2	37	53
Capital invested - Wind - Constrained (billion $2018)		13.8	10.4	16.5	14.7	6.29	1.17
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)	173	309	395	526	699	901	1,141
Installed renewables - Solar - Base land use assumptions (MW)	107	287	3,347	5,046	9,771	14,203	29,582
Installed renewables - Solar - Constrained land use assumptions (MW)	100	944	5,511	8,391	11,294	16,716	34,390
Installed renewables - Wind - Base land use assumptions (MW)	10,744	14,730	21,255	40,124	60,624	93,664	143,702
Installed renewables - Wind - Constrained land use assumptions (MW)	10,744	16,625	25,721	39,833	52,787	58,822	60,390

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass power plant (GWh)	0	9.49	295	295	295	295	295
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu power plant (GWh)	0	0	0	0	0	0	0
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)	195	486	5,419	8,152	15,708	22,773	47,178
Solar - Constrained land use assumptions (GWh)	182	1,543	8,890	13,536	18,197	26,844	54,921
Wind - Base land use assumptions (GWh)	41,883	55,716	78,202	142,280	210,951	320,274	482,424
Wind - Constrained land use assumptions (GWh)	41,883	61,841	92,114	137,870	178,181	196,403	200,980

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass purchases (million $2018/year)		131	247	249	249	1,542	3,892
Conversion capital investment - Cumulative 5-yr (million $2018)		5.45	162	25.9	0.269	17,934	48,036
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	0	19	31
Number of facilities - Diesel (quantity)	0	0	0	1	1	2	2
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Power (quantity)	0	1	1	1	1	1	1
Number of facilities - Power ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis (quantity)	0	0	0	1	1	2	2
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	0	0	28
Number of facilities - Sng (quantity)	0	1	1	1	1	2	2
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	3.25	3.35	3.32	26.5	58
Annual - BECCS (MMT)		0	0	0	0	23	54.5
Annual - Cement and lime (MMT)		0	3.24	3.35	3.32	3.42	3.53
Annual - NGCC (MMT)		0	0.01	0	0	0	0
Cumulative - All (MMT)		0	3.25	6.6	9.92	36.4	94.4
Cumulative - BECCS (MMT)		0	0	0	0	23	77.5
Cumulative - Cement and lime (MMT)		0	3.24	6.59	9.91	13.3	16.9
Cumulative - NGCC (MMT)		0	0.01	0.01	0.01	0.01	0.01

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

Item	2020	2025	2030	2035	2040	2045	2050
All (km)		0	664	957	887	1,982	4,263
Cumulative investment - All (million $2018)		0	4,192	5,208	5,173	6,364	8,539
Cumulative investment - Spur (million $2018)		0	39.1	157	122	1,313	3,488
Cumulative investment - Trunk (million $2018)		0	4,153	5,051	5,051	5,051	5,051
Spur (km)		0	47	167	96.9	1,192	3,474
Trunk (km)		0	617	790	790	790	790

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

Item	2020	2025	2030	2035	2040	2045	2050
CO2 storage (MMT)		0	0	0	0	0	0
Injection wells (wells)		0	0	0	0	0	0
Resource characterization, appraisal, permitting costs (million $2020)		0	0.01	0.01	0.01	0.01	0.01
Wells and facilities construction costs (million $2020)		0	0	0.01	0.01	0.02	0.02

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)							-4,209
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-14,138
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-472
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-18,820
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-4,209
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-7,458
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-236
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-11,904
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							2,095
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							7,797
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							859
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							10,751
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							2,095
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							4,113
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							429
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							6,638

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)							-131
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-25,467
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,534
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-1,092
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-39.8
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-732
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-3,556
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-10,483
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-7,074
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-824
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-65.8
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-8,305
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-256
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-420
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-20.3
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-244
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-1,245
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-5,241
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-536
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-278
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-98.5
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-16,885
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-895
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-756
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-29.7
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-488
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-2,400
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-7,862
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-3,805
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-551

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)							21.5
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							208
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							557
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							14.7
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							338
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							693
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							201
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							273
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							2,306
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							10.7
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							195
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							213
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							7.34
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)							178
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							347
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							34.8
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							165
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,151
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							16.1

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)							201
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							385
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							11
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)							258
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							520
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							252
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							333
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,976

