Net-Zero America - delaware state report

Larson et al. 2020

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These data underlie graphs and tables presented in the Princeton Net-Zero America study (E. Larson, C. Greig, J. Jenkins, E. Mayfield, A. Pascale, C. Zhang, J. Drossman, R. Williams, S. Pacala, R. Socolow, EJ Baik, R. Birdsey, R. Duke, R. Jones, B. Haley, E. Leslie, K. Paustian, and A. Swan, Net-Zero America: Potential Pathways, Infrastructure, and Impacts, interim report, Princeton University, Princeton, NJ, December 15, 2020. Report available at https://netzeroamerica.princeton.edu.)

Notes

- These data are a subset of 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.)
- Some results are not model outputs, but rather they are limits that apply across all scenarios (e.g., maximum carbon storage potential in agricultural soils).

List of Tables

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)	0	0.774	0.771	0	0	0	0
Sales of cooking units - Electric Resistance (%)	50.1	60.7	93.3	99.7	100	100	100
Sales of cooking units - Gas (%)	49.9	39.3	6.72	0.338	0	0	0
Sales of space heating units - Electric Heat Pump (%)	14.3	32.1	79.9	90.6	91	91	91
Sales of space heating units - Electric Resistance (%)	9.9	10.8	4.53	3.11	3.02	3.06	3.07
Sales of space heating units - Fossil (%)	20.5	26.2	6.99	2.7	2.51	2.5	2.49
Sales of space heating units - Gas (%)	55.3	30.9	8.61	3.64	3.44	3.45	3.44
Sales of water heating units - Electric Heat Pump (%)	0	9.43	49.9	59	59.4	59.4	59.4
Sales of water heating units - Electric Resistance (%)	30.2	45.9	40.3	39	38.9	38.9	38.9
Sales of water heating units - Gas Furnace (%)	65.2	41.3	7.81	0.329	0	0	0
Sales of water heating units - Other (%)	4.6	3.33	1.97	1.68	1.67	1.69	1.7

Table 2: *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	193	496	803	1,217	1,325	1,263
Public EV charging plugs - DC Fast (1000 units)	0.065	0	0.324	0	1.42	0	2.3
Public EV charging plugs - L2 (1000 units)	0.118	0	7.8	0	34.2	0	55.3
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 (%)	1.43	1.71	1.21	0.386	0.073	0.013	0
Vehicle sales - Light-duty - EV (%)	4.31	16.4	48.3	82.5	96.4	99.3	100
Vehicle sales - Light-duty - gasoline (%)	89.2	76.6	46.9	15.8	3.2	0.587	0
Vehicle sales - Light-duty - hybrid (%)	4.8	4.82	3.34	1.23	0.301	0.066	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.11	0.333	0.194	0.06	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 3: *E+ scenario - PILLAR 1: Efficiency/Electrification - Overview*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	29.9	29.8	28.5	26.5	24.9	24.3	24.6
Final energy use - Industry (PJ)	16	16.3	16.6	16.9	17.1	17.5	18
Final energy use - Residential (PJ)	41.7	39.3	35.9	31.4	27.7	25.3	24.4
Final energy use - Transportation (PJ)	81.4	75.7	67	56.1	46.1	40	37.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)	0	3,472	3,883	0	0	0	0
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 (%)	1.53	28.2	70.6	83.7	85	85.1	85.1
Sales of space heating units - Electric Resistance (%)	1.94	8.4	10.6	12.7	13.1	13.1	13.1
Sales of space heating units - Fossil (%)	12.2	4.23	0.808	0.035	0	0	0

Table 4: *E+ scenario - PILLAR 1: Efficiency/Electrification - Commercial (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Gas Furnace (%)	84.3	59.2	18.1	3.53	1.88	1.85	1.84
Sales of water heating units - Electric Heat Pump (%)	0.078	10.5	54.6	64.4	64.9	64.9	64.9
Sales of water heating units - Electric Resistance (%)	1.96	10.8	28.3	32.2	32.4	32.4	32.4
Sales of water heating units - Gas Furnace (%)	93.3	74.5	14.1	0.593	0	0	0
Sales of water heating units - Other (%)	4.67	4.25	3.03	2.72	2.72	2.72	2.71

Table 5: *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)	0	0.526	0.536	0.919	0.973	0.907	0.947

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Biomass power plant (billion $2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion $2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	0	0	0	0	0
Capital invested - Offshore Wind - Base (billion $2018)	0	0	0	0	0	5.99	5.64
Capital invested - Offshore Wind - Constrained (billion $2018)	0	0	0	0	0	3.3	8.06
Capital invested - Solar PV - Base (billion $2018)	0	0.167	0.173	0.318	0	0	0
Capital invested - Solar PV - Constrained (billion $2018)	0	0.144	0.276	0.328	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu allam power plant (GWh)	0	0	0	0	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	17,643	19,972
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	17,643	19,972
Solar - Base land use assumptions (GWh)	75.2	233	271	543	0	0	0
Solar - Constrained land use assumptions (GWh)	0	0	180	342	0	0	0
Wind - Base land use assumptions (GWh)	8.07	0	0	0	0	0	0
Wind - Constrained land use assumptions (GWh)	8.07	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass purchases (million $2018/year)	0	0	0	0	0	0	0
Conversion capital investment - Cumulative 5-yr (million $2018)	0	0	0	0	0	0	0
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Beccs hydrogen (quantity)	0	0	0	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	0
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)	0	0	0	0	0	0	0
Annual - BECCS (MMT)	0	0	0	0	0	0	0
Annual - Cement and lime (MMT)	0	0	0	0	0	0	0
Annual - NGCC (MMT)	0	0	0	0	0	0	0
Cumulative - All (MMT)	0	0	0	0	0	0	0
Cumulative - BECCS (MMT)	0	0	0	0	0	0	0
Cumulative - Cement and lime (MMT)	0	0	0	0	0	0	0
Cumulative - NGCC (MMT)	0	0	0	0	0	0	0

