Net-Zero America - virginia state report

2021-03-15

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

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Notes

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

Data by category and subcategory

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		31,138	34,700				
Sales of cooking units - Electric Resistance (%)	32	46	79.9	86.5	86.9	86.9	86.9
Sales of cooking units - Gas (%)	68	54	20.1	13.5	13.1	13.1	13.1
Sales of space heating units - Electric Heat Pump (%)	4.92	28.4	70.7	83.8	85.1	85.1	85.1
Sales of space heating units - Electric Resistance (%)	4.71	8.37	10.5	12.6	13	13	13
Sales of space heating units - Fossil (%)	7.87	4.09	0.778	0.033	0	0	0
Sales of space heating units - Gas Furnace (%)	82.5	59.2	18.1	3.58	1.92	1.89	1.88
Sales of water heating units - Electric Heat Pump (%)	0.167	10.5	54.6	64.4	64.8	64.8	64.8
Sales of water heating units - Electric Resistance (%)	4.19	10.8	28.4	32.3	32.5	32.5	32.5
Sales of water heating units - Gas Furnace (%)	91.5	74.5	14.1	0.593	0	0	0
Sales of water heating units - Other (%)	4.17	4.15	3.01	2.72	2.72	2.72	2.72

Table 2: *E+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand*

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		4.76	4.85	8.11	8.58	8.03	8.37

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	246	247	237	223	212	208	211
Final energy use - Industry (PJ)	381	402	412	418	428	431	439
Final energy use - Residential (PJ)	313	296	274	246	223	210	204
Final energy use - Transportation (PJ)	709	660	582	488	403	349	324

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)		6.43	6.21				
Sales of cooking units - Electric Resistance (%)	70.5	76.8	96	99.8	100	100	100
Sales of cooking units - Gas (%)	29.5	23.2	3.97	0.2	0	0	0
Sales of space heating units - Electric Heat Pump (%)	25.4	42.2	78.8	86.9	87.3	87.3	87.3
Sales of space heating units - Electric Resistance (%)	18.4	18.4	7.74	5.33	5.23	5.33	5.34
Sales of space heating units - Fossil (%)	12.1	15.8	6.87	4.89	4.78	4.71	4.71
Sales of space heating units - Gas (%)	44.1	23.6	6.62	2.84	2.69	2.7	2.7
Sales of water heating units - Electric Heat Pump (%)	0	8.78	46.5	54.9	55.3	55.3	55.3
Sales of water heating units - Electric Resistance (%)	50.1	62.2	46.3	42.7	42.5	42.5	42.5
Sales of water heating units - Gas Furnace (%)	45.5	26.1	4.92	0.208	0	0	0
Sales of water heating units - Other (%)	4.39	2.95	2.33	2.2	2.21	2.22	2.23

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr (million $2018)		1,456	3,742	6,046	9,166	9,967	9,508
Public EV charging plugs - DC Fast (1000 units)	0.39		2.58		11.2		18
Public EV charging plugs - L2 (1000 units)	1.37		61.9		268		433
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 (%)	1.42	1.7	1.21	0.385	0.072	0.013	0
Vehicle sales - Light-duty - EV (%)	4.33	16.5	48.4	82.6	96.4	99.3	100
Vehicle sales - Light-duty - gasoline (%)	89.2	76.6	46.8	15.8	3.19	0.587	0
Vehicle sales - Light-duty - hybrid (%)	4.83	4.83	3.35	1.23	0.302	0.067	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.11	0.333	0.193	0.059	0.012	0.002	0
Vehicle sales - Light-duty - other (%)	0.096	0.092	0.059	0.021	0.004	0.001	0
Vehicle sales - Medium-duty - diesel (%)	64.7	59.7	42.3	14.4	2.59	0.384	0
Vehicle sales - Medium-duty - EV (%)	0.784	5.07	25.3	60.8	76.5	79.5	80
Vehicle sales - Medium-duty - gasoline (%)	33.7	33.3	25.5	9.32	1.77	0.277	0
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.402	0.341	0.14	0.03	0.005	0
Vehicle sales - Medium-duty - hydrogen FC (%)	0.196	1.27	6.33	15.2	19.1	19.9	20
Vehicle sales - Medium-duty - other (%)	0.253	0.255	0.205	0.083	0.019	0.004	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Biomass power plant (billion $2018)	0	0.005	0.924	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 - Offshore Wind - Base (billion $2018)		0.157	0.192	0.399	3.46	0	0
Capital invested - Offshore Wind - Constrained (billion $2018)		0.226	0.192	0.285	3.52	0	0
Capital invested - Solar PV - Base (billion $2018)		21.3	10.4	15.4	11.5	10.4	7.01
Capital invested - Solar PV - Constrained (billion $2018)		25	11.8	20	11	12.1	8.72
Capital invested - Wind - Base (billion $2018)		0	7.75	5.4	10.5	1.63	1.3
Capital invested - Wind - Constrained (billion $2018)		0	20.7	9.24	0.089	0	1.8
Installed renewables - OffshoreWind - Base land use assumptions (MW)	0	55.5	135	331	2,326	2,326	2,326
Installed renewables - OffshoreWind - Constrained land use assumptions (MW)	0	55.5	135	331	2,326	2,326	2,326
Installed renewables - Rooftop PV (MW)	130	209	296	422	598	827	1,120
Installed renewables - Solar - Base land use assumptions (MW)	2,993	21,627	31,775	48,165	61,069	73,517	82,370
Installed renewables - Solar - Constrained land use assumptions (MW)	2,969	20,696	31,494	50,947	59,463	69,430	75,549
Installed renewables - Wind - Base land use assumptions (MW)	72	72	5,894	10,245	19,094	20,551	21,780
Installed renewables - Wind - Constrained land use assumptions (MW)	72	72	15,209	23,173	23,248	23,248	23,838