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

Item	2020	2025	2030	2035	2040	2045	2050
Natural gas consumption - Annual (tcf)		343	289	232	175	110	76.2
Natural gas consumption - Cumulative (tcf)							6,984
Natural gas production - Annual (tcf)		0	0	0	0	0	0
Oil consumption - Annual (million bbls)		84.1	77.8	66.8	56.1	47.5	40.4
Oil consumption - Cumulative (million bbls)							2,036
Oil production - Annual (million bbls)		0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		287	0.217	0.207	0.172	0.114	0.003
Monetary damages from air pollution - Natural Gas (million 2019$)		98.9	55.2	25.7	17.7	11.4	5.49
Monetary damages from air pollution - Transportation (million 2019$)		349	321	241	137	62.1	24.5
Premature deaths from air pollution - Coal (deaths)		32.4	0.025	0.023	0.019	0.013	0
Premature deaths from air pollution - Natural Gas (deaths)		11.2	6.23	2.9	2	1.29	0.62
Premature deaths from air pollution - Transportation (deaths)		39.2	36.1	27.1	15.5	6.99	2.75

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		6,919	7,067	7,049	3,937	2,193	3,480
By economic sector - Construction (jobs)		11,440	16,019	20,793	27,027	36,103	56,878
By economic sector - Manufacturing (jobs)		10,064	11,218	13,662	12,171	10,801	15,718
By economic sector - Mining (jobs)		1,793	1,250	880	600	399	273

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Other (jobs)		948	1,518	2,117	3,231	4,392	8,198
By economic sector - Pipeline (jobs)		418	869	411	239	206	316
By economic sector - Professional (jobs)		7,857	9,624	14,553	18,985	27,778	44,883
By economic sector - Trade (jobs)		6,346	6,829	8,852	10,696	14,511	23,876
By economic sector - Utilities (jobs)		9,974	12,746	16,840	21,337	30,273	47,298
By education level - All sectors - Associates degree or some college (jobs)		15,576	19,439	25,251	30,501	40,249	63,815
By education level - All sectors - Bachelors degree (jobs)		10,547	12,609	16,591	19,855	26,536	42,160
By education level - All sectors - Doctoral degree (jobs)		388	468	658	826	1,164	1,870
By education level - All sectors - High school diploma or less (jobs)		26,619	31,470	38,405	41,866	51,647	81,806
By education level - All sectors - Masters or professional degree (jobs)		2,628	3,155	4,252	5,174	7,058	11,269
By resource sector - Biomass (jobs)		16,205	16,154	15,911	9,407	8,321	15,993
By resource sector - CO2 (jobs)		0	4,129	939	52.6	326	1,578
By resource sector - Coal (jobs)		1,406	317	0	0	0	0
By resource sector - Grid (jobs)		15,007	17,367	28,428	38,098	54,804	87,225
By resource sector - Natural Gas (jobs)		3,506	3,071	2,722	2,297	2,336	2,017
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		3,740	3,174	2,517	1,961	1,552	1,239
By resource sector - Solar (jobs)		3,175	6,544	6,748	10,259	10,167	23,668
By resource sector - Wind (jobs)		12,720	16,386	27,892	36,146	49,148	69,200
Median wages - Annual - All ($2019 per job)		55,379	56,490	58,047	59,984	61,881	62,771
On-Site or In-Plant Training - Total jobs - 1 to 4 years (jobs)		8,095	10,087	13,024	15,661	20,617	32,614
On-Site or In-Plant Training - Total jobs - 4 to 10 years (jobs)		3,256	4,179	5,420	6,728	9,069	14,342
On-Site or In-Plant Training - Total jobs - None (jobs)		8,882	10,746	13,766	16,034	20,848	33,129
On-Site or In-Plant Training - Total jobs - Over 10 years (jobs)		474	588	748	879	1,141	1,803
On-Site or In-Plant Training - Total jobs - Up to 1 year (jobs)		35,051	41,541	52,201	58,919	74,979	119,033
On-the-Job Training - All sectors - 1 to 4 years (jobs)		10,101	12,721	16,554	20,176	26,786	42,340
On-the-Job Training - All sectors - 4 to 10 years (jobs)		3,105	4,048	5,287	6,653	9,024	14,284
On-the-Job Training - All sectors - None (jobs)		3,134	3,716	4,680	5,357	6,863	10,964
On-the-Job Training - All sectors - Over 10 years (jobs)		504	625	789	915	1,146	1,796
On-the-Job Training - All sectors - Up to 1 year (jobs)		38,914	46,030	57,849	65,121	82,835	131,537
Related work experience - All sectors - 1 to 4 years (jobs)		18,734	22,747	29,309	34,649	45,565	72,353
Related work experience - All sectors - 4 to 10 years (jobs)		11,629	14,347	18,675	22,508	29,854	47,258
Related work experience - All sectors - None (jobs)		8,561	10,233	12,710	14,321	18,205	28,946
Related work experience - All sectors - Over 10 years (jobs)		3,118	3,804	4,946	5,870	7,665	12,097
Related work experience - All sectors - Up to 1 year (jobs)		13,716	16,010	19,519	20,874	25,365	40,267
Wage income - All (million $2019)		3,088	3,793	4,944	5,892	7,838	12,614

