# Net-Zero America - michigan 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).

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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 | 7.71 | 9.81 | 0 | 0 | 0 | 0 |
| Sales of cooking units - Electric Resistance (%) | 35.7 | 49.4 | 91.3 | 99.6 | 100 | 100 | 100 |
| Sales of cooking units - Gas (%) | 64.3 | 50.6 | 8.66 | 0.436 | 0 | 0 | 0 |
| Sales of space heating units - Electric Heat Pump (%) | 2.17 | 6.93 | 32.9 | 84 | 93.6 | 94.2 | 94.2 |
| Sales of space heating units - Electric Resistance (%) | 5.77 | 9.31 | 7.39 | 3.21 | 2.39 | 2.33 | 2.44 |
| Sales of space heating units - Fossil (%) | 6.93 | 12.9 | 9.76 | 4.29 | 3.31 | 3.24 | 3.18 |
| Sales of space heating units - Gas (%) | 85.1 | 70.8 | 50 | 8.51 | 0.73 | 0.191 | 0.189 |
| Sales of water heating units - Electric Heat Pump (%) | 0 | 0.892 | 12.3 | 37.3 | 42 | 42.4 | 42.4 |
| Sales of water heating units - Electric Resistance (%) | 13.3 | 25.8 | 34.3 | 53.6 | 57.3 | 57.5 | 57.5 |
| Sales of water heating units - Gas Furnace (%) | 86.7 | 73.2 | 53.3 | 9.02 | 0.593 | 0.008 | 0 |
| Sales of water heating units - Other (%) | 0.036 | 0.089 | 0.089 | 0.089 | 0.088 | 0.088 | 0.089 |

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 | 1,610 | 4,124 | 6,688 | 10,128 | 11,025 | 10,511 |
| Public EV charging plugs - DC Fast (1000 units) | 0.242 | 0 | 2.84 | 0 | 12.5 | 0 | 20.2 |
| Public EV charging plugs - L2 (1000 units) | 0.857 | 0 | 68.2 | 0 | 300 | 0 | 486 |
| 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 (%) | 1.62 | 1.88 | 1.29 | 0.413 | 0.076 | 0.013 | 0 |
| Vehicle sales - Light-duty - EV (%) | 3.67 | 14.4 | 45.3 | 81.3 | 96.3 | 99.3 | 100 |
| Vehicle sales - Light-duty - gasoline (%) | 90.3 | 78.9 | 50 | 17 | 3.35 | 0.592 | 0 |
| Vehicle sales - Light-duty - hybrid (%) | 4.18 | 4.37 | 3.13 | 1.17 | 0.284 | 0.062 | 0 |
| Vehicle sales - Light-duty - hydrogen FC (%) | 0.111 | 0.344 | 0.209 | 0.065 | 0.013 | 0.002 | 0 |
| Vehicle sales - Light-duty - other (%) | 0.105 | 0.101 | 0.067 | 0.023 | 0.005 | 0.001 | 0 |
| Vehicle sales - Medium-duty - diesel (%) | 64.7 | 59.7 | 42.3 | 14.4 | 2.59 | 0.384 | 0 |
| Vehicle sales - Medium-duty - EV (%) | 0.784 | 5.07 | 25.3 | 60.8 | 76.5 | 79.5 | 80 |
| Vehicle sales - Medium-duty - gasoline (%) | 33.7 | 33.3 | 25.5 | 9.32 | 1.77 | 0.277 | 0 |
| Vehicle sales - Medium-duty - hybrid (%) | 0.363 | 0.402 | 0.341 | 0.14 | 0.03 | 0.005 | 0 |
| Vehicle sales - Medium-duty - hydrogen FC (%) | 0.196 | 1.27 | 6.33 | 15.2 | 19.1 | 19.9 | 20 |
| Vehicle sales - Medium-duty - other (%) | 0.253 | 0.255 | 0.205 | 0.083 | 0.019 | 0.004 | 0 |

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

| Item | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|
| Final energy use - Commercial (PJ) | 316 | 311 | 299 | 277 | 251 | 231 | 220 |
| Final energy use - Industry (PJ) | 501 | 510 | 519 | 515 | 526 | 536 | 540 |
| Final energy use - Residential (PJ) | 562 | 524 | 489 | 423 | 347 | 286 | 245 |
| Final energy use - Transportation (PJ) | 808 | 750 | 656 | 541 | 437 | 372 | 341 |