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass power plant (GWh)	0	8.72	1,823	1,823	1,823	1,823	1,823
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	250	612	1,495	10,640	10,640	10,640
OffshoreWind - Constrained land use assumptions (GWh)	0	250	612	1,495	10,640	10,640	10,640
Solar - Base land use assumptions (GWh)	5,353	35,628	51,990	78,384	99,117	119,043	133,329
Solar - Constrained land use assumptions (GWh)	5,284	34,037	51,473	82,716	96,466	112,459	122,342
Wind - Base land use assumptions (GWh)	269	269	20,321	33,997	59,060	62,885	66,109
Wind - Constrained land use assumptions (GWh)	269	269	48,379	69,057	69,220	69,220	71,392

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass purchases (million $2018/year)		135	422	423	423	423	520
Conversion capital investment - Cumulative 5-yr (million $2018)		5.03	1,031	30.1	0.478	0	2,067
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	0	2
Number of facilities - Diesel (quantity)	0	0	0	1	1	1	1
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	1	1
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	0	0	0
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 9: *E+ scenario - PILLAR 4: CCUS - CO2 capture*

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	3.88	3.76	3.76	6.49
Annual - BECCS (MMT)		0	0	0	0	0	2.66
Annual - Cement and lime (MMT)		0	0	3.35	3.32	3.42	3.53
Annual - NGCC (MMT)		0	0	0.53	0.45	0.34	0.3
Cumulative - All (MMT)		0	0	3.88	7.64	11.4	17.9
Cumulative - BECCS (MMT)		0	0	0	0	0	2.66
Cumulative - Cement and lime (MMT)		0	0	3.35	6.67	10.1	13.6
Cumulative - NGCC (MMT)		0	0	0.53	0.98	1.32	1.62

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

Item	2020	2025	2030	2035	2040	2045	2050
All (km)		0	0	507	507	507	805
Cumulative investment - All (million $2018)		0	0	2,259	2,258	2,260	2,500
Cumulative investment - Spur (million $2018)		0	0	155	154	157	396
Cumulative investment - Trunk (million $2018)		0	0	2,104	2,104	2,104	2,104
Spur (km)		0	0	154	154	154	452
Trunk (km)		0	0	353	353	353	353

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	0	0	0	0
Wells and facilities construction costs (million $2020)		0	0	0	0	0	0

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)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-1,871
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-67.3
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-1,938
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-986
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-33.7
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-1,020
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							1,127
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							122
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							1,249
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							594
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							61.2
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							655

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)							-254
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-34,151
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-2,149
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-9,384
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-2,265
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-9,560
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-702
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-300
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-6,186
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,351
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-127
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-10,423
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-358
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-3,605
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-1,153
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-3,187
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-246
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-150
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-469
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,130
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-190
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-22,267
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,254
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-6,494
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-1,689
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-6,373
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-474
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-225
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-3,327
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,240

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)							41.5
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							291
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							4,785
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							835
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)							66.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							19.8
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							176
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,111
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							7,325
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							20.8
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							273
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,833
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							417
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)							35.1
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							9.91
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							30.5
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							672
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,292
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							31.1

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)							282
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,309
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							628
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)							50.9
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							14.9
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							220
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,354
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							5,890

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

Item	2020	2025	2030	2035	2040	2045	2050
Natural gas consumption - Annual (tcf)		491	414	332	250	157	109
Natural gas consumption - Cumulative (tcf)							9,993
Natural gas production - Annual (tcf)		136	129	112	94.7	75.1	58.4
Oil consumption - Annual (million bbls)		129	111	85.7	61.8	42.9	28
Oil consumption - Cumulative (million bbls)							2,649
Oil production - Annual (million bbls)		0.006	0.006	0.006	0.005	0.004	0.003

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		845	0.772	0.76	0.678	0.484	0.043
Monetary damages from air pollution - Natural Gas (million 2019$)		219	159	96.1	80.9	39.7	15.8
Monetary damages from air pollution - Transportation (million 2019$)		939	876	665	385	173	65.5
Premature deaths from air pollution - Coal (deaths)		95.4	0.087	0.086	0.077	0.055	0.005
Premature deaths from air pollution - Natural Gas (deaths)		24.7	17.9	10.8	9.14	4.48	1.78
Premature deaths from air pollution - Transportation (deaths)		106	98.5	74.8	43.3	19.5	7.37

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		419	1,112	1,315	1,087	840	809
By economic sector - Construction (jobs)		22,203	21,077	28,476	31,550	29,524	28,852
By economic sector - Manufacturing (jobs)		12,648	22,817	23,376	19,372	21,199	17,256
By economic sector - Mining (jobs)		3,933	2,711	1,871	1,247	811	532