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)		9,055	9,867				
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 (%)	2.46	6.56	8.85	16.3	34.3	56.8	70
Sales of space heating units - Electric Resistance (%)	4.11	5.51	5.75	6.55	8.23	10.1	11.1
Sales of space heating units - Fossil (%)	2.55	2.28	2.17	1.72	1.01	0.534	0.37
Sales of space heating units - Gas Furnace (%)	90.9	85.6	83.2	75.4	56.5	32.5	18.5
Sales of water heating units - Electric Heat Pump (%)	0.634	1.28	2.56	6.82	17.1	30.1	37.7
Sales of water heating units - Electric Resistance (%)	5.5	7.41	8.68	12.8	22.8	35.4	42.8
Sales of water heating units - Gas Furnace (%)	93	90.3	87.8	79.5	59.3	33.8	18.7
Sales of water heating units - Other (%)	0.862	0.976	0.957	0.895	0.802	0.745	0.724

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)		2.47	2.54	3.3	3.45	4.74	5.02

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	119	116	113	110	106	102	97.9
Final energy use - Industry (PJ)	698	728	742	746	756	762	767
Final energy use - Residential (PJ)	158	150	143	137	130	120	108
Final energy use - Transportation (PJ)	289	271	246	226	211	194	173

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)		2.72	3.37				
Sales of cooking units - Electric Resistance (%)	62.1	63.1	66.6	75.7	88.4	96.3	99
Sales of cooking units - Gas (%)	37.9	36.9	33.4	24.3	11.6	3.74	1.01
Sales of space heating units - Electric Heat Pump (%)	4.32	7.79	10.3	18.6	37.9	61.5	75.1
Sales of space heating units - Electric Resistance (%)	10.7	15	14.6	13.6	11.1	7.88	6.19
Sales of space heating units - Fossil (%)	10.9	17.8	17.4	15.8	12.1	7.79	5.49
Sales of space heating units - Gas (%)	74.1	59.4	57.7	52.1	39	22.8	13.2
Sales of water heating units - Electric Heat Pump (%)	0	0.379	1.42	4.88	13.3	23.9	30.1
Sales of water heating units - Electric Resistance (%)	25.3	40.4	40.9	42.9	47.7	53.9	57.5
Sales of water heating units - Gas Furnace (%)	74.7	59.2	57.6	52.2	39	22.2	12.3
Sales of water heating units - Other (%)	0.023	0.026	0.026	0.026	0.026	0.025	0.025

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	114	242	813	2,567	3,737
Public EV charging plugs - DC Fast (1000 units)	0.103		0.425		2.32		6.52
Public EV charging plugs - L2 (1000 units)	0.26		10.2		55.9		157
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 (%)	1.72	2.11	2.09	1.67	1.08	0.558	0.238
Vehicle sales - Light-duty - EV (%)	1.7	4.27	11	24.5	46.8	71	87.2
Vehicle sales - Light-duty - gasoline (%)	92.3	88.3	81	68.4	47.9	25.9	11.4
Vehicle sales - Light-duty - hybrid (%)	4.03	4.87	5.52	5.1	3.9	2.35	1.15
Vehicle sales - Light-duty - hydrogen FC (%)	0.113	0.385	0.335	0.26	0.187	0.104	0.048
Vehicle sales - Light-duty - other (%)	0.11	0.113	0.104	0.091	0.066	0.037	0.017
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)							-4,209
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-14,138
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-472
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-18,820
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-4,209
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-7,458
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-236
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-11,904
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							2,095
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							7,797
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							859

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)							10,751
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							2,095
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							4,113
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							429
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							6,638

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)							-131
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-25,467
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,534
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-1,092
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-39.8
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-732
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-3,556
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-10,483
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-7,074
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-824
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-65.8
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-8,305
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-256
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-420
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-20.3
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-244
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-1,245
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-5,241
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-536
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-278
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-98.5

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)							-16,885
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-895
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-756
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-29.7
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-488
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-2,400
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-7,862
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-3,805
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-551
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							21.5
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							208
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							557
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							14.7
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							338
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							693
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							201
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							273
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							2,306
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							10.7
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							195
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							213
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							7.34
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)							178
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							347
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							34.8
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							165
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,151
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							16.1
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							201
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							385
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							11
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)							258
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							520
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							252
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							333
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,976

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		287	0.217	0.207	0.172	0.114	0.003
Monetary damages from air pollution - Natural Gas (million 2019$)		98.5	47.8	19.4	8.98	3.62	2.91
Monetary damages from air pollution - Transportation (million 2019$)		354	352	339	303	239	163
Premature deaths from air pollution - Coal (deaths)		32.4	0.025	0.023	0.019	0.013	0
Premature deaths from air pollution - Natural Gas (deaths)		11.1	5.39	2.19	1.01	0.408	0.329
Premature deaths from air pollution - Transportation (deaths)		39.8	39.6	38.1	34	26.9	18.3