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
All (km)	0	0	0	0	0	0	166
Cumulative investment - All (million $2018)	0	0	0	0	0	0	122
Cumulative investment - Spur (million $2018)	0	0	0	0	0	0	122
Cumulative investment - Trunk (million $2018)	0	0	0	0	0	0	0
Spur (km)	0	0	0	0	0	0	166
Trunk (km)	0	0	0	0	0	0	0

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

Item	2020	2025	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)	0	0	-244
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-6.43
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-250
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)	0	0	-126
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-3.22
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-129
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)	0	0	171
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	11.7
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	183
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	0

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

Item	2020	2025	2050
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)	0	0	88.6
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	5.85
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	94.5

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

Item	2020	2025	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)	0	0	6.94
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	901
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	206
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	201
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	27.3
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	208
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	83.5
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	5.4
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	85.9
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	76.6
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	3.48
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	263
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	34.3
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	77.3
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	13.9
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	69.4
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	29.2
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	2.7
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	6.51
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	25.8
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	5.21
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	581
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	120
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	139
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	20.4
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	139

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

Item	2020	2025	2050
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	56.4
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	4.05
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	46.2
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	51.2
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	1.13
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0	27.8
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	103
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	10.1
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)	0	0	0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)	0	0	7.93
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	0.357
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	2.44
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	25.4
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	178
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	0.567
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	26.1
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	39.3
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	5.03
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)	0	0	4.17
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	0.179
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	0.423
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	15.4
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	91.2
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	0.851
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	27
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	71
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	7.57
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)	0	0	6.05

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

Item	2020	2025	2050
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)	0	0	0.268
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	3.06
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	30.9
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	147

Table 14: *E+ scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	130	0.091	0.09	0.083	0.057	0.005
Monetary damages from air pollution - Natural Gas (million 2019$)	0	52.5	38.6	25.7	23.3	15.7	6.51
Monetary damages from air pollution - Transportation (million 2019$)	0	232	218	166	96.2	43.7	16.6
Premature deaths from air pollution - Coal (deaths)	0	14.6	0.01	0.01	0.009	0.006	0.001
Premature deaths from air pollution - Natural Gas (deaths)	0	5.93	4.36	2.9	2.63	1.77	0.736
Premature deaths from air pollution - Transportation (deaths)	0	26.1	24.5	18.7	10.8	4.91	1.87

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)	3.29	3.8	7.71	2.95	2.29	1.68	1.25
By economic sector - Construction (jobs)	1,159	1,159	1,095	1,419	1,414	4,193	7,337
By economic sector - Manufacturing (jobs)	779	1,426	2,601	2,635	2,094	2,841	2,826
By economic sector - Mining (jobs)	395	287	197	119	64.2	27.8	8.9
By economic sector - Other (jobs)	126	116	123	181	172	423	786
By economic sector - Pipeline (jobs)	83.7	81.8	67.9	52	36.7	21.4	39.3
By economic sector - Professional (jobs)	482	476	427	558	573	2,181	4,081
By economic sector - Trade (jobs)	414	359	317	376	364	1,221	2,325
By economic sector - Utilities (jobs)	1,085	1,300	1,156	1,571	1,840	5,242	8,746
By education level - All sectors - Associates degree or some college (jobs)	1,443	1,678	1,926	2,244	2,150	5,290	8,572
By education level - All sectors - Bachelors degree (jobs)	925	1,049	1,188	1,348	1,271	3,178	5,187
By education level - All sectors - Doctoral degree (jobs)	28.9	29.2	28.5	33.8	32.7	102	183
By education level - All sectors - High school diploma or less (jobs)	1,913	2,216	2,597	2,993	2,820	6,801	10,887
By education level - All sectors - Masters or professional degree (jobs)	216	238	253	295	286	782	1,321
By resource sector - Biomass (jobs)	13.7	16.3	21.3	8.39	6.88	6.13	5.33
By resource sector - CO2 (jobs)	0	0	0	0	0	0	224
By resource sector - Coal (jobs)	188	60.3	0	0	0	0	0
By resource sector - Grid (jobs)	981	1,544	1,578	2,444	2,815	10,088	16,956
By resource sector - Natural Gas (jobs)	1,273	1,224	934	898	1,048	701	713
By resource sector - Nuclear (jobs)	0	0	0	0	0	0	0
By resource sector - Oil (jobs)	706	583	435	275	147	58.8	0
By resource sector - Solar (jobs)	1,363	1,777	2,924	3,212	2,308	2,259	2,349
By resource sector - Wind (jobs)	1.9	4.99	99.5	77	236	3,040	5,904
Median wages - Annual - All ($2019 per job)	63,848	64,185	63,423	64,501	66,169	68,740	70,482
On-Site or In-Plant Training - Total jobs - 1 to 4 years (jobs)	748	860	972	1,135	1,091	2,713	4,412
On-Site or In-Plant Training - Total jobs - 4 to 10 years (jobs)	312	338	340	414	417	1,130	1,912
On-Site or In-Plant Training - Total jobs - None (jobs)	730	840	979	1,121	1,053	2,568	4,154