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Other (jobs)		3,445	3,067	4,478	5,132	5,356	5,678
By economic sector - Pipeline (jobs)		638	540	692	330	223	190
By economic sector - Professional (jobs)		9,189	10,304	13,589	16,508	16,062	16,258
By economic sector - Trade (jobs)		6,477	6,358	8,232	9,877	9,878	10,210
By economic sector - Utilities (jobs)		13,578	16,421	22,067	26,170	24,088	23,677
By education level - All sectors - Associates degree or some college (jobs)		22,955	26,700	33,265	35,774	34,758	33,328
By education level - All sectors - Bachelors degree (jobs)		14,202	16,704	20,276	21,823	21,269	20,425
By education level - All sectors - Doctoral degree (jobs)		493	540	680	777	753	747
By education level - All sectors - High school diploma or less (jobs)		31,486	36,552	45,030	47,515	45,977	43,866
By education level - All sectors - Masters or professional degree (jobs)		3,393	3,912	4,847	5,383	5,222	5,097
By resource sector - Biomass (jobs)		1,600	3,016	3,684	3,237	3,069	3,471
By resource sector - CO2 (jobs)		0	0	2,189	128	159	444
By resource sector - Coal (jobs)		2,025	1,063	849	742	670	594
By resource sector - Grid (jobs)		19,398	26,618	37,207	48,133	44,956	45,446
By resource sector - Natural Gas (jobs)		8,140	6,617	5,566	5,298	3,940	2,360
By resource sector - Nuclear (jobs)		989	973	564	0	0	0
By resource sector - Oil (jobs)		5,733	4,544	3,230	2,161	1,402	860
By resource sector - Solar (jobs)		34,531	36,719	43,800	37,807	37,496	34,505
By resource sector - Wind (jobs)		114	4,858	7,006	13,766	16,288	15,782
Median wages - Annual - All ($2019 per job)		60,633	61,397	62,227	63,665	64,451	65,651
On-Site or In-Plant Training - Total jobs - 1 to 4 years (jobs)		11,897	13,673	17,039	18,325	17,712	16,982
On-Site or In-Plant Training - Total jobs - 4 to 10 years (jobs)		4,923	5,298	6,850	7,603	7,231	7,039
On-Site or In-Plant Training - Total jobs - None (jobs)		11,817	13,818	16,985	18,082	17,614	16,859
On-Site or In-Plant Training - Total jobs - Over 10 years (jobs)		616	710	903	987	951	917
On-Site or In-Plant Training - Total jobs - Up to 1 year (jobs)		43,277	50,909	62,321	66,275	64,471	61,665
On-the-Job Training - All sectors - 1 to 4 years (jobs)		15,287	17,510	21,893	23,625	22,808	21,885
On-the-Job Training - All sectors - 4 to 10 years (jobs)		4,873	5,200	6,791	7,578	7,199	7,027
On-the-Job Training - All sectors - None (jobs)		3,982	4,522	5,567	5,951	5,802	5,593
On-the-Job Training - All sectors - Over 10 years (jobs)		749	877	1,057	1,082	1,060	993
On-the-Job Training - All sectors - Up to 1 year (jobs)		47,639	56,299	68,789	73,036	71,110	67,966
Related work experience - All sectors - 1 to 4 years (jobs)		25,881	30,055	37,052	39,750	38,538	36,974
Related work experience - All sectors - 4 to 10 years (jobs)		16,682	19,316	23,912	25,749	24,946	23,921
Related work experience - All sectors - None (jobs)		10,462	12,126	15,079	16,158	15,650	15,043
Related work experience - All sectors - Over 10 years (jobs)		4,437	5,307	6,440	6,815	6,652	6,316
Related work experience - All sectors - Up to 1 year (jobs)		15,068	17,604	21,614	22,799	22,194	21,208
Wage income - All (million $2019)		4,398	5,183	6,478	7,085	6,960	6,793

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)		31,112	34,614				
Sales of cooking units - Electric Resistance (%)	32	36.2	40.9	53.4	71	81.7	85.5
Sales of cooking units - Gas (%)	68	63.8	59.1	46.6	29	18.3	14.5
Sales of space heating units - Electric Heat Pump (%)	4.92	20.4	25.2	39.1	61.2	76.9	82.9
Sales of space heating units - Electric Resistance (%)	4.71	8.04	8.28	9.07	10.5	11.9	12.7
Sales of space heating units - Fossil (%)	7.87	4.72	4.38	3.33	1.64	0.517	0.135
Sales of space heating units - Gas Furnace (%)	82.5	66.9	62.2	48.4	26.6	10.7	4.34
Sales of water heating units - Electric Heat Pump (%)	0.167	2.04	7.05	21.5	43.6	58.1	63.1
Sales of water heating units - Electric Resistance (%)	4.19	7.46	9.4	15.2	24	29.7	31.8
Sales of water heating units - Gas Furnace (%)	91.5	86.1	79.2	59.5	29.1	9.3	2.42
Sales of water heating units - Other (%)	4.17	4.38	4.34	3.87	3.3	2.91	2.76

Table 18: *E- scenario - PILLAR 1: Efficiency/Electrification - Electricity demand*

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		4.07	4.08	5.45	5.62	6.97	7.29

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	246	247	244	240	233	227	224
Final energy use - Industry (PJ)	381	403	413	422	433	437	443
Final energy use - Residential (PJ)	313	297	288	278	263	239	221
Final energy use - Transportation (PJ)	710	666	609	562	524	480	428

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)		6.4	6.15				
Sales of cooking units - Electric Resistance (%)	70.4	71.2	73.9	81	91	97.1	99.2
Sales of cooking units - Gas (%)	29.6	28.8	26.1	19	9.05	2.92	0.786
Sales of space heating units - Electric Heat Pump (%)	25.4	35.1	39.3	51.3	69.7	81.7	85.8
Sales of space heating units - Electric Resistance (%)	18.4	20.5	19.2	15.6	10.3	6.88	5.68
Sales of space heating units - Fossil (%)	12.1	17.5	16.6	13.7	9.14	6.15	5.13
Sales of space heating units - Gas (%)	44.1	26.9	24.9	19.4	10.9	5.32	3.37
Sales of water heating units - Electric Heat Pump (%)	0	1.51	5.8	18.2	37.1	49.5	53.8
Sales of water heating units - Electric Resistance (%)	50.1	65.3	63.5	58.2	50.1	44.9	43.1
Sales of water heating units - Gas Furnace (%)	45.5	30.1	27.7	20.8	10.2	3.27	0.852
Sales of water heating units - Other (%)	4.39	3.08	3.01	2.82	2.52	2.32	2.25

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	237	495	1,674	5,255	7,661
Public EV charging plugs - DC Fast (1000 units)	0.39		0.815		4.16		11.6
Public EV charging plugs - L2 (1000 units)	1.37		19.6		99.8		277
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 (%)	1.44	1.87	2.03	1.61	1.02	0.522	0.224
Vehicle sales - Light-duty - EV (%)	2.03	5	12.5	26.9	49.5	72.8	87.9
Vehicle sales - Light-duty - gasoline (%)	91.3	86.9	78.6	65.3	44.9	24.1	10.7
Vehicle sales - Light-duty - hybrid (%)	5.01	5.8	6.46	5.82	4.3	2.51	1.2
Vehicle sales - Light-duty - hydrogen FC (%)	0.112	0.377	0.319	0.241	0.169	0.093	0.043
Vehicle sales - Light-duty - other (%)	0.098	0.101	0.091	0.079	0.057	0.031	0.014
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)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-1,871
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-67.3
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-1,938
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-986
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-33.7
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-1,020
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							1,127
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							122

