Net-Zero America - mississippi 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	2.27	2.78	0	0	0	0
Sales of cooking units - Electric Resistance (%)	75.8	81	96.7	99.8	100	100	100
Sales of cooking units - Gas (%)	24.2	19	3.26	0.164	0	0	0
Sales of space heating units - Electric Heat Pump (%)	29.5	45.1	80.4	88.3	88.7	88.6	88.6
Sales of space heating units - Electric Resistance (%)	28.6	27.1	11.4	7.85	7.68	7.79	7.8
Sales of space heating units - Fossil (%)	11.7	11.3	3.21	1.36	1.27	1.25	1.25
Sales of space heating units - Gas (%)	30.2	16.4	4.98	2.47	2.38	2.36	2.35
Sales of water heating units - Electric Heat Pump (%)	0	12.1	64	75.6	76.1	76.1	76.1
Sales of water heating units - Electric Resistance (%)	67.2	69.3	30.5	21.8	21.4	21.4	21.4
Sales of water heating units - Gas Furnace (%)	29.2	16.1	3.02	0.128	0	0	0
Sales of water heating units - Other (%)	3.59	2.49	2.46	2.47	2.48	2.48	2.49

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	398	1,016	1,653	2,501	2,725	2,596
Public EV charging plugs - DC Fast (1000 units)	0.053	0	0.878	0	3.92	0	6.35
Public EV charging plugs - L2 (1000 units)	0.175	0	21.1	0	94.3	0	153
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 (%)	1.54	1.81	1.26	0.402	0.074	0.013	0
Vehicle sales - Light-duty - EV (%)	3.93	15.2	46.5	81.8	96.3	99.3	100
Vehicle sales - Light-duty - gasoline (%)	89.9	78	48.7	16.5	3.29	0.59	0
Vehicle sales - Light-duty - hybrid (%)	4.44	4.55	3.22	1.19	0.291	0.064	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.11	0.339	0.203	0.063	0.013	0.002	0
Vehicle sales - Light-duty - other (%)	0.102	0.097	0.064	0.022	0.004	0.001	0
Vehicle sales - Medium-duty - diesel (%)	64.7	59.7	42.3	14.4	2.59	0.384	0
Vehicle sales - Medium-duty - EV (%)	0.784	5.07	25.3	60.8	76.5	79.5	80
Vehicle sales - Medium-duty - gasoline (%)	33.7	33.3	25.5	9.32	1.77	0.277	0
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.402	0.341	0.14	0.03	0.005	0
Vehicle sales - Medium-duty - hydrogen FC (%)	0.196	1.27	6.33	15.2	19.1	19.9	20
Vehicle sales - Medium-duty - other (%)	0.253	0.255	0.205	0.083	0.019	0.004	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	70.6	70.6	68.1	64.4	61.3	60.1	60.4
Final energy use - Industry (PJ)	201	206	208	206	206	204	203
Final energy use - Residential (PJ)	99.2	92.9	85.6	76.5	69.1	64.8	63
Final energy use - Transportation (PJ)	350	323	285	238	196	170	160

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	8,123	9,222	0	0	0	0
Sales of cooking units - Electric Resistance (%)	43.5	55.3	83.4	88.9	89.2	89.2	89.1
Sales of cooking units - Gas (%)	56.5	44.7	16.6	11.1	10.8	10.8	10.9
Sales of space heating units - Electric Heat Pump (%)	9.46	29.3	77	90.8	91.9	92	92
Sales of space heating units - Electric Resistance (%)	4.72	4.61	4.92	6.26	6.57	6.57	6.55
Sales of space heating units - Fossil (%)	0	2.89	0.56	0.024	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 (%)	85.8	63.2	17.5	2.95	1.48	1.43	1.43
Sales of water heating units - Electric Heat Pump (%)	0.153	10.6	55.7	65.7	66.1	66.2	66.2
Sales of water heating units - Electric Resistance (%)	5.64	9.97	28	32.1	32.3	32.3	32.3
Sales of water heating units - Gas Furnace (%)	92.7	77.8	14.7	0.62	0	0	0
Sales of water heating units - Other (%)	1.56	1.58	1.58	1.58	1.58	1.57	1.56

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	2.03	2.09	3.69	3.94	2.98	3.07

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	0.002	0	0
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	2.86	0	0	2.52	0
Capital invested - Solar PV - Base (billion $2018)	0	1.43	1.39	5.45	9.46	9.29	10.8
Capital invested - Solar PV - Constrained (billion $2018)	0	0.876	2.23	4.75	5.05	7.97	9.84
Capital invested - Wind - Base (billion $2018)	0	0	0	0	0	0.529	1.14
Capital invested - Wind - Constrained (billion $2018)	0	0	0	0	15.8	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	2.37	2.37	2.37
Biomass w/ccu power plant (GWh)	0	0	3,205	3,205	3,205	6,036	6,036
Solar - Base land use assumptions (GWh)	112	2,037	2,227	9,438	17,405	18,107	22,314
Solar - Constrained land use assumptions (GWh)	103	1,616	3,640	16,087	13,275	19,277	21,094
Wind - Base land use assumptions (GWh)	0	0	0	0	0	1,363	3,140
Wind - Constrained land use assumptions (GWh)	0	0	0	0	33,562	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	125	365	581	1,029	1,029
Conversion capital investment - Cumulative 5-yr (million $2018)	0	0	2,620	4,363	3,928	8,452	0
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	1	1	1
Number of facilities - Beccs hydrogen (quantity)	0	0	0	4	7	14	14
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	1	1	1
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu (quantity)	0	0	2	2	2	4	4
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	1	1	1
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	1	1	1	1	1