Table 15: *E+ scenario - IMPACTS - Jobs (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
On-Site or In-Plant Training - Total jobs - Over 10 years (jobs)	39.2	45.4	50.2	59.7	58.7	150	246
On-Site or In-Plant Training - Total jobs - Up to 1 year (jobs)	2,698	3,126	3,652	4,184	3,941	9,592	15,426
On-the-Job Training - All sectors - 1 to 4 years (jobs)	966	1,107	1,241	1,453	1,403	3,514	5,735
On-the-Job Training - All sectors - 4 to 10 years (jobs)	305	329	328	404	411	1,127	1,916
On-the-Job Training - All sectors - None (jobs)	243	272	311	356	334	827	1,349
On-the-Job Training - All sectors - Over 10 years (jobs)	45.2	53.6	66.8	74.5	67.3	150	233
On-the-Job Training - All sectors - Up to 1 year (jobs)	2,968	3,447	4,047	4,626	4,345	10,535	16,918
Related work experience - All sectors - 1 to 4 years (jobs)	1,633	1,867	2,125	2,453	2,336	5,797	9,419
Related work experience - All sectors - 4 to 10 years (jobs)	1,063	1,218	1,376	1,592	1,524	3,800	6,192
Related work experience - All sectors - None (jobs)	656	754	856	994	952	2,345	3,805
Related work experience - All sectors - Over 10 years (jobs)	283	335	399	453	424	1,014	1,614
Related work experience - All sectors - Up to 1 year (jobs)	891	1,036	1,238	1,421	1,325	3,197	5,121
Wage income - All (million $2019)	289	334	380	446	434	1,110	1,843

Table 16: *E+ scenario - IMPACTS - Fossil fuel industries*

Item	2020	2025	2030	2035	2040	2045	2050
Natural gas consumption - Annual (tcf)	72.9	73.9	62.3	50	37.6	23.7	16.4
Natural gas consumption - Cumulative (tcf)	0	0	0	0	0	0	1,505
Natural gas production - Annual (tcf)	0	0	0	0	0	0	0
Oil consumption - Annual (million bbls)	14.5	13.1	10.7	7.3	4.21	1.8	0
Oil consumption - Cumulative (million bbls)	0	0	0	0	0	0	229
Oil production - Annual (million bbls)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)	0	0.769	0.798	0	0	0	0
Sales of cooking units - Electric Resistance (%)	49.9	51.2	55.8	67.9	84.7	95.1	98.7
Sales of cooking units - Gas (%)	50.1	48.8	44.2	32.1	15.3	4.94	1.33
Sales of space heating units - Electric Heat Pump (%)	14.3	22.9	28.3	44	68	83.7	89.1
Sales of space heating units - Electric Resistance (%)	9.9	12	11.2	9.09	5.93	3.95	3.26
Sales of space heating units - Fossil (%)	20.5	29.9	27.8	21.5	11.8	5.49	3.29
Sales of space heating units - Gas (%)	55.3	35.2	32.6	25.4	14.2	6.89	4.33
Sales of water heating units - Electric Heat Pump (%)	0	1.62	6.23	19.5	39.9	53.2	57.8
Sales of water heating units - Electric Resistance (%)	30.2	47	46.3	44.4	41.6	39.8	39.1
Sales of water heating units - Gas Furnace (%)	65.2	47.8	44	33.1	16.2	5.18	1.35
Sales of water heating units - Other (%)	4.6	3.59	3.44	3	2.33	1.9	1.75

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr (million $2018)	0	0	31.3	65.7	222	699	1,018
Public EV charging plugs - DC Fast (1000 units)	0.065	0	0.1	0	0.527	0	1.47
Public EV charging plugs - L2 (1000 units)	0.118	0	2.42	0	12.7	0	35.4
Vehicle sales - Heavy-duty - diesel (%)	97.4	96	91.3	79.8	58.2	32.1	13.7

Table 18: *E- scenario - PILLAR 1: Efficiency/Electrification - Transportation (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
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 (%)	1.45	1.88	2.04	1.61	1.02	0.523	0.225
Vehicle sales - Light-duty - EV (%)	2.03	4.99	12.5	26.8	49.4	72.7	87.8
Vehicle sales - Light-duty - gasoline (%)	91.3	86.9	78.6	65.4	45	24.1	10.7
Vehicle sales - Light-duty - hybrid (%)	4.99	5.77	6.44	5.81	4.29	2.5	1.2
Vehicle sales - Light-duty - hydrogen FC (%)	0.112	0.377	0.319	0.241	0.169	0.094	0.044
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 19: *E- scenario - PILLAR 1: Efficiency/Electrification - Overview*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	29.9	29.9	29.5	28.9	28	27	26.5
Final energy use - Industry (PJ)	16	16.3	16.7	17.1	17.5	17.9	18.4
Final energy use - Residential (PJ)	41.7	39.5	38.4	37	34.6	31.5	28.6
Final energy use - Transportation (PJ)	81.5	76.4	70.2	64.9	60.8	55.9	50.1