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							1,249
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							594
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							61.2
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							655

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)							-254
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-34,151
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-2,149
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-9,384
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-2,265
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-9,560
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-702
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-300
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-6,186
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,351
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-127
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-10,423
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-358
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-3,605
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-1,153
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-3,187
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-246
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-150
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-469
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,130
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-190

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)							-22,267
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,254
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-6,494
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-1,689
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-6,373
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-474
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-225
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-3,327
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,240
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							41.5
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							291
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							4,785
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							835
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)							66.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							19.8
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							176
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,111
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							7,325
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							20.8
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							273
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,833
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							417
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)							35.1
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							9.91
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							30.5
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							672
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,292
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							31.1
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							282
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,309
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							628
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)							50.9
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							14.9
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							220
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,354
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							5,890

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		845	0.772	0.76	0.678	0.484	0.043
Monetary damages from air pollution - Natural Gas (million 2019$)		187	126	51.6	23	7.67	4.53
Monetary damages from air pollution - Transportation (million 2019$)		957	969	943	850	676	462
Premature deaths from air pollution - Coal (deaths)		95.4	0.087	0.086	0.077	0.055	0.005
Premature deaths from air pollution - Natural Gas (deaths)		21.1	14.3	5.82	2.59	0.866	0.512
Premature deaths from air pollution - Transportation (deaths)		108	109	106	95.6	76	51.9

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)		31,138	34,700				
Sales of cooking units - Electric Resistance (%)	32	46	79.9	86.5	86.9	86.9	86.9
Sales of cooking units - Gas (%)	68	54	20.1	13.5	13.1	13.1	13.1
Sales of space heating units - Electric Heat Pump (%)	4.92	28.4	70.7	83.8	85.1	85.1	85.1
Sales of space heating units - Electric Resistance (%)	4.71	8.37	10.5	12.6	13	13	13
Sales of space heating units - Fossil (%)	7.87	4.09	0.778	0.033	0	0	0
Sales of space heating units - Gas Furnace (%)	82.5	59.2	18.1	3.58	1.92	1.89	1.88
Sales of water heating units - Electric Heat Pump (%)	0.167	10.5	54.6	64.4	64.8	64.8	64.8
Sales of water heating units - Electric Resistance (%)	4.19	10.8	28.4	32.3	32.5	32.5	32.5
Sales of water heating units - Gas Furnace (%)	91.5	74.5	14.1	0.593	0	0	0
Sales of water heating units - Other (%)	4.17	4.15	3.01	2.72	2.72	2.72	2.72

Table 26: *E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand*

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		4.76	4.85	8.11	8.58	8.03	8.37

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	246	247	237	223	212	208	211
Final energy use - Industry (PJ)	381	402	412	418	428	431	439
Final energy use - Residential (PJ)	313	296	274	246	223	210	204
Final energy use - Transportation (PJ)	709	660	582	488	403	349	324

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)		6.43	6.21				
Sales of cooking units - Electric Resistance (%)	70.5	76.8	96	99.8	100	100	100
Sales of cooking units - Gas (%)	29.5	23.2	3.97	0.2	0	0	0
Sales of space heating units - Electric Heat Pump (%)	25.4	42.2	78.8	86.9	87.3	87.3	87.3
Sales of space heating units - Electric Resistance (%)	18.4	18.4	7.74	5.33	5.23	5.33	5.34
Sales of space heating units - Fossil (%)	12.1	15.8	6.87	4.89	4.78	4.71	4.71
Sales of space heating units - Gas (%)	44.1	23.6	6.62	2.84	2.69	2.7	2.7
Sales of water heating units - Electric Heat Pump (%)	0	8.78	46.5	54.9	55.3	55.3	55.3
Sales of water heating units - Electric Resistance (%)	50.1	62.2	46.3	42.7	42.5	42.5	42.5
Sales of water heating units - Gas Furnace (%)	45.5	26.1	4.92	0.208	0	0	0
Sales of water heating units - Other (%)	4.39	2.95	2.33	2.2	2.21	2.22	2.23

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr (million $2018)		1,456	3,742	6,046	9,166	9,967	9,508
Public EV charging plugs - DC Fast (1000 units)	0.39		2.58		11.2		18
Public EV charging plugs - L2 (1000 units)	1.37		61.9		268		433
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 (%)	1.42	1.7	1.21	0.385	0.072	0.013	0
Vehicle sales - Light-duty - EV (%)	4.33	16.5	48.4	82.6	96.4	99.3	100
Vehicle sales - Light-duty - gasoline (%)	89.2	76.6	46.8	15.8	3.19	0.587	0
Vehicle sales - Light-duty - hybrid (%)	4.83	4.83	3.35	1.23	0.302	0.067	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.11	0.333	0.193	0.059	0.012	0.002	0
Vehicle sales - Light-duty - other (%)	0.096	0.092	0.059	0.021	0.004	0.001	0
Vehicle sales - Medium-duty - diesel (%)	64.7	59.7	42.3	14.4	2.59	0.384	0
Vehicle sales - Medium-duty - EV (%)	0.784	5.07	25.3	60.8	76.5	79.5	80
Vehicle sales - Medium-duty - gasoline (%)	33.7	33.3	25.5	9.32	1.77	0.277	0
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.402	0.341	0.14	0.03	0.005	0
Vehicle sales - Medium-duty - hydrogen FC (%)	0.196	1.27	6.33	15.2	19.1	19.9	20
Vehicle sales - Medium-duty - other (%)	0.253	0.255	0.205	0.083	0.019	0.004	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Offshore Wind - Base (billion $2018)		0.157	0.251	4.43	9.84	11.8	0
Capital invested - Solar PV - Base (billion $2018)		21.3	15.1	26.2	10.3	10.1	106
Capital invested - Wind - Base (billion $2018)		0	10.7	7.72	14.1	1.18	0
Installed renewables - OffshoreWind - Base land use assumptions (MW)	0	55.5	160	2,326	7,990	15,958	15,958
Installed renewables - OffshoreWind - Constrained land use assumptions (MW)	0	159	319	4,652	4,652	4,652	31,916
Installed renewables - Solar - Base land use assumptions (MW)	3,398	22,013	36,770	64,605	76,203	88,294	222,542
Installed renewables - Solar - Constrained land use assumptions (MW)	11,702	44,331	69,926	104,958	127,073	147,745	472,975
Installed renewables - Wind - Base land use assumptions (MW)	72	72	8,141	14,360	26,312	27,364	27,364
Installed renewables - Wind - Constrained land use assumptions (MW)	144	144	40,832	46,497	46,497	46,497	67,575