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)	0	0	3.17	13.7	18.5	30.9	31.4
Annual - BECCS (MMT)	0	0	3.17	8.78	13.7	24.3	24.3
Annual - Cement and lime (MMT)	0	0	0	0	0	0	0
Annual - NGCC (MMT)	0	0	0	4.93	4.83	6.52	7.04
Cumulative - All (MMT)	0	0	3.17	16.9	35.4	66.3	97.6
Cumulative - BECCS (MMT)	0	0	3.17	11.9	25.7	50	74.3
Cumulative - Cement and lime (MMT)	0	0	0	0	0	0	0
Cumulative - NGCC (MMT)	0	0	0	4.93	9.76	16.3	23.3

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

Item	2020	2025	2030	2035	2040	2045	2050
CO2 storage (MMT)	0	0	6.58	21.1	37.9	60.2	80.1
Injection wells (wells)	0	0	6	24	42	70	86
Resource characterization, appraisal, permitting costs (million $2020)	0	32.8	590	935	935	935	935
Wells and facilities construction costs (million $2020)	0	0	181	705	1,257	2,102	2,610

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

Item	2020	2025	2030	2035	2040	2045	2050
All (km)	0	0	589	2,034	2,607	3,243	3,577
Cumulative investment - All (million $2018)	0	0	2,939	6,495	6,986	7,602	7,791
Cumulative investment - Spur (million $2018)	0	0	84.9	787	1,278	1,895	2,084
Cumulative investment - Trunk (million $2018)	0	0	2,854	5,707	5,707	5,707	5,707
Spur (km)	0	0	103	1,060	1,633	2,269	2,604
Trunk (km)	0	0	487	973	973	973	973

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	-172
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)	0	0	-6,293
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-68.6
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-6,534
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	-172
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)	0	0	-3,250
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-34.3
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-3,456
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	69.5
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)	0	0	1,815
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	125
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	2,009
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	69.5

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	939
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	62.4
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	1,070

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

Item	2020	2025	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)	0	0	746
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	50,122
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	1,278
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	8,378
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	5,109
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	15,703
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	809
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	6,522
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	6,558
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	5,019
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	374
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	17,371
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	213
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	3,218
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	2,599
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	5,234
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	283
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	3,261
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	497
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	1,692
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	560
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	33,702
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	746
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	5,798
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	3,809
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	10,469

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	546
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	4,891
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	3,528
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	3,356
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	122
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0	173
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	4,272
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	1,882
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	76.8
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	431
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	186
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	1,664
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	8,807
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	61.1
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	162
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	1,637
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	941
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	40.4
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	216
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	32.3
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	1,007
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	4,096
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	91.6
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	168
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	2,954
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	1,416
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	58.6

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	323
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	234
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	2,027
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	7,273

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	222	0.235	0.212	0.139	0.086	0.005
Monetary damages from air pollution - Natural Gas (million 2019$)	0	83.5	59	32.9	27	12.3	4.72
Monetary damages from air pollution - Transportation (million 2019$)	0	429	398	301	173	78.1	30.4
Premature deaths from air pollution - Coal (deaths)	0	24.9	0.026	0.024	0.016	0.01	0.001
Premature deaths from air pollution - Natural Gas (deaths)	0	9.43	6.67	3.71	3.05	1.39	0.533
Premature deaths from air pollution - Transportation (deaths)	0	48.3	44.8	33.9	19.4	8.78	3.42

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)	177	189	382	879	1,095	1,486	1,221
By economic sector - Construction (jobs)	4,334	5,108	6,096	10,102	12,546	13,918	17,638
By economic sector - Manufacturing (jobs)	4,217	6,520	7,438	9,493	9,166	8,160	9,567
By economic sector - Mining (jobs)	5,696	4,845	4,039	3,230	2,135	1,564	986
By economic sector - Other (jobs)	204	375	424	1,169	2,154	2,578	3,730
By economic sector - Pipeline (jobs)	557	557	829	869	478	423	430
By economic sector - Professional (jobs)	2,765	2,896	2,895	4,772	6,444	7,924	9,510
By economic sector - Trade (jobs)	2,673	2,569	2,375	3,189	4,098	4,721	5,977
By economic sector - Utilities (jobs)	6,260	5,944	6,784	9,692	10,212	11,514	13,573
By education level - All sectors - Associates degree or some college (jobs)	8,033	8,761	9,590	13,506	15,104	16,333	19,865
By education level - All sectors - Bachelors degree (jobs)	6,298	6,583	6,789	8,936	9,747	10,478	12,320
By education level - All sectors - Doctoral degree (jobs)	201	205	204	283	339	387	453
By education level - All sectors - High school diploma or less (jobs)	10,845	11,912	13,109	18,563	20,775	22,486	26,929
By education level - All sectors - Masters or professional degree (jobs)	1,506	1,543	1,572	2,107	2,362	2,603	3,066
By resource sector - Biomass (jobs)	572	633	1,009	2,448	3,263	5,424	5,229
By resource sector - CO2 (jobs)	0	12.8	3,162	4,290	1,772	2,278	2,838
By resource sector - Coal (jobs)	680	218	0	0	0	0	0
By resource sector - Grid (jobs)	6,536	6,142	6,203	11,297	14,577	17,732	23,650
By resource sector - Natural Gas (jobs)	6,273	6,086	4,934	4,471	4,263	3,622	2,000
By resource sector - Nuclear (jobs)	739	727	715	704	693	402	0
By resource sector - Oil (jobs)	10,908	10,204	8,953	7,700	5,576	4,129	2,634
By resource sector - Solar (jobs)	841	3,340	3,975	9,403	15,361	16,457	23,050
By resource sector - Wind (jobs)	334	1,640	2,311	3,082	2,822	2,243	3,233
Median wages - Annual - All ($2019 per job)	54,484	54,192	54,236	53,714	53,644	54,302	54,459
On-Site or In-Plant Training - Total jobs - 1 to 4 years (jobs)	4,301	4,646	5,062	7,058	7,830	8,436	10,187
On-Site or In-Plant Training - Total jobs - 4 to 10 years (jobs)	1,715	1,804	1,988	2,832	3,188	3,502	4,250
On-Site or In-Plant Training - Total jobs - None (jobs)	4,299	4,671	5,018	7,002	7,866	8,519	10,200