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)	0	3,468	3,852	0	0	0	0
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 (%)	1.53	20.1	24.9	38.9	61.1	76.8	82.8
Sales of space heating units - Electric Resistance (%)	1.94	8.06	8.33	9.15	10.6	12	12.8
Sales of space heating units - Fossil (%)	12.2	4.9	4.55	3.47	1.71	0.536	0.14
Sales of space heating units - Gas Furnace (%)	84.3	66.9	62.2	48.4	26.6	10.7	4.3
Sales of water heating units - Electric Heat Pump (%)	0.078	2.03	7.05	21.5	43.6	58.1	63.1
Sales of water heating units - Electric Resistance (%)	1.96	7.38	9.33	15.1	24	29.7	31.7
Sales of water heating units - Gas Furnace (%)	93.3	86.1	79.2	59.5	29.1	9.29	2.42
Sales of water heating units - Other (%)	4.67	4.49	4.43	3.93	3.32	2.91	2.76

Table 21: *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)	0	0.457	0.458	0.597	0.614	0.89	0.939

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

Item	2020	2025	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)	0	0	-244
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-6.43
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-250

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

Item	2020	2025	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)	0	0	-126
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-3.22
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-129
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)	0	0	171
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	11.7
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	183
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)	0	0	88.6
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	5.85
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	94.5

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

Item	2020	2025	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)	0	0	6.94
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	901
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	206
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	201
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	27.3
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	208
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	83.5
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	5.4
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	85.9
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	76.6
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	3.48
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	263
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	34.3
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	77.3
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	13.9

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

Item	2020	2025	2050
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	69.4
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	29.2
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	2.7
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	6.51
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	25.8
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	5.21
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	581
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	120
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	139
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	20.4
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	139
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	56.4
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	4.05
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	46.2
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	51.2
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	1.13
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0	27.8
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	103
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	10.1
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)	0	0	0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)	0	0	7.93
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	0.357
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	2.44
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	25.4
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	178
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	0.567
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	26.1
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	39.3
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	5.03
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)	0	0	0

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

Item	2020	2025	2050
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)	0	0	4.17
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	0.179
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	0.423
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	15.4
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	91.2
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	0.851
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	27
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	71
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	7.57
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)	0	0	6.05
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)	0	0	0.268
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	3.06
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	30.9
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	147

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	130	0.091	0.09	0.083	0.057	0.005
Monetary damages from air pollution - Natural Gas (million 2019$)	0	47.6	30.8	13.4	5.76	1.89	1.29
Monetary damages from air pollution - Transportation (million 2019$)	0	237	240	234	212	169	116
Premature deaths from air pollution - Coal (deaths)	0	14.6	0.01	0.01	0.009	0.006	0.001
Premature deaths from air pollution - Natural Gas (deaths)	0	5.37	3.48	1.51	0.651	0.213	0.146
Premature deaths from air pollution - Transportation (deaths)	0	26.6	27	26.4	23.8	19	13.1

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)	0	0.774	0.771	0	0	0	0
Sales of cooking units - Electric Resistance (%)	50.1	60.7	93.3	99.7	100	100	100
Sales of cooking units - Gas (%)	49.9	39.3	6.72	0.338	0	0	0
Sales of space heating units - Electric Heat Pump (%)	14.3	32.1	79.9	90.6	91	91	91
Sales of space heating units - Electric Resistance (%)	9.9	10.8	4.53	3.11	3.02	3.06	3.07
Sales of space heating units - Fossil (%)	20.5	26.2	6.99	2.7	2.51	2.5	2.49
Sales of space heating units - Gas (%)	55.3	30.9	8.61	3.64	3.44	3.45	3.44
Sales of water heating units - Electric Heat Pump (%)	0	9.43	49.9	59	59.4	59.4	59.4

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Electric Resistance (%)	30.2	45.9	40.3	39	38.9	38.9	38.9
Sales of water heating units - Gas Furnace (%)	65.2	41.3	7.81	0.329	0	0	0
Sales of water heating units - Other (%)	4.6	3.33	1.97	1.68	1.67	1.69	1.7

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr (million $2018)	0	193	496	803	1,217	1,325	1,263
Public EV charging plugs - DC Fast (1000 units)	0.065	0	0.324	0	1.42	0	2.3
Public EV charging plugs - L2 (1000 units)	0.118	0	7.8	0	34.2	0	55.3
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 (%)	1.43	1.71	1.21	0.386	0.073	0.013	0
Vehicle sales - Light-duty - EV (%)	4.31	16.4	48.3	82.5	96.4	99.3	100
Vehicle sales - Light-duty - gasoline (%)	89.2	76.6	46.9	15.8	3.2	0.587	0
Vehicle sales - Light-duty - hybrid (%)	4.8	4.82	3.34	1.23	0.301	0.066	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.11	0.333	0.194	0.06	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 27: *E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Overview*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	29.9	29.8	28.5	26.5	24.9	24.3	24.6
Final energy use - Industry (PJ)	16	16.3	16.6	16.9	17.1	17.5	18
Final energy use - Residential (PJ)	41.7	39.3	35.9	31.4	27.7	25.3	24.4
Final energy use - Transportation (PJ)	81.4	75.7	67	56.1	46.1	40	37.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)	0	3,472	3,883	0	0	0	0
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 (%)	1.53	28.2	70.6	83.7	85	85.1	85.1
Sales of space heating units - Electric Resistance (%)	1.94	8.4	10.6	12.7	13.1	13.1	13.1
Sales of space heating units - Fossil (%)	12.2	4.23	0.808	0.035	0	0	0
Sales of space heating units - Gas Furnace (%)	84.3	59.2	18.1	3.53	1.88	1.85	1.84
Sales of water heating units - Electric Heat Pump (%)	0.078	10.5	54.6	64.4	64.9	64.9	64.9
Sales of water heating units - Electric Resistance (%)	1.96	10.8	28.3	32.2	32.4	32.4	32.4
Sales of water heating units - Gas Furnace (%)	93.3	74.5	14.1	0.593	0	0	0
Sales of water heating units - Other (%)	4.67	4.25	3.03	2.72	2.72	2.72	2.71