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	250	721	10,640	36,059	73,536	73,536
OffshoreWind - Constrained land use assumptions (GWh)	0	719	1,442	21,281	21,281	21,281	147,073
Solar - Base land use assumptions (GWh)	6,021	36,233	60,020	104,910	123,532	143,020	360,420
Solar - Constrained land use assumptions (GWh)	20,077	73,118	114,622	170,803	206,419	239,962	766,843
Wind - Base land use assumptions (GWh)	269	269	27,500	46,204	77,676	80,178	80,178

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

Item	2020	2025	2030	2035	2040	2045	2050
Wind - Constrained land use assumptions (GWh)	538	538	124,462	138,441	138,441	138,441	205,791

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)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-1,871
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-67.3
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-1,938
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-986
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-33.7
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-1,020
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							1,127
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							122
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							1,249
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							594
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							61.2
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							655

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)							-254
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-34,151
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-2,149

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-9,384
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-2,265
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-9,560
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-702
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-300
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-6,186
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,351
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-127
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-10,423
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-358
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-3,605
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-1,153
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-3,187
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-246
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-150
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-469
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,130
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-190
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-22,267
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,254
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-6,494
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-1,689
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-6,373
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-474
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-225
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-3,327
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,240
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							41.5
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							291

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 - Extend rotation length (1000 hectares)							4,785
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							835
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)							66.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							19.8
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							176
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,111
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							7,325
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							20.8
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							273
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,833
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							417
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)							35.1
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							9.91
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							30.5
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							672
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,292
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							31.1
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							282
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,309
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							628

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 - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							50.9
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							14.9
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							220
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,354
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							5,890

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		845	0.772	0.76	0.678	0.484	0.043
Monetary damages from air pollution - Natural Gas (million 2019$)		169	128	75.9	48.4	14.7	3.66
Monetary damages from air pollution - Transportation (million 2019$)		939	876	665	385	173	65.5
Premature deaths from air pollution - Coal (deaths)		95.4	0.087	0.086	0.077	0.055	0.005
Premature deaths from air pollution - Natural Gas (deaths)		19.1	14.5	8.57	5.47	1.66	0.413
Premature deaths from air pollution - Transportation (deaths)		106	98.5	74.8	43.3	19.5	7.37

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)		31,138	34,700				
Sales of cooking units - Electric Resistance (%)	32	46	79.9	86.5	86.9	86.9	86.9
Sales of cooking units - Gas (%)	68	54	20.1	13.5	13.1	13.1	13.1
Sales of space heating units - Electric Heat Pump (%)	4.92	28.4	70.7	83.8	85.1	85.1	85.1
Sales of space heating units - Electric Resistance (%)	4.71	8.37	10.5	12.6	13	13	13
Sales of space heating units - Fossil (%)	7.87	4.09	0.778	0.033	0	0	0
Sales of space heating units - Gas Furnace (%)	82.5	59.2	18.1	3.58	1.92	1.89	1.88
Sales of water heating units - Electric Heat Pump (%)	0.167	10.5	54.6	64.4	64.8	64.8	64.8
Sales of water heating units - Electric Resistance (%)	4.19	10.8	28.4	32.3	32.5	32.5	32.5
Sales of water heating units - Gas Furnace (%)	91.5	74.5	14.1	0.593	0	0	0
Sales of water heating units - Other (%)	4.17	4.15	3.01	2.72	2.72	2.72	2.72

Table 36: *E+RE- scenario - PILLAR 1: Efficiency/Electrification - Electricity demand*

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		4.76	4.85	8.11	8.58	8.03	8.37

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	246	247	237	223	212	208	211
Final energy use - Industry (PJ)	381	402	412	418	428	431	439
Final energy use - Residential (PJ)	313	296	274	246	223	210	204
Final energy use - Transportation (PJ)	709	660	582	488	403	349	324

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)		6.43	6.21				
Sales of cooking units - Electric Resistance (%)	70.5	76.8	96	99.8	100	100	100
Sales of cooking units - Gas (%)	29.5	23.2	3.97	0.2	0	0	0
Sales of space heating units - Electric Heat Pump (%)	25.4	42.2	78.8	86.9	87.3	87.3	87.3
Sales of space heating units - Electric Resistance (%)	18.4	18.4	7.74	5.33	5.23	5.33	5.34
Sales of space heating units - Fossil (%)	12.1	15.8	6.87	4.89	4.78	4.71	4.71
Sales of space heating units - Gas (%)	44.1	23.6	6.62	2.84	2.69	2.7	2.7
Sales of water heating units - Electric Heat Pump (%)	0	8.78	46.5	54.9	55.3	55.3	55.3
Sales of water heating units - Electric Resistance (%)	50.1	62.2	46.3	42.7	42.5	42.5	42.5
Sales of water heating units - Gas Furnace (%)	45.5	26.1	4.92	0.208	0	0	0
Sales of water heating units - Other (%)	4.39	2.95	2.33	2.2	2.21	2.22	2.23