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)		9,055	9,857				
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 (%)	2.46	7.62	30.1	77.9	86.5	87	87
Sales of space heating units - Electric Resistance (%)	4.11	5.76	8.25	11.9	12.5	12.5	12.5
Sales of space heating units - Fossil (%)	2.55	1.96	0.38	0.016	0	0	0
Sales of space heating units - Gas Furnace (%)	90.9	84.7	61.3	10.2	1.03	0.455	0.455
Sales of water heating units - Electric Heat Pump (%)	0.634	1.83	14.5	42	47	47.3	47.3
Sales of water heating units - Electric Resistance (%)	5.5	7.95	20.3	47	51.7	52	52
Sales of water heating units - Gas Furnace (%)	93	89.3	64.5	10.3	0.611	0	0
Sales of water heating units - Other (%)	0.862	0.936	0.728	0.68	0.676	0.678	0.678

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)		3.02	3.15	5.47	5.86	5.07	5.32

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	119	116	111	104	96.2	90.2	86.6
Final energy use - Industry (PJ)	698	727	740	738	743	749	755
Final energy use - Residential (PJ)	158	149	141	125	107	92.3	82.5
Final energy use - Transportation (PJ)	288	269	235	195	158	136	127

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)		2.73	3.43				
Sales of cooking units - Electric Resistance (%)	62.2	70.3	94.9	99.7	100	100	100
Sales of cooking units - Gas (%)	37.8	29.7	5.08	0.256	0	0	0
Sales of space heating units - Electric Heat Pump (%)	4.32	9.3	34.2	83.1	91.9	92.5	92.3
Sales of space heating units - Electric Resistance (%)	10.7	14.9	11.7	5.07	3.86	3.82	4.03
Sales of space heating units - Fossil (%)	10.9	17.4	12.6	4.14	2.53	2.35	2.41
Sales of space heating units - Gas (%)	74.1	58.4	41.4	7.68	1.69	1.31	1.28
Sales of water heating units - Electric Heat Pump (%)	0	0.81	11.1	33.7	37.7	37.9	37.9
Sales of water heating units - Electric Resistance (%)	25.3	40.6	46.5	59.5	61.9	62.1	62
Sales of water heating units - Gas Furnace (%)	74.7	58.5	42.4	6.78	0.4	0	0
Sales of water heating units - Other (%)	0.023	0.026	0.026	0.026	0.025	0.025	0.025

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)		710	1,814	2,950	4,464	4,863	4,634
Public EV charging plugs - DC Fast (1000 units)	0.103		1.41		6.29		10.2
Public EV charging plugs - L2 (1000 units)	0.26		34		151		245
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 (%)	1.71	1.95	1.32	0.425	0.077	0.013	0
Vehicle sales - Light-duty - EV (%)	3.38	13.6	43.9	80.8	96.2	99.3	100
Vehicle sales - Light-duty - gasoline (%)	90.8	79.9	51.4	17.5	3.42	0.594	0
Vehicle sales - Light-duty - hybrid (%)	3.9	4.16	3.03	1.15	0.275	0.059	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.111	0.349	0.216	0.068	0.013	0.002	0
Vehicle sales - Light-duty - other (%)	0.109	0.105	0.07	0.025	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	12.5	9.1	12.2	7.82	10.9
Capital invested - Wind - Base (billion $2018)		7.4	11	28.2	51	72.5	59.1
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)	107	107	12,325	21,988	35,758	45,085	58,900
Installed renewables - Solar - Constrained land use assumptions (MW)	214	214	15,064	38,554	66,882	94,807	142,092
Installed renewables - Wind - Base land use assumptions (MW)	10,744	15,776	24,006	46,724	89,860	154,507	210,288
Installed renewables - Wind - Constrained land use assumptions (MW)	21,488	36,105	55,715	95,513	117,210	120,676	235,891

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)	195	195	19,777	35,039	56,724	71,448	93,207
Solar - Constrained land use assumptions (GWh)	390	390	24,171	61,417	106,168	150,245	224,399
Wind - Base land use assumptions (GWh)	41,883	59,332	87,562	164,486	307,797	516,732	689,511
Wind - Constrained land use assumptions (GWh)	83,766	133,262	198,265	325,109	391,517	401,621	789,938

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)							-4,209
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-14,138
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-472
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-18,820
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-4,209
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-7,458
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-236
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-11,904
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							2,095
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							7,797
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							859
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							10,751
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							2,095
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							4,113
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							429
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							6,638

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)							-131
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-25,467
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,534
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-1,092
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-39.8
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-732