Table 29: *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)	0	0.526	0.536	0.919	0.973	0.907	0.947

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Offshore Wind - Base (billion $2018)	0	0	0	0	3.88	7.84	1.02
Capital invested - Solar PV - Base (billion $2018)	0	0	0.242	0	0	0	2.91
Capital invested - Wind - Base (billion $2018)	0	0	0	0	0	0	0.246

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

Item	2020	2025	2030	2040	2045	2050
OffshoreWind - Base land use assumptions (GWh)	0	0	0	9,506	24,461	3,648
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	9,526	0	28,109
Solar - Base land use assumptions (GWh)	75.2	0	378	0	0	5,898
Solar - Constrained land use assumptions (GWh)	75.2	199	1,119	0	0	5,572
Wind - Base land use assumptions (GWh)	8.07	0	0	0	0	395
Wind - Constrained land use assumptions (GWh)	8.07	0	0	0	0	0

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

Item	2020	2025	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)	0	0	-244
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-6.43
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-250
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)	0	0	-126
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-3.22
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-129
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)	0	0	171
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	11.7
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	183
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)	0	0	88.6
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	5.85
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	94.5

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

Item	2020	2025	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)	0	0	6.94
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	901
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	206
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	201
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	27.3
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	208
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	83.5
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	5.4
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	85.9
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	76.6
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	3.48
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	263
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	34.3
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	77.3
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	13.9
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	69.4
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	29.2
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	2.7
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	6.51
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	25.8
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	5.21
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	581
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	120
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	139
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	20.4
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	139
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	56.4
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	4.05
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	46.2
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	51.2
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	1.13

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

Item	2020	2025	2050
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0	27.8
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	103
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	10.1
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)	0	0	0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)	0	0	7.93
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	0.357
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	2.44
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	25.4
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	178
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	0.567
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	26.1
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	39.3
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	5.03
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)	0	0	4.17
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	0.179
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	0.423
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	15.4
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	91.2
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	0.851
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	27
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	71
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	7.57
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)	0	0	6.05
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)	0	0	0.268
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	3.06
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	30.9
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	147

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	130	0.091	0.09	0.083	0.057	0.005
Monetary damages from air pollution - Natural Gas (million 2019$)	0	43.7	32.3	19.8	13.5	4.78	0.945
Monetary damages from air pollution - Transportation (million 2019$)	0	232	218	166	96.2	43.7	16.6
Premature deaths from air pollution - Coal (deaths)	0	14.6	0.01	0.01	0.009	0.006	0.001
Premature deaths from air pollution - Natural Gas (deaths)	0	4.93	3.65	2.23	1.52	0.539	0.107
Premature deaths from air pollution - Transportation (deaths)	0	26.1	24.5	18.7	10.8	4.91	1.87

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)	0	0.774	0.771	0	0	0	0
Sales of cooking units - Electric Resistance (%)	50.1	60.7	93.3	99.7	100	100	100
Sales of cooking units - Gas (%)	49.9	39.3	6.72	0.338	0	0	0
Sales of space heating units - Electric Heat Pump (%)	14.3	32.1	79.9	90.6	91	91	91
Sales of space heating units - Electric Resistance (%)	9.9	10.8	4.53	3.11	3.02	3.06	3.07
Sales of space heating units - Fossil (%)	20.5	26.2	6.99	2.7	2.51	2.5	2.49
Sales of space heating units - Gas (%)	55.3	30.9	8.61	3.64	3.44	3.45	3.44
Sales of water heating units - Electric Heat Pump (%)	0	9.43	49.9	59	59.4	59.4	59.4
Sales of water heating units - Electric Resistance (%)	30.2	45.9	40.3	39	38.9	38.9	38.9
Sales of water heating units - Gas Furnace (%)	65.2	41.3	7.81	0.329	0	0	0
Sales of water heating units - Other (%)	4.6	3.33	1.97	1.68	1.67	1.69	1.7

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr (million $2018)	0	193	496	803	1,217	1,325	1,263
Public EV charging plugs - DC Fast (1000 units)	0.065	0	0.324	0	1.42	0	2.3
Public EV charging plugs - L2 (1000 units)	0.118	0	7.8	0	34.2	0	55.3
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 (%)	1.43	1.71	1.21	0.386	0.073	0.013	0
Vehicle sales - Light-duty - EV (%)	4.31	16.4	48.3	82.5	96.4	99.3	100
Vehicle sales - Light-duty - gasoline (%)	89.2	76.6	46.9	15.8	3.2	0.587	0
Vehicle sales - Light-duty - hybrid (%)	4.8	4.82	3.34	1.23	0.301	0.066	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.11	0.333	0.194	0.06	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 37: *E+RE- scenario - PILLAR 1: Efficiency/Electrification - Overview*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	29.9	29.8	28.5	26.5	24.9	24.3	24.6
Final energy use - Industry (PJ)	16	16.3	16.6	16.9	17.1	17.5	18
Final energy use - Residential (PJ)	41.7	39.3	35.9	31.4	27.7	25.3	24.4
Final energy use - Transportation (PJ)	81.4	75.7	67	56.1	46.1	40	37.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)	0	3,472	3,883	0	0	0	0
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 (%)	1.53	28.2	70.6	83.7	85	85.1	85.1
Sales of space heating units - Electric Resistance (%)	1.94	8.4	10.6	12.7	13.1	13.1	13.1
Sales of space heating units - Fossil (%)	12.2	4.23	0.808	0.035	0	0	0
Sales of space heating units - Gas Furnace (%)	84.3	59.2	18.1	3.53	1.88	1.85	1.84
Sales of water heating units - Electric Heat Pump (%)	0.078	10.5	54.6	64.4	64.9	64.9	64.9
Sales of water heating units - Electric Resistance (%)	1.96	10.8	28.3	32.2	32.4	32.4	32.4
Sales of water heating units - Gas Furnace (%)	93.3	74.5	14.1	0.593	0	0	0
Sales of water heating units - Other (%)	4.67	4.25	3.03	2.72	2.72	2.72	2.71