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr (million $2018)		1,456	3,742	6,046	9,166	9,967	9,508
Public EV charging plugs - DC Fast (1000 units)	0.39		2.58		11.2		18
Public EV charging plugs - L2 (1000 units)	1.37		61.9		268		433
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 (%)	1.42	1.7	1.21	0.385	0.072	0.013	0
Vehicle sales - Light-duty - EV (%)	4.33	16.5	48.4	82.6	96.4	99.3	100
Vehicle sales - Light-duty - gasoline (%)	89.2	76.6	46.8	15.8	3.19	0.587	0
Vehicle sales - Light-duty - hybrid (%)	4.83	4.83	3.35	1.23	0.302	0.067	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.11	0.333	0.193	0.059	0.012	0.002	0
Vehicle sales - Light-duty - other (%)	0.096	0.092	0.059	0.021	0.004	0.001	0
Vehicle sales - Medium-duty - diesel (%)	64.7	59.7	42.3	14.4	2.59	0.384	0
Vehicle sales - Medium-duty - EV (%)	0.784	5.07	25.3	60.8	76.5	79.5	80
Vehicle sales - Medium-duty - gasoline (%)	33.7	33.3	25.5	9.32	1.77	0.277	0
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.402	0.341	0.14	0.03	0.005	0

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

Item	2020	2025	2030	2035	2040	2045	2050
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 - Offshore Wind - Base (billion $2018)		0.157	0.192	0	0	0.088	0
Capital invested - Offshore Wind - Constrained (billion $2018)		0	0	0	0	0	0
Capital invested - Solar PV - Base (billion $2018)		9.13	8.28	3.3	7.12	6.22	0.463
Capital invested - Solar PV - Constrained (billion $2018)		5.29	4.41	2.11	5.62	7.88	0.463
Capital invested - Wind - Base (billion $2018)		0.803	2.45	0	0.453	0.085	0.118
Capital invested - Wind - Constrained (billion $2018)		1.14	9.89	0	0.816	0.294	0.29
Installed renewables - OffshoreWind - Base land use assumptions (MW)	0	55.5	135	135	135	195	195
Installed renewables - OffshoreWind - Constrained land use assumptions (MW)	0	79.7	79.7	160	160	219	219
Installed renewables - Solar - Base land use assumptions (MW)	3,308	11,295	19,395	22,894	30,918	38,337	38,922
Installed renewables - Solar - Constrained land use assumptions (MW)	3,848	8,474	12,785	15,024	21,359	30,763	31,348
Installed renewables - Wind - Base land use assumptions (MW)	72	617	2,454	2,454	2,838	2,913	3,025
Installed renewables - Wind - Constrained land use assumptions (MW)	72	850	8,277	8,277	8,967	9,229	9,503

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	250	612	612	612	881	881
OffshoreWind - Constrained land use assumptions (GWh)	0	359	359	721	721	989	989
Solar - Base land use assumptions (GWh)	5,869	18,890	32,001	37,647	50,592	62,587	63,535
Solar - Constrained land use assumptions (GWh)	6,759	14,243	21,220	24,850	35,118	50,282	51,217
Wind - Base land use assumptions (GWh)	269	2,295	8,784	8,784	10,077	10,324	10,690
Wind - Constrained land use assumptions (GWh)	269	3,131	27,867	27,867	30,016	30,799	31,620

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)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-1,871
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-67.3
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-1,938

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-986
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-33.7
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-1,020
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							1,127
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							122
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							1,249
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							594
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							61.2
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							655

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)							-254
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-34,151
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-2,149
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-9,384
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-2,265
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-9,560
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-702
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-300
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-6,186
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,351
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-127

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-10,423
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-358
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-3,605
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-1,153
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-3,187
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-246
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-150
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-469
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,130
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-190
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-22,267
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,254
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-6,494
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-1,689
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-6,373
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-474
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-225
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-3,327
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,240
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							41.5
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							291
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							4,785
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							835
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)							66.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							19.8
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							176

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,111
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							7,325
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							20.8
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							273
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,833
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							417
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)							35.1
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							9.91
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							30.5
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							672
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,292
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							31.1
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							282
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,309
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							628
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)							50.9
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							14.9
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							220
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,354
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							5,890

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		845	0.772	0.76	0.678	0.484	0.043
Monetary damages from air pollution - Natural Gas (million 2019$)		213	161	173	132	42.3	13.8
Monetary damages from air pollution - Transportation (million 2019$)		939	876	665	385	173	65.5
Premature deaths from air pollution - Coal (deaths)		95.4	0.087	0.086	0.077	0.055	0.005
Premature deaths from air pollution - Natural Gas (deaths)		24.1	18.2	19.5	14.9	4.78	1.56
Premature deaths from air pollution - Transportation (deaths)		106	98.5	74.8	43.3	19.5	7.37

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)		31,112	34,614				
Sales of cooking units - Electric Resistance (%)	32	36.2	40.9	53.4	71	81.7	85.5
Sales of cooking units - Gas (%)	68	63.8	59.1	46.6	29	18.3	14.5
Sales of space heating units - Electric Heat Pump (%)	4.92	20.4	25.2	39.1	61.2	76.9	82.9
Sales of space heating units - Electric Resistance (%)	4.71	8.04	8.28	9.07	10.5	11.9	12.7
Sales of space heating units - Fossil (%)	7.87	4.72	4.38	3.33	1.64	0.517	0.135
Sales of space heating units - Gas Furnace (%)	82.5	66.9	62.2	48.4	26.6	10.7	4.34
Sales of water heating units - Electric Heat Pump (%)	0.167	2.04	7.05	21.5	43.6	58.1	63.1
Sales of water heating units - Electric Resistance (%)	4.19	7.46	9.4	15.2	24	29.7	31.8
Sales of water heating units - Gas Furnace (%)	91.5	86.1	79.2	59.5	29.1	9.3	2.42
Sales of water heating units - Other (%)	4.17	4.38	4.34	3.87	3.3	2.91	2.76