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)	208	228	255	365	410	449	548
On-Site or In-Plant Training - Total jobs - Up to 1 year (jobs)	16,360	17,656	18,940	26,137	29,033	31,381	37,448
On-the-Job Training - All sectors - 1 to 4 years (jobs)	5,513	5,942	6,484	9,051	10,037	10,818	13,080
On-the-Job Training - All sectors - 4 to 10 years (jobs)	1,594	1,684	1,879	2,737	3,123	3,451	4,223
On-the-Job Training - All sectors - None (jobs)	1,477	1,580	1,664	2,301	2,611	2,840	3,419
On-the-Job Training - All sectors - Over 10 years (jobs)	251	287	314	432	474	495	597
On-the-Job Training - All sectors - Up to 1 year (jobs)	18,047	19,511	20,922	28,874	32,083	34,684	41,314
Related work experience - All sectors - 1 to 4 years (jobs)	9,965	10,647	11,395	15,661	17,356	18,744	22,368
Related work experience - All sectors - 4 to 10 years (jobs)	6,360	6,809	7,309	10,039	11,088	11,956	14,336
Related work experience - All sectors - None (jobs)	3,783	4,088	4,461	6,275	7,027	7,660	9,197
Related work experience - All sectors - Over 10 years (jobs)	1,755	1,903	2,027	2,730	2,967	3,149	3,761
Related work experience - All sectors - Up to 1 year (jobs)	5,019	5,558	6,070	8,690	9,888	10,778	12,970
Wage income - All (million $2019)	1,465	1,572	1,696	2,331	2,593	2,840	3,411

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

Item	2020	2025	2030	2035	2040	2045	2050
Natural gas consumption - Annual (tcf)	440	446	376	302	227	143	99.1
Natural gas consumption - Cumulative (tcf)	0	0	0	0	0	0	9,085
Natural gas production - Annual (tcf)	39.2	43.4	41	35.7	30.2	24	18.6
Oil consumption - Annual (million bbls)	80	75.7	66.7	53.5	41	31.1	23.1
Oil consumption - Cumulative (million bbls)	0	0	0	0	0	0	1,650
Oil production - Annual (million bbls)	28.1	30.3	30.5	30.4	24.1	19.6	13

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	2.25	2.65	0	0	0	0
Sales of cooking units - Electric Resistance (%)	75.7	76.4	78.6	84.4	92.6	97.6	99.4
Sales of cooking units - Gas (%)	24.3	23.6	21.4	15.6	7.42	2.39	0.644
Sales of space heating units - Electric Heat Pump (%)	29.5	38.3	42.3	54.1	71.8	83.3	87.2
Sales of space heating units - Electric Resistance (%)	28.6	30.1	28.3	23	15.1	10.1	8.37
Sales of space heating units - Fossil (%)	11.7	12.9	12.1	9.17	5.03	2.44	1.57
Sales of space heating units - Gas (%)	30.2	18.6	17.3	13.8	8.07	4.19	2.84
Sales of water heating units - Electric Heat Pump (%)	0	2.08	7.99	25	51.1	68.1	74
Sales of water heating units - Electric Resistance (%)	67.2	76.8	72.5	59.6	40.1	27.4	23
Sales of water heating units - Gas Furnace (%)	29.2	18.6	17	12.9	6.35	2.02	0.528
Sales of water heating units - Other (%)	3.59	2.49	2.47	2.49	2.51	2.49	2.49

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	63.7	135	456	1,438	2,094
Public EV charging plugs - DC Fast (1000 units)	0.053	0	0.263	0	1.45	0	4.06
Public EV charging plugs - L2 (1000 units)	0.175	0	6.32	0	34.8	0	97.8
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 (%)	1.56	1.97	2.06	1.64	1.05	0.537	0.23
Vehicle sales - Light-duty - EV (%)	1.89	4.69	11.9	25.9	48.4	72.1	87.6
Vehicle sales - Light-duty - gasoline (%)	91.7	87.4	79.6	66.6	46.2	24.8	11
Vehicle sales - Light-duty - hybrid (%)	4.6	5.4	6.07	5.52	4.14	2.44	1.18
Vehicle sales - Light-duty - hydrogen FC (%)	0.113	0.38	0.326	0.249	0.176	0.098	0.045
Vehicle sales - Light-duty - other (%)	0.103	0.106	0.096	0.084	0.061	0.033	0.015
Vehicle sales - Medium-duty - diesel (%)	64.8	62.2	57.7	49.4	35.6	19.6	8.37
Vehicle sales - Medium-duty - EV (%)	0.664	1.94	5.49	14.3	31.4	52.6	68
Vehicle sales - Medium-duty - gasoline (%)	33.8	34.7	34.7	31.9	24.4	14.2	6.33
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.418	0.464	0.478	0.414	0.275	0.141
Vehicle sales - Medium-duty - hydrogen FC (%)	0.166	0.485	1.37	3.58	7.86	13.2	17
Vehicle sales - Medium-duty - other (%)	0.253	0.266	0.279	0.286	0.258	0.184	0.102

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	70.6	70.8	69.9	68.7	66.7	64.8	63.6
Final energy use - Industry (PJ)	201	207	209	208	209	207	206
Final energy use - Residential (PJ)	99.2	93.3	89.2	84.7	79.1	73.1	68.2
Final energy use - Transportation (PJ)	351	326	298	275	258	238	214