Table 39: *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)	0	0.526	0.536	0.919	0.973	0.907	0.947

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Offshore Wind - Constrained (billion $2018)	0	0	0	0	0	0.356	0.106
Capital invested - Solar PV - Base (billion $2018)	0	0	0	0	0	0	0
Capital invested - Solar PV - Constrained (billion $2018)	0	0	0.127	0.275	0	0.217	0
Capital invested - Wind - Base (billion $2018)	0	0	0	0	0	0	0
Capital invested - Wind - Constrained (billion $2018)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2045	2050
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	1,008	340
Solar - Base land use assumptions (GWh)	75.2	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	75.2	0	199	469	414	0
Wind - Base land use assumptions (GWh)	8.07	0	0	0	0	0
Wind - Constrained land use assumptions (GWh)	8.07	0	0	0	0	0

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

Item	2020	2025	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)	0	0	-244
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-6.43

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

Item	2020	2025	2050
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-250
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)	0	0	-126
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-3.22
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-129
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)	0	0	171
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	11.7
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	183
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)	0	0	88.6
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	5.85
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	94.5

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

Item	2020	2025	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)	0	0	6.94
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	901
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	206
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	201
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	27.3
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	208
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	83.5
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	5.4
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	85.9
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	76.6
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	3.48
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	263
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	34.3
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	77.3

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

Item	2020	2025	2050
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	13.9
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	69.4
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	29.2
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	2.7
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	6.51
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	25.8
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	5.21
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	581
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	120
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	139
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	20.4
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	139
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	56.4
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	4.05
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	46.2
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	51.2
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	1.13
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0	27.8
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	103
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	10.1
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)	0	0	0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)	0	0	7.93
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	0.357
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	2.44
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	25.4
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	178
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	0.567
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	26.1
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	39.3
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	5.03

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

Item	2020	2025	2050
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)	0	0	4.17
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	0.179
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	0.423
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	15.4
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	91.2
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	0.851
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	27
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	71
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	7.57
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)	0	0	6.05
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)	0	0	0.268
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	3.06
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	30.9
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	147

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	130	0.091	0.09	0.083	0.057	0.005
Monetary damages from air pollution - Natural Gas (million 2019$)	0	51.3	41.8	48.2	36.9	14.7	4.27
Monetary damages from air pollution - Transportation (million 2019$)	0	232	218	166	96.2	43.7	16.6
Premature deaths from air pollution - Coal (deaths)	0	14.6	0.01	0.01	0.009	0.006	0.001
Premature deaths from air pollution - Natural Gas (deaths)	0	5.79	4.72	5.44	4.16	1.66	0.482
Premature deaths from air pollution - Transportation (deaths)	0	26.1	24.5	18.7	10.8	4.91	1.87

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)	0	0.769	0.798	0	0	0	0
Sales of cooking units - Electric Resistance (%)	49.9	51.2	55.8	67.9	84.7	95.1	98.7
Sales of cooking units - Gas (%)	50.1	48.8	44.2	32.1	15.3	4.94	1.33
Sales of space heating units - Electric Heat Pump (%)	14.3	22.9	28.3	44	68	83.7	89.1
Sales of space heating units - Electric Resistance (%)	9.9	12	11.2	9.09	5.93	3.95	3.26
Sales of space heating units - Fossil (%)	20.5	29.9	27.8	21.5	11.8	5.49	3.29
Sales of space heating units - Gas (%)	55.3	35.2	32.6	25.4	14.2	6.89	4.33

Table 45: *E-B+ scenario - PILLAR 1: Efficiency/Electrification - Residential (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Electric Heat Pump (%)	0	1.62	6.23	19.5	39.9	53.2	57.8
Sales of water heating units - Electric Resistance (%)	30.2	47	46.3	44.4	41.6	39.8	39.1
Sales of water heating units - Gas Furnace (%)	65.2	47.8	44	33.1	16.2	5.18	1.35
Sales of water heating units - Other (%)	4.6	3.59	3.44	3	2.33	1.9	1.75