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)							-3,556
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-10,483
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-7,074
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-824
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-65.8
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-8,305
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-256
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-420
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-20.3
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-244
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-1,245
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-5,241
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-536
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-278
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-98.5
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-16,885
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-895
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-756
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-29.7
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-488
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-2,400
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-7,862
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-3,805
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-551
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							21.5
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							208
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							557
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							14.7

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)							338
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							693
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							201
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							273
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							2,306
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							10.7
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							195
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							213
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							7.34
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)							178
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							347
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							34.8
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							165
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,151
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							16.1
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							201
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							385
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							11
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)							258

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)							520
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							252
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							333
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,976

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		287	0.217	0.207	0.172	0.114	0.003
Monetary damages from air pollution - Natural Gas (million 2019$)		92.4	50.1	16.2	9.87	4.32	2.69
Monetary damages from air pollution - Transportation (million 2019$)		349	321	241	137	62.1	24.5
Premature deaths from air pollution - Coal (deaths)		32.4	0.025	0.023	0.019	0.013	0
Premature deaths from air pollution - Natural Gas (deaths)		10.4	5.65	1.82	1.11	0.487	0.303
Premature deaths from air pollution - Transportation (deaths)		39.2	36.1	27.1	15.5	6.99	2.75

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)		9,055	9,857				
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 (%)	2.46	7.62	30.1	77.9	86.5	87	87
Sales of space heating units - Electric Resistance (%)	4.11	5.76	8.25	11.9	12.5	12.5	12.5
Sales of space heating units - Fossil (%)	2.55	1.96	0.38	0.016	0	0	0
Sales of space heating units - Gas Furnace (%)	90.9	84.7	61.3	10.2	1.03	0.455	0.455
Sales of water heating units - Electric Heat Pump (%)	0.634	1.83	14.5	42	47	47.3	47.3
Sales of water heating units - Electric Resistance (%)	5.5	7.95	20.3	47	51.7	52	52
Sales of water heating units - Gas Furnace (%)	93	89.3	64.5	10.3	0.611	0	0
Sales of water heating units - Other (%)	0.862	0.936	0.728	0.68	0.676	0.678	0.678

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)		3.02	3.15	5.47	5.86	5.07	5.32

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	119	116	111	104	96.2	90.2	86.6

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Industry (PJ)	698	727	740	738	743	749	755
Final energy use - Residential (PJ)	158	149	141	125	107	92.3	82.5
Final energy use - Transportation (PJ)	288	269	235	195	158	136	127

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)		2.73	3.43				
Sales of cooking units - Electric Resistance (%)	62.2	70.3	94.9	99.7	100	100	100
Sales of cooking units - Gas (%)	37.8	29.7	5.08	0.256	0	0	0
Sales of space heating units - Electric Heat Pump (%)	4.32	9.3	34.2	83.1	91.9	92.5	92.3
Sales of space heating units - Electric Resistance (%)	10.7	14.9	11.7	5.07	3.86	3.82	4.03
Sales of space heating units - Fossil (%)	10.9	17.4	12.6	4.14	2.53	2.35	2.41
Sales of space heating units - Gas (%)	74.1	58.4	41.4	7.68	1.69	1.31	1.28
Sales of water heating units - Electric Heat Pump (%)	0	0.81	11.1	33.7	37.7	37.9	37.9
Sales of water heating units - Electric Resistance (%)	25.3	40.6	46.5	59.5	61.9	62.1	62
Sales of water heating units - Gas Furnace (%)	74.7	58.5	42.4	6.78	0.4	0	0
Sales of water heating units - Other (%)	0.023	0.026	0.026	0.026	0.025	0.025	0.025

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)		710	1,814	2,950	4,464	4,863	4,634
Public EV charging plugs - DC Fast (1000 units)	0.103		1.41		6.29		10.2
Public EV charging plugs - L2 (1000 units)	0.26		34		151		245
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 (%)	1.71	1.95	1.32	0.425	0.077	0.013	0
Vehicle sales - Light-duty - EV (%)	3.38	13.6	43.9	80.8	96.2	99.3	100
Vehicle sales - Light-duty - gasoline (%)	90.8	79.9	51.4	17.5	3.42	0.594	0
Vehicle sales - Light-duty - hybrid (%)	3.9	4.16	3.03	1.15	0.275	0.059	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.111	0.349	0.216	0.068	0.013	0.002	0
Vehicle sales - Light-duty - other (%)	0.109	0.105	0.07	0.025	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)		1.6	1.92	2.46	1.34	1.03	0
Capital invested - Solar PV - Constrained (billion $2018)		3.27	1.61	1.91	1.19	0.971	0
Capital invested - Wind - Base (billion $2018)		0.916	6.86	6.44	11.9	15.7	0.297
Capital invested - Wind - Constrained (billion $2018)		3.08	8.43	8.58	8.09	7.9	7.74
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)	107	1,502	3,381	5,991	7,498	8,725	8,725
Installed renewables - Solar - Constrained land use assumptions (MW)	737	3,595	5,170	7,195	8,533	9,692	9,692
Installed renewables - Wind - Base land use assumptions (MW)	10,744	11,366	16,519	21,711	31,815	45,829	46,109
Installed renewables - Wind - Constrained land use assumptions (MW)	10,744	12,837	19,171	26,087	32,929	39,975	47,282