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	8,119	9,209	0	0	0	0
Sales of cooking units - Electric Resistance (%)	43.5	47.1	51.3	61.6	76.1	85	88
Sales of cooking units - Gas (%)	56.5	52.9	48.7	38.4	23.9	15	12
Sales of space heating units - Electric Heat Pump (%)	9.46	20.2	25.6	41.4	66.1	83.2	89.6
Sales of space heating units - Electric Resistance (%)	4.72	4.61	4.65	4.77	5.23	5.91	6.33
Sales of space heating units - Fossil (%)	0	3.34	3.16	2.39	1.19	0.387	0.102
Sales of space heating units - Gas Furnace (%)	85.8	71.8	66.6	51.4	27.5	10.5	3.93
Sales of water heating units - Electric Heat Pump (%)	0.153	1.96	7.08	21.8	44.4	59.2	64.3
Sales of water heating units - Electric Resistance (%)	5.64	6.47	8.38	14.4	23.5	29.5	31.6
Sales of water heating units - Gas Furnace (%)	92.7	90	83	62.2	30.5	9.74	2.53
Sales of water heating units - Other (%)	1.56	1.58	1.58	1.58	1.58	1.57	1.56

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	1.69	1.71	2.12	2.18	3.13	3.3

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	-172
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)	0	0	-6,293
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-68.6
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-6,534

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	-172
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)	0	0	-3,250
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-34.3
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-3,456
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	69.5
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)	0	0	1,815
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	125
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	2,009
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	69.5
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)	0	0	939
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	62.4
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	1,070

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

Item	2020	2025	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)	0	0	746
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	50,122
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	1,278
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	8,378
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	5,109
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	15,703
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	809
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	6,522
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	6,558
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	5,019
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	374
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	17,371
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	213
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	3,218
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	2,599

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	5,234
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	283
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	3,261
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	497
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	1,692
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	560
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	33,702
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	746
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	5,798
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	3,809
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	10,469
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	546
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	4,891
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	3,528
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	3,356
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	122
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0	173
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	4,272
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	1,882
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	76.8
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	431
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	186
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	1,664
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	8,807
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	61.1
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	162
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	1,637
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	941
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	40.4
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	216
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	32.3
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	1,007
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	4,096
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	91.6
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	168
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	2,954
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	1,416
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	58.6
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)	0	0	323
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	234
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	2,027
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	7,273

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	222	0.235	0.212	0.139	0.086	0.005
Monetary damages from air pollution - Natural Gas (million 2019$)	0	78.7	47.2	20.4	7.86	2.96	2.04
Monetary damages from air pollution - Transportation (million 2019$)	0	436	438	424	380	301	205
Premature deaths from air pollution - Coal (deaths)	0	24.9	0.026	0.024	0.016	0.01	0.001
Premature deaths from air pollution - Natural Gas (deaths)	0	8.9	5.33	2.31	0.888	0.335	0.23
Premature deaths from air pollution - Transportation (deaths)	0	49	49.2	47.7	42.8	33.9	23.1

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	2.27	2.78	0	0	0	0
Sales of cooking units - Electric Resistance (%)	75.8	81	96.7	99.8	100	100	100
Sales of cooking units - Gas (%)	24.2	19	3.26	0.164	0	0	0
Sales of space heating units - Electric Heat Pump (%)	29.5	45.1	80.4	88.3	88.7	88.6	88.6
Sales of space heating units - Electric Resistance (%)	28.6	27.1	11.4	7.85	7.68	7.79	7.8
Sales of space heating units - Fossil (%)	11.7	11.3	3.21	1.36	1.27	1.25	1.25
Sales of space heating units - Gas (%)	30.2	16.4	4.98	2.47	2.38	2.36	2.35
Sales of water heating units - Electric Heat Pump (%)	0	12.1	64	75.6	76.1	76.1	76.1

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 (%)	67.2	69.3	30.5	21.8	21.4	21.4	21.4
Sales of water heating units - Gas Furnace (%)	29.2	16.1	3.02	0.128	0	0	0
Sales of water heating units - Other (%)	3.59	2.49	2.46	2.47	2.48	2.48	2.49

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	398	1,016	1,653	2,501	2,725	2,596
Public EV charging plugs - DC Fast (1000 units)	0.053	0	0.878	0	3.92	0	6.35
Public EV charging plugs - L2 (1000 units)	0.175	0	21.1	0	94.3	0	153
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 (%)	1.54	1.81	1.26	0.402	0.074	0.013	0
Vehicle sales - Light-duty - EV (%)	3.93	15.2	46.5	81.8	96.3	99.3	100
Vehicle sales - Light-duty - gasoline (%)	89.9	78	48.7	16.5	3.29	0.59	0
Vehicle sales - Light-duty - hybrid (%)	4.44	4.55	3.22	1.19	0.291	0.064	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.11	0.339	0.203	0.063	0.013	0.002	0
Vehicle sales - Light-duty - other (%)	0.102	0.097	0.064	0.022	0.004	0.001	0
Vehicle sales - Medium-duty - diesel (%)	64.7	59.7	42.3	14.4	2.59	0.384	0
Vehicle sales - Medium-duty - EV (%)	0.784	5.07	25.3	60.8	76.5	79.5	80
Vehicle sales - Medium-duty - gasoline (%)	33.7	33.3	25.5	9.32	1.77	0.277	0
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.402	0.341	0.14	0.03	0.005	0
Vehicle sales - Medium-duty - hydrogen FC (%)	0.196	1.27	6.33	15.2	19.1	19.9	20
Vehicle sales - Medium-duty - other (%)	0.253	0.255	0.205	0.083	0.019	0.004	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	70.6	70.6	68.1	64.4	61.3	60.1	60.4
Final energy use - Industry (PJ)	201	206	208	206	206	204	203
Final energy use - Residential (PJ)	99.2	92.9	85.6	76.5	69.1	64.8	63
Final energy use - Transportation (PJ)	350	323	285	238	196	170	160