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr (million $2018)	0	0	31.3	65.7	222	699	1,018
Public EV charging plugs - DC Fast (1000 units)	0.065	0	0.1	0	0.527	0	1.47
Public EV charging plugs - L2 (1000 units)	0.118	0	2.42	0	12.7	0	35.4
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 (%)	1.45	1.88	2.04	1.61	1.02	0.523	0.225
Vehicle sales - Light-duty - EV (%)	2.03	4.99	12.5	26.8	49.4	72.7	87.8
Vehicle sales - Light-duty - gasoline (%)	91.3	86.9	78.6	65.4	45	24.1	10.7
Vehicle sales - Light-duty - hybrid (%)	4.99	5.77	6.44	5.81	4.29	2.5	1.2
Vehicle sales - Light-duty - hydrogen FC (%)	0.112	0.377	0.319	0.241	0.169	0.094	0.044
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 47: *E-B+ scenario - PILLAR 1: Efficiency/Electrification - Overview*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	29.9	29.9	29.5	28.9	28	27	26.5
Final energy use - Industry (PJ)	16	16.3	16.7	17.1	17.5	17.9	18.4
Final energy use - Residential (PJ)	41.7	39.5	38.4	37	34.6	31.5	28.6
Final energy use - Transportation (PJ)	81.5	76.4	70.2	64.9	60.8	55.9	50.1

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)	0	3,468	3,852	0	0	0	0
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 (%)	1.53	20.1	24.9	38.9	61.1	76.8	82.8
Sales of space heating units - Electric Resistance (%)	1.94	8.06	8.33	9.15	10.6	12	12.8
Sales of space heating units - Fossil (%)	12.2	4.9	4.55	3.47	1.71	0.536	0.14
Sales of space heating units - Gas Furnace (%)	84.3	66.9	62.2	48.4	26.6	10.7	4.3
Sales of water heating units - Electric Heat Pump (%)	0.078	2.03	7.05	21.5	43.6	58.1	63.1
Sales of water heating units - Electric Resistance (%)	1.96	7.38	9.33	15.1	24	29.7	31.7
Sales of water heating units - Gas Furnace (%)	93.3	86.1	79.2	59.5	29.1	9.29	2.42
Sales of water heating units - Other (%)	4.67	4.49	4.43	3.93	3.32	2.91	2.76

Table 49: *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)	0	0.457	0.458	0.597	0.614	0.89	0.939

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	0	0	0	0	0	69.2
Conversion capital investment - Cumulative 5-yr (million $2018)	0	0	0	0	0	0	772
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	1
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	0	0	0	0	0
Annual - BECCS (MMT)	0	0	0	0	0	0	0
Annual - Cement and lime (MMT)	0	0	0	0	0	0	0
Annual - NGCC (MMT)	0	0	0	0	0	0	0
Cumulative - All (MMT)	0	0	0	0	0	0	0
Cumulative - BECCS (MMT)	0	0	0	0	0	0	0
Cumulative - Cement and lime (MMT)	0	0	0	0	0	0	0
Cumulative - NGCC (MMT)	0	0	0	0	0	0	0

Table 54: *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	0
Injection wells (wells)	0	0	0	0	0	0	0
Resource characterization, appraisal, permitting costs (million $2020)	0	0	0	0	0	0	0
Wells and facilities construction costs (million $2020)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
All (km)	0	0	0	0	0	0	0
Cumulative investment - All (million $2018)	0	0	0	0	0	0	0
Cumulative investment - Spur (million $2018)	0	0	0	0	0	0	0
Cumulative investment - Trunk (million $2018)	0	0	0	0	0	0	0
Spur (km)	0	0	0	0	0	0	0
Trunk (km)	0	0	0	0	0	0	0

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

Item	2020	2025	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	-25.9
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)	0	0	-225
Carbon sink potential - Aggressive deployment - Cropland to woody energy crops (1000 tCO2e/y)	0	0	0
Carbon sink potential - Aggressive deployment - Pasture to energy crops (1000 tCO2e/y)	0	0	0
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-5.61
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-257
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	-25.9
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)	0	0	-116
Carbon sink potential - Moderate deployment - Cropland to woody energy crops (1000 tCO2e/y)	0	0	0
Carbon sink potential - Moderate deployment - Pasture to energy crops (1000 tCO2e/y)	0	0	0
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-2.8
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-145
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	13.8
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)	0	0	390
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)	0	0	3.07
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)	0	0	0.14
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	10.2
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	417
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	13.8
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)	0	0	81.5
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)	0	0	3.07
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)	0	0	0.14

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

Item	2020	2025	2050
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	5.1
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	104

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

Item	2020	2025	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)	0	0	6.94
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	901
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	206
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	201
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	27.3
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	208
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	83.5
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	5.4
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	85.9
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	76.6
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	3.48
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	263
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	34.3
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	77.3
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	13.9
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	69.4
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	29.2
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	2.7
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	6.51
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	25.8
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	5.21
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	581
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	120
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	139
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	20.4
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	139
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	56.4

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

Item	2020	2025	2050
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	4.05
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	46.2
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	51.2
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	1.13
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0	27.8
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	103
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	10.1
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)	0	0	0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)	0	0	7.93
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	0.357
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	2.44
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	25.4
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	178
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	0.567
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	26.1
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	39.3
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	5.03
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)	0	0	4.17
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	0.179
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	0.423
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	15.4
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	91.2
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	0.851
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	27
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	71
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	7.57
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)	0	0	6.05
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)	0	0	0.268

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

Item	2020	2025	2050
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	3.06
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	30.9
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	147