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)	195	2,437	5,463	9,628	12,029	13,967	13,967
Solar - Constrained land use assumptions (GWh)	1,214	5,805	8,316	11,567	13,697	15,525	15,525
Wind - Base land use assumptions (GWh)	41,883	44,041	61,913	79,746	114,129	161,498	162,421
Wind - Constrained land use assumptions (GWh)	41,883	49,047	70,382	93,314	115,649	138,138	161,130

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)							-4,209
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-14,138
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-472
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-18,820
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-4,209
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-7,458
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-236
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-11,904

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)							2,095
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							7,797
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							859
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							10,751
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							2,095
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							4,113
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							429
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							6,638

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)							-131
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-25,467
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,534
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-1,092
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-39.8
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-732
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-3,556
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-10,483
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-7,074
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-824
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-65.8
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-8,305
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-256
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-420
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-20.3
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-244
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-1,245

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)							-5,241
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-536
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-278
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-98.5
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-16,885
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-895
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-756
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-29.7
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-488
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-2,400
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-7,862
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-3,805
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-551
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							21.5
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							208
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							557
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							14.7
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							338
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							693
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							201
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							273
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							2,306
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							10.7
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							195

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)							213
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							7.34
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)							178
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							347
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							34.8
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							165
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,151
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							16.1
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							201
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							385
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							11
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)							258
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							520
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							252
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							333
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,976

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		287	0.217	0.207	0.172	0.114	0.003
Monetary damages from air pollution - Natural Gas (million 2019$)		104	49.7	53.7	37	15.1	6.91
Monetary damages from air pollution - Transportation (million 2019$)		349	321	241	137	62.1	24.5
Premature deaths from air pollution - Coal (deaths)		32.4	0.025	0.023	0.019	0.013	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)		11.7	5.61	6.06	4.18	1.7	0.78
Premature deaths from air pollution - Transportation (deaths)		39.2	36.1	27.1	15.5	6.99	2.75

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)		9,055	9,867				
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 (%)	2.46	6.56	8.85	16.3	34.3	56.8	70
Sales of space heating units - Electric Resistance (%)	4.11	5.51	5.75	6.55	8.23	10.1	11.1
Sales of space heating units - Fossil (%)	2.55	2.28	2.17	1.72	1.01	0.534	0.37
Sales of space heating units - Gas Furnace (%)	90.9	85.6	83.2	75.4	56.5	32.5	18.5
Sales of water heating units - Electric Heat Pump (%)	0.634	1.28	2.56	6.82	17.1	30.1	37.7
Sales of water heating units - Electric Resistance (%)	5.5	7.41	8.68	12.8	22.8	35.4	42.8
Sales of water heating units - Gas Furnace (%)	93	90.3	87.8	79.5	59.3	33.8	18.7
Sales of water heating units - Other (%)	0.862	0.976	0.957	0.895	0.802	0.745	0.724

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)		2.47	2.54	3.3	3.45	4.74	5.02

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	119	116	113	110	106	102	97.9
Final energy use - Industry (PJ)	698	728	742	746	756	762	767
Final energy use - Residential (PJ)	158	150	143	137	130	120	108
Final energy use - Transportation (PJ)	289	271	246	226	211	194	173

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)		2.72	3.37				
Sales of cooking units - Electric Resistance (%)	62.1	63.1	66.6	75.7	88.4	96.3	99
Sales of cooking units - Gas (%)	37.9	36.9	33.4	24.3	11.6	3.74	1.01
Sales of space heating units - Electric Heat Pump (%)	4.32	7.79	10.3	18.6	37.9	61.5	75.1
Sales of space heating units - Electric Resistance (%)	10.7	15	14.6	13.6	11.1	7.88	6.19
Sales of space heating units - Fossil (%)	10.9	17.8	17.4	15.8	12.1	7.79	5.49
Sales of space heating units - Gas (%)	74.1	59.4	57.7	52.1	39	22.8	13.2
Sales of water heating units - Electric Heat Pump (%)	0	0.379	1.42	4.88	13.3	23.9	30.1
Sales of water heating units - Electric Resistance (%)	25.3	40.4	40.9	42.9	47.7	53.9	57.5

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 (%)	74.7	59.2	57.6	52.2	39	22.2	12.3
Sales of water heating units - Other (%)	0.023	0.026	0.026	0.026	0.026	0.025	0.025