Table 46: *E-B+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand*

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		4.07	4.08	5.45	5.62	6.97	7.29

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	246	247	244	240	233	227	224
Final energy use - Industry (PJ)	381	403	413	422	433	437	443
Final energy use - Residential (PJ)	313	297	288	278	263	239	221
Final energy use - Transportation (PJ)	710	666	609	562	524	480	428

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)		6.4	6.15				
Sales of cooking units - Electric Resistance (%)	70.4	71.2	73.9	81	91	97.1	99.2
Sales of cooking units - Gas (%)	29.6	28.8	26.1	19	9.05	2.92	0.786
Sales of space heating units - Electric Heat Pump (%)	25.4	35.1	39.3	51.3	69.7	81.7	85.8

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Resistance (%)	18.4	20.5	19.2	15.6	10.3	6.88	5.68
Sales of space heating units - Fossil (%)	12.1	17.5	16.6	13.7	9.14	6.15	5.13
Sales of space heating units - Gas (%)	44.1	26.9	24.9	19.4	10.9	5.32	3.37
Sales of water heating units - Electric Heat Pump (%)	0	1.51	5.8	18.2	37.1	49.5	53.8
Sales of water heating units - Electric Resistance (%)	50.1	65.3	63.5	58.2	50.1	44.9	43.1
Sales of water heating units - Gas Furnace (%)	45.5	30.1	27.7	20.8	10.2	3.27	0.852
Sales of water heating units - Other (%)	4.39	3.08	3.01	2.82	2.52	2.32	2.25

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	237	495	1,674	5,255	7,661
Public EV charging plugs - DC Fast (1000 units)	0.39		0.815		4.16		11.6
Public EV charging plugs - L2 (1000 units)	1.37		19.6		99.8		277
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 (%)	1.44	1.87	2.03	1.61	1.02	0.522	0.224
Vehicle sales - Light-duty - EV (%)	2.03	5	12.5	26.9	49.5	72.8	87.9
Vehicle sales - Light-duty - gasoline (%)	91.3	86.9	78.6	65.3	44.9	24.1	10.7
Vehicle sales - Light-duty - hybrid (%)	5.01	5.8	6.46	5.82	4.3	2.51	1.2
Vehicle sales - Light-duty - hydrogen FC (%)	0.112	0.377	0.319	0.241	0.169	0.093	0.043
Vehicle sales - Light-duty - other (%)	0.098	0.101	0.091	0.079	0.057	0.031	0.014
Vehicle sales - Medium-duty - diesel (%)	64.8	62.2	57.7	49.4	35.6	19.6	8.37
Vehicle sales - Medium-duty - EV (%)	0.664	1.94	5.49	14.3	31.4	52.6	68
Vehicle sales - Medium-duty - gasoline (%)	33.8	34.7	34.7	31.9	24.4	14.2	6.33
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.418	0.464	0.478	0.414	0.275	0.141
Vehicle sales - Medium-duty - hydrogen FC (%)	0.166	0.485	1.37	3.58	7.86	13.2	17
Vehicle sales - Medium-duty - other (%)	0.253	0.266	0.279	0.286	0.258	0.184	0.102

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

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

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass purchases (million $2018/year)		0	512	515	515	515	900
Conversion capital investment - Cumulative 5-yr (million $2018)		0	1,031	30.8	0.343	0	4,523
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	0	0
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	5
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	3.35	3.32	3.42	3.53
Annual - BECCS (MMT)		0	0	0	0	0	0
Annual - Cement and lime (MMT)		0	0	3.35	3.32	3.42	3.53
Annual - NGCC (MMT)		0	0	0	0	0	0
Cumulative - All (MMT)		0	0	3.35	6.67	10.1	13.6
Cumulative - BECCS (MMT)		0	0	0	0	0	0
Cumulative - Cement and lime (MMT)		0	0	3.35	6.67	10.1	13.6
Cumulative - NGCC (MMT)		0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
All (km)		0	0	506	506	506	543
Cumulative investment - All (million $2018)		0	0	2,258	2,257	2,260	2,292
Cumulative investment - Spur (million $2018)		0	0	155	154	157	188
Cumulative investment - Trunk (million $2018)		0	0	2,104	2,104	2,104	2,104
Spur (km)		0	0	153	153	153	190
Trunk (km)		0	0	353	353	353	353

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	0	0	0	0
Wells and facilities construction costs (million $2020)		0	0	0	0	0	0

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)							-204

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-1,727
Carbon sink potential - Aggressive deployment - Cropland to woody energy crops (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Pasture to energy crops (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-60.7
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-1,993
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-204
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-911
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)							-30.4
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-1,145
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							117
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							2,514
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)							23.6
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)							297
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							110
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							3,063
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							117
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							537
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)							23.6
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)							297

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							55.2
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,030

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)							-254
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-34,151
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-2,149
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-9,384
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-2,265
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-9,560
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-702
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-300
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-6,186
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,351
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-127
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-10,423
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-358
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-3,605
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-1,153
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-3,187
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-246
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-150
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-469
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,130
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-190
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-22,267
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,254
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-6,494
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-1,689
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-6,373

Table 57: *E-B+ 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)							-474
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-225
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-3,327
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,240
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							41.5
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							291
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							4,785
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							835
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)							66.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							19.8
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							176
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,111
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							7,325
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							20.8
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							273
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,833
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							417
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)							35.1
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							9.91
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							30.5
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							672

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,292
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							31.1
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							282
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,309
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							628
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)							50.9
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							14.9
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							220
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,354
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							5,890