Table 58: *REF scenario - PILLAR 1: Efficiency/Electrification - Residential*

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)	0	0.756	0.716	0	0	0	0
Sales of cooking units - Electric Resistance (%)	49.4	49.4	49.4	49.4	49.4	49.4	49.4
Sales of cooking units - Gas (%)	50.6	50.6	50.6	50.6	50.6	50.6	50.6
Sales of space heating units - Electric Heat Pump (%)	11.1	37.9	39.1	40.3	41.2	41.9	42.9
Sales of space heating units - Electric Resistance (%)	10.4	9.91	9.75	9.4	9.02	8.38	7.34
Sales of space heating units - Fossil (%)	21.2	21.3	11.8	7.55	7.21	7.18	7.25
Sales of space heating units - Gas (%)	57.3	30.9	39.4	42.7	42.6	42.6	42.6
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	30.2	47.2	47.2	47.1	47	47	46.9
Sales of water heating units - Gas Furnace (%)	65.2	49.1	49.2	49.2	49.3	49.4	49.4
Sales of water heating units - Other (%)	4.6	3.64	3.64	3.65	3.66	3.66	3.67

Table 59: *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 (%)	1.44	1.87	2.16	2.02	1.81	1.69	1.6
Vehicle sales - Light-duty - EV (%)	3.95	6.1	6.91	8.53	10.3	11.9	13.1
Vehicle sales - Light-duty - gasoline (%)	89.6	85.9	83.6	81.6	79.5	77.5	76
Vehicle sales - Light-duty - hybrid (%)	4.82	5.65	6.89	7.44	7.98	8.51	8.88
Vehicle sales - Light-duty - hydrogen FC (%)	0.11	0.373	0.339	0.3	0.296	0.295	0.306
Vehicle sales - Light-duty - other (%)	0.097	0.101	0.097	0.097	0.097	0.095	0.098
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 60: *REF scenario - PILLAR 1: Efficiency/Electrification - Overview*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	29.9	30.3	30.5	30.5	30.7	31.5	33.2
Final energy use - Industry (PJ)	16	16.8	17.7	18.8	20	21.3	22.7
Final energy use - Residential (PJ)	41.7	39.3	38.7	38.6	39	40	41.1
Final energy use - Transportation (PJ)	81.4	76.3	70.4	66.8	66.7	68.4	70.6

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)	0	3,421	3,558	0	0	0	0
Sales of cooking units - Electric Resistance (%)	32	34.3	34.3	34.3	34.4	34.3	34.3

Table 61: *REF scenario - PILLAR 1: Efficiency/Electrification - Commercial (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
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 (%)	1.53	24.1	48.5	68.4	71.7	72.1	72.1
Sales of space heating units - Electric Resistance (%)	1.94	8.79	12.8	20.1	25.2	25.9	26
Sales of space heating units - Fossil (%)	12.2	4.76	3.52	1.51	0.221	0.018	0
Sales of space heating units - Gas Furnace (%)	84.3	62.4	35.2	9.91	2.84	1.91	1.84
Sales of water heating units - Electric Heat Pump (%)	0.078	0.268	0.265	0.267	0.268	0.267	0.268
Sales of water heating units - Electric Resistance (%)	1.96	6.67	6.62	6.62	6.65	6.63	6.65
Sales of water heating units - Gas Furnace (%)	93.3	88.5	88.5	88.6	88.5	88.5	88.5
Sales of water heating units - Other (%)	4.67	4.54	4.63	4.53	4.56	4.58	4.53

Table 62: *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)	0	0.488	0.492	0.647	0.67	0.83	0.869

Table 63: *REF scenario - PILLAR 6: Land sinks - Forests*

Item	2020	2025	2030	2050
Business-as-usual carbon sink - Natural uptake (Mt CO2e/y)	-0.69	0	-0.314	-0.281
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-0.057	0	-0.102	-0.106
Business-as-usual carbon sink - Total (Mt CO2e/y)	-0.747	0	-0.416	-0.387
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)	0	0	0	6.94
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	0	901
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	0	206
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	0	201
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	0	27.3
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	0	208
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	0	83.5
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	0	5.4
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	0	85.9
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	0	76.6
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	0	3.48
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	0	263
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	0	34.3
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	0	77.3
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	0	13.9
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	0	69.4
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	0	29.2
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	0	2.7

Table 63: *REF scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2050
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	0	6.51
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	0	25.8
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	0	5.21
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	0	581
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	0	120
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	0	139
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	0	20.4
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	0	139
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	0	56.4
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	0	4.05
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	0	46.2
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	0	51.2
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	0	1.13
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0	0	27.8
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	0	103
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	0	10.1
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)	0	0	0	0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)	0	0	0	7.93
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	0	0.357
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	0	2.44
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	0	25.4
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	0	178
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	0	0.567
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	0	26.1
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	0	39.3
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	0	5.03
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)	0	0	0	0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)	0	0	0	4.17
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	0	0.179
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	0	0.423

Table 63: *REF scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2050
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	0	15.4
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	0	91.2
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	0	0.851
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	0	27
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	0	71
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	0	7.57
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)	0	0	0	0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)	0	0	0	6.05
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)	0	0	0	0.268
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	0	3.06
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	0	30.9
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	0	147

Table 64: *REF scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	346	216	203	198	194	178
Monetary damages from air pollution - Natural Gas (million 2019$)	0	36.8	41	53.8	55.8	55.9	52.2
Monetary damages from air pollution - Transportation (million 2019$)	0	236	243	249	257	265	272
Premature deaths from air pollution - Coal (deaths)	0	38.9	24.3	22.8	22.2	21.8	19.9
Premature deaths from air pollution - Natural Gas (deaths)	0	4.15	4.63	6.08	6.31	6.31	5.9
Premature deaths from air pollution - Transportation (deaths)	0	26.6	27.3	28.1	28.9	29.8	30.6