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	8,123	9,222	0	0	0	0
Sales of cooking units - Electric Resistance (%)	43.5	55.3	83.4	88.9	89.2	89.2	89.1
Sales of cooking units - Gas (%)	56.5	44.7	16.6	11.1	10.8	10.8	10.9
Sales of space heating units - Electric Heat Pump (%)	9.46	29.3	77	90.8	91.9	92	92
Sales of space heating units - Electric Resistance (%)	4.72	4.61	4.92	6.26	6.57	6.57	6.55
Sales of space heating units - Fossil (%)	0	2.89	0.56	0.024	0	0	0
Sales of space heating units - Gas Furnace (%)	85.8	63.2	17.5	2.95	1.48	1.43	1.43
Sales of water heating units - Electric Heat Pump (%)	0.153	10.6	55.7	65.7	66.1	66.2	66.2
Sales of water heating units - Electric Resistance (%)	5.64	9.97	28	32.1	32.3	32.3	32.3
Sales of water heating units - Gas Furnace (%)	92.7	77.8	14.7	0.62	0	0	0
Sales of water heating units - Other (%)	1.56	1.58	1.58	1.58	1.58	1.57	1.56

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	2.03	2.09	3.69	3.94	2.98	3.07

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Solar PV - Base (billion $2018)	0	2.71	4.34	7.5	19.5	24.7	31.9
Capital invested - Wind - Base (billion $2018)	0	0	0	0	0.242	1.56	33.8

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	112	3,884	6,936	12,999	35,844	48,167	65,840
Solar - Constrained land use assumptions (GWh)	112	4,268	6,159	16,432	41,750	59,587	66,320
Wind - Base land use assumptions (GWh)	0	0	0	0	582	4,057	80,459
Wind - Constrained land use assumptions (GWh)	0	0	0	7,525	26,037	0	3,615

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	-172
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)	0	0	-6,293
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-68.6
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-6,534
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	-172
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)	0	0	-3,250
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-34.3
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-3,456
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	69.5
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)	0	0	1,815
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	125
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	2,009
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	69.5
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)	0	0	939
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	62.4
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	1,070

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	746
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	50,122
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	1,278
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	8,378
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	5,109
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	15,703
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	809
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	6,522
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	6,558
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	5,019
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	374
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	17,371
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	213
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	3,218
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	2,599
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	5,234
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	283
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	3,261
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	497
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	1,692
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	560
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	33,702
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	746
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	5,798
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	3,809
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	10,469
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	546
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	4,891
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	3,528
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	3,356
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	122

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	173
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	4,272
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	1,882
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	76.8
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	431
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	186
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	1,664
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	8,807
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	61.1
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	162
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	1,637
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	941
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	40.4
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	216
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	32.3
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	1,007
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	4,096
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	91.6
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	168
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	2,954
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	1,416
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	58.6
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)	0	0	323
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	234
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	2,027
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	7,273

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	222	0.235	0.212	0.139	0.086	0.005
Monetary damages from air pollution - Natural Gas (million 2019$)	0	89.4	62.1	33	21	5.73	2.37
Monetary damages from air pollution - Transportation (million 2019$)	0	429	398	301	173	78.1	30.4
Premature deaths from air pollution - Coal (deaths)	0	24.9	0.026	0.024	0.016	0.01	0.001
Premature deaths from air pollution - Natural Gas (deaths)	0	10.1	7.01	3.73	2.37	0.648	0.267
Premature deaths from air pollution - Transportation (deaths)	0	48.3	44.8	33.9	19.4	8.78	3.42

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	2.27	2.78	0	0	0	0
Sales of cooking units - Electric Resistance (%)	75.8	81	96.7	99.8	100	100	100
Sales of cooking units - Gas (%)	24.2	19	3.26	0.164	0	0	0
Sales of space heating units - Electric Heat Pump (%)	29.5	45.1	80.4	88.3	88.7	88.6	88.6
Sales of space heating units - Electric Resistance (%)	28.6	27.1	11.4	7.85	7.68	7.79	7.8
Sales of space heating units - Fossil (%)	11.7	11.3	3.21	1.36	1.27	1.25	1.25
Sales of space heating units - Gas (%)	30.2	16.4	4.98	2.47	2.38	2.36	2.35
Sales of water heating units - Electric Heat Pump (%)	0	12.1	64	75.6	76.1	76.1	76.1
Sales of water heating units - Electric Resistance (%)	67.2	69.3	30.5	21.8	21.4	21.4	21.4
Sales of water heating units - Gas Furnace (%)	29.2	16.1	3.02	0.128	0	0	0
Sales of water heating units - Other (%)	3.59	2.49	2.46	2.47	2.48	2.48	2.49

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	398	1,016	1,653	2,501	2,725	2,596
Public EV charging plugs - DC Fast (1000 units)	0.053	0	0.878	0	3.92	0	6.35
Public EV charging plugs - L2 (1000 units)	0.175	0	21.1	0	94.3	0	153
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 (%)	1.54	1.81	1.26	0.402	0.074	0.013	0
Vehicle sales - Light-duty - EV (%)	3.93	15.2	46.5	81.8	96.3	99.3	100
Vehicle sales - Light-duty - gasoline (%)	89.9	78	48.7	16.5	3.29	0.59	0
Vehicle sales - Light-duty - hybrid (%)	4.44	4.55	3.22	1.19	0.291	0.064	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.11	0.339	0.203	0.063	0.013	0.002	0
Vehicle sales - Light-duty - other (%)	0.102	0.097	0.064	0.022	0.004	0.001	0
Vehicle sales - Medium-duty - diesel (%)	64.7	59.7	42.3	14.4	2.59	0.384	0
Vehicle sales - Medium-duty - EV (%)	0.784	5.07	25.3	60.8	76.5	79.5	80
Vehicle sales - Medium-duty - gasoline (%)	33.7	33.3	25.5	9.32	1.77	0.277	0
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.402	0.341	0.14	0.03	0.005	0
Vehicle sales - Medium-duty - hydrogen FC (%)	0.196	1.27	6.33	15.2	19.1	19.9	20
Vehicle sales - Medium-duty - other (%)	0.253	0.255	0.205	0.083	0.019	0.004	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	70.6	70.6	68.1	64.4	61.3	60.1	60.4
Final energy use - Industry (PJ)	201	206	208	206	206	204	203
Final energy use - Residential (PJ)	99.2	92.9	85.6	76.5	69.1	64.8	63
Final energy use - Transportation (PJ)	350	323	285	238	196	170	160