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	114	242	813	2,567	3,737
Public EV charging plugs - DC Fast (1000 units)	0.103		0.425		2.32		6.52
Public EV charging plugs - L2 (1000 units)	0.26		10.2		55.9		157
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 (%)	1.72	2.11	2.09	1.67	1.08	0.558	0.238
Vehicle sales - Light-duty - EV (%)	1.7	4.27	11	24.5	46.8	71	87.2
Vehicle sales - Light-duty - gasoline (%)	92.3	88.3	81	68.4	47.9	25.9	11.4
Vehicle sales - Light-duty - hybrid (%)	4.03	4.87	5.52	5.1	3.9	2.35	1.15
Vehicle sales - Light-duty - hydrogen FC (%)	0.113	0.385	0.335	0.26	0.187	0.104	0.048
Vehicle sales - Light-duty - other (%)	0.11	0.113	0.104	0.091	0.066	0.037	0.017
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	0.005	0.13	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion $2018)	0	0	0	0	0.012	0	0
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	0	0	8.02	0.797	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass power plant (GWh)	0	9.52	264	264	264	264	264
Biomass w/ccu allam power plant (GWh)	0	0	0	0	11.5	11.5	11.5
Biomass w/ccu power plant (GWh)	0	0	0	0	9,003	9,897	9,897

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass purchases (million $2018/year)		311	335	337	3,172	4,260	8,697
Conversion capital investment - Cumulative 5-yr (million $2018)		5.5	145	27.7	29,846	11,171	70,993
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	1	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	25	39	49
Number of facilities - Diesel (quantity)	0	0	0	1	2	2	2
Number of facilities - Diesel ccu (quantity)	0	0	0	0	1	1	1
Number of facilities - Power (quantity)	0	1	1	1	1	1	1
Number of facilities - Power ccu (quantity)	0	0	0	0	7	8	8
Number of facilities - Pyrolysis (quantity)	0	0	0	1	2	2	2
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	0	1	44
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	3.24	3.35	41.1	55.5	96.1
Annual - BECCS (MMT)		0	0	0	37.8	52.1	92.6
Annual - Cement and lime (MMT)		0	3.24	3.35	3.32	3.42	3.53
Annual - NGCC (MMT)		0	0.01	0	0	0	0
Cumulative - All (MMT)		0	3.24	6.59	47.7	103	199
Cumulative - BECCS (MMT)		0	0	0	37.8	89.9	182
Cumulative - Cement and lime (MMT)		0	3.24	6.59	9.91	13.3	16.9
Cumulative - NGCC (MMT)		0	0.01	0.01	0.01	0.01	0.01

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

Item	2020	2025	2030	2035	2040	2045	2050
All (km)		0	664	887	2,807	4,289	6,153
Cumulative investment - All (million $2018)		0	4,269	5,411	10,382	11,657	13,724
Cumulative investment - Spur (million $2018)		0	39.1	191	1,957	3,232	5,299
Cumulative investment - Trunk (million $2018)		0	4,230	5,220	8,425	8,425	8,425
Spur (km)		0	47	96.9	1,400	2,882	4,746
Trunk (km)		0	617	790	1,407	1,407	1,407

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

Item	2020	2025	2030	2035	2040	2045	2050
CO2 storage (MMT)		0	0	0	0	0	0
Injection wells (wells)		0	0	0	0	0	0
Resource characterization, appraisal, permitting costs (million $2020)		0	0.01	0.02	0.02	0.02	0.02
Wells and facilities construction costs (million $2020)		0	0	0.02	0.03	0.06	0.07

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)							-5,657
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-12,929
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)							-431
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-19,017
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-5,657
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-6,820
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)							-215
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-12,692
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							2,826
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							17,578
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)							436
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)							259
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							784
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							21,883
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							2,826
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							3,755
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)							436
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)							259
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							392
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							7,668

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)							-131
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-25,467
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,534
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-1,092
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-39.8
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-732
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-3,556
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-10,483
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-7,074
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-824
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-65.8
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-8,305
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-256
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-420
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-20.3
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-244
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-1,245
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-5,241
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-536
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-278
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-98.5
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-16,885
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-895
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-756
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-29.7
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-488
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-2,400
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-7,862
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-3,805
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-551

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)							21.5
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							208
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							557
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							14.7
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							338
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							693
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							201
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							273
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							2,306
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							10.7
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							195
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							213
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							7.34
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)							178
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							347
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							34.8
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							165
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,151
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							16.1

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)							201
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							385
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							11
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)							258
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							520
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							252
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							333
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,976