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		845	0.772	0.76	0.678	0.484	0.043
Monetary damages from air pollution - Natural Gas (million 2019$)		181	117	59	41.4	23.3	8.8
Monetary damages from air pollution - Transportation (million 2019$)		957	969	943	850	676	462
Premature deaths from air pollution - Coal (deaths)		95.4	0.087	0.086	0.077	0.055	0.005
Premature deaths from air pollution - Natural Gas (deaths)		20.4	13.2	6.66	4.67	2.63	0.993
Premature deaths from air pollution - Transportation (deaths)		108	109	106	95.6	76	51.9

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)		30,680	31,883				
Sales of cooking units - Electric Resistance (%)	32	34.3	34.3	34.3	34.4	34.3	34.3
Sales of cooking units - Gas (%)	68	65.7	65.7	65.7	65.6	65.7	65.7
Sales of space heating units - Electric Heat Pump (%)	4.92	24.3	48.6	68.6	71.8	72.2	72.2
Sales of space heating units - Electric Resistance (%)	4.71	8.77	12.8	20	25.1	25.8	25.9
Sales of space heating units - Fossil (%)	7.87	4.59	3.39	1.45	0.212	0.017	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Gas Furnace (%)	82.5	62.3	35.2	9.95	2.88	1.94	1.88
Sales of water heating units - Electric Heat Pump (%)	0.167	0.273	0.269	0.271	0.272	0.27	0.272
Sales of water heating units - Electric Resistance (%)	4.19	6.76	6.69	6.7	6.72	6.7	6.71
Sales of water heating units - Gas Furnace (%)	91.5	88.5	88.5	88.6	88.5	88.5	88.6
Sales of water heating units - Other (%)	4.17	4.42	4.53	4.44	4.48	4.5	4.46

Table 60: *REF scenario - PILLAR 1: Efficiency/Electrification - Electricity demand*

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		4.39	4.43	6.57	6.87	7.03	7.31

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	246	251	253	255	257	265	279
Final energy use - Industry (PJ)	381	412	434	451	473	490	511
Final energy use - Residential (PJ)	313	298	294	293	296	303	311
Final energy use - Transportation (PJ)	709	670	623	596	599	617	640

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)		6.34	5.72				
Sales of cooking units - Electric Resistance (%)	70.1	70.1	70.1	70.1	70.1	70.1	70.1
Sales of cooking units - Gas (%)	29.9	29.9	29.9	29.9	29.9	29.9	29.9
Sales of space heating units - Electric Heat Pump (%)	23.5	46.8	47.7	48.9	49.9	51	52.7
Sales of space heating units - Electric Resistance (%)	18.9	17	16.7	16.1	15.6	14.6	12.7
Sales of space heating units - Fossil (%)	12.4	13.6	8.94	6.9	6.71	6.67	6.75
Sales of space heating units - Gas (%)	45.2	22.7	26.7	28	27.8	27.7	27.8
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	50.1	65.9	65.9	65.8	65.8	65.7	65.7
Sales of water heating units - Gas Furnace (%)	45.5	31	31	31	31.1	31.1	31.2
Sales of water heating units - Other (%)	4.39	3.1	3.11	3.12	3.13	3.14	3.15

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 (%)	1.43	1.86	2.16	2.02	1.81	1.69	1.6
Vehicle sales - Light-duty - EV (%)	3.97	6.13	6.94	8.56	10.4	11.9	13.1
Vehicle sales - Light-duty - gasoline (%)	89.5	85.9	83.5	81.6	79.4	77.5	76
Vehicle sales - Light-duty - hybrid (%)	4.85	5.67	6.91	7.47	8	8.52	8.89

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle sales - Light-duty - hydrogen FC (%)	0.11	0.372	0.339	0.299	0.295	0.295	0.305
Vehicle sales - Light-duty - other (%)	0.096	0.1	0.097	0.097	0.096	0.095	0.097
Vehicle sales - Medium-duty - diesel (%)	65.2	63.5	61.6	59.6	58	56.5	55.2
Vehicle sales - Medium-duty - EV (%)	0.027	0.105	0.329	0.671	0.895	0.973	0.993
Vehicle sales - Medium-duty - gasoline (%)	34	35.5	37	38.5	39.7	40.8	41.7
Vehicle sales - Medium-duty - hybrid (%)	0.365	0.427	0.496	0.577	0.674	0.793	0.929
Vehicle sales - Medium-duty - hydrogen FC (%)	0.175	0.208	0.242	0.285	0.339	0.409	0.487
Vehicle sales - Medium-duty - other (%)	0.255	0.271	0.298	0.345	0.42	0.528	0.671

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-254
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-34,151
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-2,149
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-9,384
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-2,265
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-9,560
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-702
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-300
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-6,186
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,351
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-127
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-10,423
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-358
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-3,605
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-1,153
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-3,187
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-246
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-150
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-469
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,130
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-190
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-22,267
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,254

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-6,494
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-1,689
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-6,373
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-474
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-225
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-3,327
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,240
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							41.5
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							291
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							4,785
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							835
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)							66.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							19.8
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							176
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,111
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							7,325
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							20.8
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							273
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,833
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							417
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)							35.1

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 - Reforest cropland (1000 hectares)							9.91
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							30.5
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							672
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,292
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							31.1
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							282
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,309
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							628
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)							50.9
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							14.9
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							220
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,354
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							5,890

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)	-41.9		-12.3				-10
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-2.6		-4.34				-4.57
Business-as-usual carbon sink - Total (Mt CO2e/y)	-44.5		-16.7				-14.6

Table 66: *REF scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		2,362	1,481	1,350	1,296	1,267	1,169
Monetary damages from air pollution - Natural Gas (million 2019$)		156	167	189	210	197	196
Monetary damages from air pollution - Transportation (million 2019$)		954	979	1,004	1,032	1,058	1,084
Premature deaths from air pollution - Coal (deaths)		267	167	153	146	143	132
Premature deaths from air pollution - Natural Gas (deaths)		17.6	18.8	21.4	23.7	22.2	22.2

Table 66: *REF scenario - IMPACTS - Health (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Transportation (deaths)		107	110	113	116	119	122