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	8,123	9,222	0	0	0	0
Sales of cooking units - Electric Resistance (%)	43.5	55.3	83.4	88.9	89.2	89.2	89.1
Sales of cooking units - Gas (%)	56.5	44.7	16.6	11.1	10.8	10.8	10.9
Sales of space heating units - Electric Heat Pump (%)	9.46	29.3	77	90.8	91.9	92	92
Sales of space heating units - Electric Resistance (%)	4.72	4.61	4.92	6.26	6.57	6.57	6.55
Sales of space heating units - Fossil (%)	0	2.89	0.56	0.024	0	0	0
Sales of space heating units - Gas Furnace (%)	85.8	63.2	17.5	2.95	1.48	1.43	1.43
Sales of water heating units - Electric Heat Pump (%)	0.153	10.6	55.7	65.7	66.1	66.2	66.2
Sales of water heating units - Electric Resistance (%)	5.64	9.97	28	32.1	32.3	32.3	32.3
Sales of water heating units - Gas Furnace (%)	92.7	77.8	14.7	0.62	0	0	0
Sales of water heating units - Other (%)	1.56	1.58	1.58	1.58	1.58	1.57	1.56

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	2.03	2.09	3.69	3.94	2.98	3.07

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Solar PV - Base (billion $2018)	0	0.952	0.805	1.37	3.54	4.8	0
Capital invested - Solar PV - Constrained (billion $2018)	0	3.09	2.54	2.21	6.75	2.85	0.089
Capital invested - Wind - Constrained (billion $2018)	0	0	0	0	0	0	0.445

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	112	1,365	1,294	2,372	6,500	9,325	0
Solar - Constrained land use assumptions (GWh)	112	4,420	4,066	3,851	12,490	5,560	185
Wind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	1,052

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	-172
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)	0	0	-6,293
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-68.6
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-6,534
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	-172
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)	0	0	-3,250

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

Item	2020	2025	2050
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-34.3
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-3,456
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	69.5
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)	0	0	1,815
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	125
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	2,009
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	69.5
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)	0	0	939
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	62.4
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	1,070

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	746
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	50,122
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	1,278
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	8,378
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	5,109
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	15,703
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	809
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	6,522
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	6,558
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	5,019
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	374
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	17,371
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	213
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	3,218
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	2,599
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	5,234
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	283

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

Item	2020	2025	2050
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	3,261
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	497
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	1,692
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	560
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	33,702
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	746
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	5,798
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	3,809
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	10,469
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	546
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	4,891
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	3,528
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	3,356
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	122
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0	173
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	4,272
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	1,882
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	76.8
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	431
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	186
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	1,664
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	8,807
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	61.1
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	162
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	1,637
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	941
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	40.4
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	216

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

Item	2020	2025	2050
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	32.3
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	1,007
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	4,096
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	91.6
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	168
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	2,954
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	1,416
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	58.6
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)	0	0	323
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	234
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	2,027
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	7,273

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	222	0.235	0.212	0.139	0.086	0.005
Monetary damages from air pollution - Natural Gas (million 2019$)	0	84.9	54.2	50.1	40.1	15	4.65
Monetary damages from air pollution - Transportation (million 2019$)	0	429	398	301	173	78.1	30.4
Premature deaths from air pollution - Coal (deaths)	0	24.9	0.026	0.024	0.016	0.01	0.001
Premature deaths from air pollution - Natural Gas (deaths)	0	9.59	6.13	5.65	4.53	1.69	0.525
Premature deaths from air pollution - Transportation (deaths)	0	48.3	44.8	33.9	19.4	8.78	3.42

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	2.25	2.65	0	0	0	0
Sales of cooking units - Electric Resistance (%)	75.7	76.4	78.6	84.4	92.6	97.6	99.4
Sales of cooking units - Gas (%)	24.3	23.6	21.4	15.6	7.42	2.39	0.644
Sales of space heating units - Electric Heat Pump (%)	29.5	38.3	42.3	54.1	71.8	83.3	87.2
Sales of space heating units - Electric Resistance (%)	28.6	30.1	28.3	23	15.1	10.1	8.37
Sales of space heating units - Fossil (%)	11.7	12.9	12.1	9.17	5.03	2.44	1.57
Sales of space heating units - Gas (%)	30.2	18.6	17.3	13.8	8.07	4.19	2.84
Sales of water heating units - Electric Heat Pump (%)	0	2.08	7.99	25	51.1	68.1	74
Sales of water heating units - Electric Resistance (%)	67.2	76.8	72.5	59.6	40.1	27.4	23
Sales of water heating units - Gas Furnace (%)	29.2	18.6	17	12.9	6.35	2.02	0.528
Sales of water heating units - Other (%)	3.59	2.49	2.47	2.49	2.51	2.49	2.49