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		287	0.217	0.207	0.172	0.114	0.003
Monetary damages from air pollution - Natural Gas (million 2019$)		97.1	43.2	24.1	14.6	6.53	3.39
Monetary damages from air pollution - Transportation (million 2019$)		354	352	339	303	239	163
Premature deaths from air pollution - Coal (deaths)		32.4	0.025	0.023	0.019	0.013	0
Premature deaths from air pollution - Natural Gas (deaths)		11	4.87	2.72	1.65	0.737	0.382
Premature deaths from air pollution - Transportation (deaths)		39.8	39.6	38.1	34	26.9	18.3

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)		8,949	9,212				
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 (%)	2.46	13	44.6	70.4	74.7	75.1	75.2
Sales of space heating units - Electric Resistance (%)	4.11	6.34	10.8	18.4	23.5	24.3	24.4
Sales of space heating units - Fossil (%)	2.55	2.22	1.72	0.767	0.114	0.009	0
Sales of space heating units - Gas Furnace (%)	90.9	78.4	43	10.4	1.69	0.519	0.457
Sales of water heating units - Electric Heat Pump (%)	0.634	0.814	0.811	0.811	0.809	0.805	0.804
Sales of water heating units - Electric Resistance (%)	5.5	6.96	6.98	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 (%)	93	91.2	91.2	91.2	91.3	91.2	91.2
Sales of water heating units - Other (%)	0.862	0.984	0.985	0.982	0.981	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)		2.55	2.62	2.79	2.88	2.99	3.08

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	119	119	119	117	116	116	120
Final energy use - Industry (PJ)	698	736	756	769	790	805	826
Final energy use - Residential (PJ)	158	150	146	144	143	143	143
Final energy use - Transportation (PJ)	289	271	248	234	233	240	249

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)		2.62	2.76				
Sales of cooking units - Electric Resistance (%)	61.8	61.8	61.8	61.8	61.8	61.8	61.8
Sales of cooking units - Gas (%)	38.2	38.2	38.2	38.2	38.2	38.2	38.2
Sales of space heating units - Electric Heat Pump (%)	3.44	11.4	11.7	12.3	12.7	13.2	13.9
Sales of space heating units - Electric Resistance (%)	10.9	14.5	14.3	14.1	13.9	13.4	12.8
Sales of space heating units - Fossil (%)	11.1	16.5	16.1	15.8	15.5	15.4	15.5
Sales of space heating units - Gas (%)	74.6	57.6	57.9	57.8	57.8	58	57.7
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	25.3	40.2	40.1	40	40	40	40
Sales of water heating units - Gas Furnace (%)	74.7	59.8	59.9	59.9	59.9	60	60
Sales of water heating units - Other (%)	0.023	0.026	0.026	0.026	0.026	0.026	0.026

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 (%)	1.71	2.1	2.21	2.06	1.86	1.73	1.65
Vehicle sales - Light-duty - EV (%)	3.03	4.92	5.63	6.88	8.43	9.87	11
Vehicle sales - Light-duty - gasoline (%)	91.1	87.7	85.8	84.2	82.2	80.3	78.6
Vehicle sales - Light-duty - hybrid (%)	3.92	4.79	5.88	6.46	7.07	7.72	8.28
Vehicle sales - Light-duty - hydrogen FC (%)	0.112	0.382	0.355	0.318	0.317	0.318	0.329
Vehicle sales - Light-duty - other (%)	0.109	0.113	0.11	0.111	0.11	0.109	0.112
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)							-131
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-25,467
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,534
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-1,092
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-39.8
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-732
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-3,556
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-10,483
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-7,074
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-824
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-65.8
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-8,305
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-256
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-420
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-20.3
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-244
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-1,245
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-5,241
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-536
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-278
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-98.5
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-16,885
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-895
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-756
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-29.7
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-488

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)							-2,400
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-7,862
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-3,805
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-551
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							21.5
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							208
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							557
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							14.7
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							338
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							693
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							201
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							273
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							2,306
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							10.7
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							195
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							213
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							7.34
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)							178
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							347
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							34.8
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							165

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)							1,151
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							16.1
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							201
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							385
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							11
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)							258
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							520
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							252
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							333
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,976

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)	3.55		-2.54				-2.27
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-0.199		-0.358				-0.373
Business-as-usual carbon sink - Total (Mt CO2e/y)	3.35		-2.9				-2.65

Table 66: *REF scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		889	498	302	243	214	207
Monetary damages from air pollution - Natural Gas (million 2019$)		115	98.7	109	70.6	61.2	56.5
Monetary damages from air pollution - Transportation (million 2019$)		354	357	362	368	375	382
Premature deaths from air pollution - Coal (deaths)		100	56.3	34.1	27.5	24.1	23.4
Premature deaths from air pollution - Natural Gas (deaths)		13	11.1	12.3	7.97	6.91	6.38
Premature deaths from air pollution - Transportation (deaths)		39.8	40.2	40.7	41.4	42.2	43