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	63.7	135	456	1,438	2,094
Public EV charging plugs - DC Fast (1000 units)	0.053	0	0.263	0	1.45	0	4.06
Public EV charging plugs - L2 (1000 units)	0.175	0	6.32	0	34.8	0	97.8
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 (%)	1.56	1.97	2.06	1.64	1.05	0.537	0.23
Vehicle sales - Light-duty - EV (%)	1.89	4.69	11.9	25.9	48.4	72.1	87.6
Vehicle sales - Light-duty - gasoline (%)	91.7	87.4	79.6	66.6	46.2	24.8	11
Vehicle sales - Light-duty - hybrid (%)	4.6	5.4	6.07	5.52	4.14	2.44	1.18
Vehicle sales - Light-duty - hydrogen FC (%)	0.113	0.38	0.326	0.249	0.176	0.098	0.045
Vehicle sales - Light-duty - other (%)	0.103	0.106	0.096	0.084	0.061	0.033	0.015
Vehicle sales - Medium-duty - diesel (%)	64.8	62.2	57.7	49.4	35.6	19.6	8.37
Vehicle sales - Medium-duty - EV (%)	0.664	1.94	5.49	14.3	31.4	52.6	68
Vehicle sales - Medium-duty - gasoline (%)	33.8	34.7	34.7	31.9	24.4	14.2	6.33
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.418	0.464	0.478	0.414	0.275	0.141
Vehicle sales - Medium-duty - hydrogen FC (%)	0.166	0.485	1.37	3.58	7.86	13.2	17
Vehicle sales - Medium-duty - other (%)	0.253	0.266	0.279	0.286	0.258	0.184	0.102

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	70.6	70.8	69.9	68.7	66.7	64.8	63.6
Final energy use - Industry (PJ)	201	207	209	208	209	207	206
Final energy use - Residential (PJ)	99.2	93.3	89.2	84.7	79.1	73.1	68.2
Final energy use - Transportation (PJ)	351	326	298	275	258	238	214

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	8,119	9,209	0	0	0	0
Sales of cooking units - Electric Resistance (%)	43.5	47.1	51.3	61.6	76.1	85	88
Sales of cooking units - Gas (%)	56.5	52.9	48.7	38.4	23.9	15	12
Sales of space heating units - Electric Heat Pump (%)	9.46	20.2	25.6	41.4	66.1	83.2	89.6
Sales of space heating units - Electric Resistance (%)	4.72	4.61	4.65	4.77	5.23	5.91	6.33
Sales of space heating units - Fossil (%)	0	3.34	3.16	2.39	1.19	0.387	0.102
Sales of space heating units - Gas Furnace (%)	85.8	71.8	66.6	51.4	27.5	10.5	3.93
Sales of water heating units - Electric Heat Pump (%)	0.153	1.96	7.08	21.8	44.4	59.2	64.3
Sales of water heating units - Electric Resistance (%)	5.64	6.47	8.38	14.4	23.5	29.5	31.6
Sales of water heating units - Gas Furnace (%)	92.7	90	83	62.2	30.5	9.74	2.53
Sales of water heating units - Other (%)	1.56	1.58	1.58	1.58	1.58	1.57	1.56

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	1.69	1.71	2.12	2.18	3.13	3.3

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

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

Item	2020	2025	2030	2035	2040	2045	2050
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	10.1	11.5	24	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	11,378	24,305	51,189	51,189	51,189

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	701	1,498	3,156	3,563	3,563
Conversion capital investment - Cumulative 5-yr (million $2018)	0	0	9,299	10,565	21,971	4,675	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	5	5
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	9	19	40	40	40
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 53: *E-B+ scenario - PILLAR 4: CCUS - CO2 capture*

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)	0	0	11.3	24.1	50.7	56.7	57
Annual - BECCS (MMT)	0	0	11.3	24	50.6	56.7	56.5
Annual - Cement and lime (MMT)	0	0	0	0	0	0	0
Annual - NGCC (MMT)	0	0	0	0.1	0.08	0.07	0.56
Cumulative - All (MMT)	0	0	11.3	35.4	86.1	143	200
Cumulative - BECCS (MMT)	0	0	11.3	35.3	86	143	199
Cumulative - Cement and lime (MMT)	0	0	0	0	0	0	0
Cumulative - NGCC (MMT)	0	0	0	0.1	0.18	0.25	0.81

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

Item	2020	2025	2030	2035	2040	2045	2050
CO2 storage (MMT)	0	0	7.39	36.4	71.3	98.5	104
Injection wells (wells)	0	0	8	34	60	100	124
Resource characterization, appraisal, permitting costs (million $2020)	0	32.8	810	1,299	1,299	1,299	1,299
Wells and facilities construction costs (million $2020)	0	0	257	1,000	1,782	2,980	3,700

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

Item	2020	2025	2030	2035	2040	2045	2050
All (km)	0	0	837	1,795	3,172	3,780	3,685
Cumulative investment - All (million $2018)	0	0	3,530	7,100	10,298	10,924	10,789
Cumulative investment - Spur (million $2018)	0	0	434	909	2,297	2,923	2,787
Cumulative investment - Trunk (million $2018)	0	0	3,096	6,192	8,002	8,002	8,002
Spur (km)	0	0	350	822	1,958	2,566	2,471
Trunk (km)	0	0	487	973	1,214	1,214	1,214

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	-637
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)	0	0	-5,685
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	-58.1
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-6,380
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	-637
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)	0	0	-2,929
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	-29.1
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-3,594
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	257
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)	0	0	4,057
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)	0	0	119
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)	0	0	265
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	106
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	4,803
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	257
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)	0	0	848
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)	0	0	119
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)	0	0	265
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	52.9
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	1,542

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	746
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	50,122
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	1,278
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	8,378
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	5,109
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	15,703
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	809
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	6,522
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	6,558
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	5,019
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	374
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	17,371
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	213
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	3,218
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	2,599
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	5,234
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	283
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	3,261
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	497
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	1,692
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	560
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	33,702
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	746
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	5,798
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	3,809
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	10,469
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	546
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	4,891
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	3,528
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	3,356
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	122

Table 57: *E-B+ 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	173
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	4,272
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	1,882
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	76.8
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	431
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	186
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	1,664
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	8,807
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	61.1
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	162
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	1,637
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	941
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	40.4
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	216
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	32.3
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	1,007
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	4,096
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	91.6
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	168
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	2,954
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	1,416
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	58.6
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)	0	0	323
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	234
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	2,027
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	7,273

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	2.2	2.3	0	0	0	0
Sales of cooking units - Electric Resistance (%)	75.5	75.5	75.5	75.5	75.5	75.5	75.5
Sales of cooking units - Gas (%)	24.5	24.5	24.5	24.5	24.5	24.5	24.5
Sales of space heating units - Electric Heat Pump (%)	26.6	55.5	56.3	57.6	58.8	60.4	62.7
Sales of space heating units - Electric Resistance (%)	29.8	23.9	23.5	22.8	21.8	20.4	18
Sales of space heating units - Fossil (%)	12.2	6.81	6.91	6.74	6.58	6.52	6.54
Sales of space heating units - Gas (%)	31.4	13.8	13.3	12.9	12.8	12.7	12.7
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	67.2	78.4	78.5	78.3	78.1	78.1	78
Sales of water heating units - Gas Furnace (%)	29.2	19.2	19	19.2	19.4	19.4	19.5
Sales of water heating units - Other (%)	3.59	2.49	2.47	2.49	2.52	2.51	2.52

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 (%)	1.55	1.96	2.18	2.03	1.83	1.7	1.62
Vehicle sales - Light-duty - EV (%)	3.58	5.62	6.4	7.87	9.58	11.1	12.3
Vehicle sales - Light-duty - gasoline (%)	90.2	86.6	84.5	82.6	80.6	78.6	77.1
Vehicle sales - Light-duty - hybrid (%)	4.45	5.3	6.48	7.05	7.62	8.2	8.64
Vehicle sales - Light-duty - hydrogen FC (%)	0.111	0.377	0.346	0.307	0.304	0.304	0.315
Vehicle sales - Light-duty - other (%)	0.102	0.106	0.102	0.103	0.102	0.101	0.103
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)	70.6	71.9	72.2	72.2	72.8	74.9	78.5
Final energy use - Industry (PJ)	201	210	218	222	228	232	238
Final energy use - Residential (PJ)	99.2	93.5	91	89.7	89.7	90.9	92.4
Final energy use - Transportation (PJ)	350	326	299	283	283	291	302

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	7,974	8,300	0	0	0	0
Sales of cooking units - Electric Resistance (%)	43.5	45.6	45.9	45.7	46	45.9	45.7
Sales of cooking units - Gas (%)	56.5	54.4	54.1	54.3	54	54.1	54.3
Sales of space heating units - Electric Heat Pump (%)	9.46	31.9	71.2	79	79.3	79.4	79.4
Sales of space heating units - Electric Resistance (%)	4.72	6.4	12	15.8	18.7	19.2	19.2
Sales of space heating units - Fossil (%)	0	2.67	0.47	0.024	0	0	0
Sales of space heating units - Gas Furnace (%)	85.8	59	16.4	5.24	1.95	1.48	1.43
Sales of water heating units - Electric Heat Pump (%)	0.153	0.153	0.147	0.149	0.149	0.145	0.148

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Electric Resistance (%)	5.64	5.74	5.58	5.66	5.62	5.55	5.6
Sales of water heating units - Gas Furnace (%)	92.7	92.5	92.7	92.6	92.7	92.7	92.7
Sales of water heating units - Other (%)	1.56	1.58	1.58	1.58	1.58	1.57	1.56

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	2.32	2.41	3.75	3.99	3.1	3.21

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

Item	2020	2025	2030	2050
Business-as-usual carbon sink - Natural uptake (Mt CO2e/y)	-32.9	0	-14.9	-12.1
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-4.27	0	-7.13	-7.5
Business-as-usual carbon sink - Total (Mt CO2e/y)	-37.1	0	-22	-19.6
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)	0	0	0	746
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	0	50,122
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	0	1,278
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	0	8,378
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	0	5,109
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	0	15,703
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	0	809
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	0	6,522
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	0	6,558
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	0	5,019
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	0	374
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	0	17,371
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	0	213
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	0	3,218
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	0	2,599
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	0	5,234
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	0	283
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	0	3,261
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	0	497
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	0	1,692
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	0	560
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	0	33,702

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

Item	2020	2025	2030	2050
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	0	746
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	0	5,798
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	0	3,809
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	0	10,469
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	0	546
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	0	4,891
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	0	3,528
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	0	3,356
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	0	122
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0	0	173
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	0	4,272
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	0	1,882
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	76.8
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	0	431
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	0	186
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	0	1,664
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	0	8,807
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	0	61.1
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	0	162
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	0	1,637
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	0	941
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	40.4
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	0	216
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	0	32.3
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	0	1,007
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	0	4,096
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	0	91.6
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	0	168

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

Item	2020	2025	2030	2050
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	0	2,954
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	0	1,416
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	58.6
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)	0	0	0	323
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	0	234
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	0	2,027
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	0	7,273

Table 64: *REF scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	955	636	434	351	320	318
Monetary damages from air pollution - Natural Gas (million 2019$)	0	94.8	100	105	101	103	106
Monetary damages from air pollution - Transportation (million 2019$)	0	436	444	452	463	473	483
Premature deaths from air pollution - Coal (deaths)	0	107	71.4	48.7	39.3	35.9	35.6
Premature deaths from air pollution - Natural Gas (deaths)	0	10.7	11.3	11.9	11.4	11.6	12
Premature deaths from air pollution - Transportation (deaths)	0	49	49.9	50.9	52	53.2	54.3