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 | 29,341 | 32,040 | 0 | 0 | 0 | 0 |
| Sales of cooking units - Electric Resistance (%) | 41 | 54.2 | 82.9 | 88.6 | 88.9 | 88.9 | 88.9 |
| Sales of cooking units - Gas (%) | 59 | 45.8 | 17.1 | 11.4 | 11.1 | 11.1 | 11.1 |
| Sales of space heating units - Electric Heat Pump (%) | 0.384 | 6.16 | 30.1 | 79.2 | 88.5 | 89.1 | 89.1 |
| Sales of space heating units - Electric Resistance (%) | 1.64 | 3.48 | 5.48 | 9.74 | 10.5 | 10.6 | 10.6 |
| Sales of space heating units - Fossil (%) | 2.54 | 2.36 | 0.454 | 0.019 | 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 (%) | 95.4 | 88 | 64 | 11.1 | 1.06 | 0.368 | 0.359 |
| Sales of water heating units - Electric Heat Pump (%) | 0.161 | 1.36 | 14.4 | 43 | 48.4 | 48.8 | 48.8 |
| Sales of water heating units - Electric Resistance (%) | 1.64 | 4.19 | 17 | 45.3 | 50.6 | 51 | 51 |
| Sales of water heating units - Gas Furnace (%) | 98.1 | 94.3 | 68.5 | 11.6 | 0.763 | 0.01 | 0 |
| Sales of water heating units - Other (%) | 0.093 | 0.184 | 0.185 | 0.186 | 0.185 | 0.186 | 0.186 |

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 | 5.19 | 5.33 | 9.38 | 9.99 | 8.85 | 9.24 |

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 - Solar PV - Base (billion $2018) | 0 | 0 | 0.127 | 3.76 | 1.42 | 3.66 | 1.59 |
| Capital invested - Solar PV - Constrained (billion $2018) | 0 | 0.126 | 0.092 | 3.16 | 1.11 | 4.22 | 2.15 |
| Capital invested - Wind - Base (billion $2018) | 0 | 0 | 10.5 | 8.15 | 9.94 | 0.935 | 1.1 |
| Capital invested - Wind - Constrained (billion $2018) | 0 | 0 | 9.73 | 1.89 | 0.139 | 0.288 | 4.17 |

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 |
| Solar - Base land use assumptions (GWh) | 155 | 0 | 181 | 5,809 | 2,322 | 6,288 | 2,928 |
| Solar - Constrained land use assumptions (GWh) | 155 | 0 | 1,394 | 1,548 | 5,335 | 6,300 | 6,964 |
| Wind - Base land use assumptions (GWh) | 9,704 | 0 | 25,924 | 21,058 | 26,539 | 2,887 | 3,575 |
| Wind - Constrained land use assumptions (GWh) | 9,704 | 0 | 22,452 | 5,874 | 527 | 871 | 6,595 |

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 | 999 |
| Conversion capital investment - Cumulative 5-yr (million $2018) | 0 | 0 | 0 | 0 | 0 | 0 | 15,722 |
| 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 | 14 |
| 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 | 2 |
| 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 | 3.24 | 3.35 | 6.64 | 6.84 | 24.3 |
| Annual - BECCS (MMT) | 0 | 0 | 0 | 0 | 0 | 0 | 17.2 |
| Annual - Cement and lime (MMT) | 0 | 0 | 3.24 | 3.35 | 6.64 | 6.84 | 7.07 |
| Annual - NGCC (MMT) | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cumulative - All (MMT) | 0 | 0 | 3.24 | 6.59 | 13.2 | 20.1 | 44.4 |
| Cumulative - BECCS (MMT) | 0 | 0 | 0 | 0 | 0 | 0 | 17.2 |
| Cumulative - Cement and lime (MMT) | 0 | 0 | 3.24 | 6.59 | 13.2 | 20.1 | 27.1 |
| 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 | 638 | 638 | 751 | 751 | 1,890 |
| Cumulative investment - All (million $2018) | 0 | 0 | 1,578 | 1,582 | 1,692 | 1,698 | 2,602 |
| Cumulative investment - Spur (million $2018) | 0 | 0 | 202 | 206 | 316 | 322 | 1,226 |
| Cumulative investment - Trunk (million $2018) | 0 | 0 | 1,376 | 1,376 | 1,376 | 1,376 | 1,376 |
| Spur (km) | 0 | 0 | 201 | 201 | 314 | 314 | 1,452 |
| Trunk (km) | 0 | 0 | 437 | 437 | 437 | 437 | 437 |

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 | -699 |
| Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y) | 0 | 0 | -4,144 |
| Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y) | 0 | 0 | -148 |
| Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y) | 0 | 0 | -4,990 |
| Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y) | 0 | 0 | -699 |
| Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y) | 0 | 0 | -2,176 |
| Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y) | 0 | 0 | -74 |
| Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y) | 0 | 0 | -2,949 |
| Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares) | 0 | 0 | 292 |
| Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares) | 0 | 0 | 2,649 |
| Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares) | 0 | 0 | 269 |
| Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares) | 0 | 0 | 3,209 |
| Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares) | 0 | 0 | 292 |

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 | 1,392 |
| Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares) | 0 | 0 | 135 |
| Land impacted for carbon sink - Moderate deployment - Total (1000 hectares) | 0 | 0 | 1,818 |

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

| Item | 2020 | 2025 | 2050 |
|---|---|---|---|
| Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y) | 0 | 0 | 403 |
| Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y) | 0 | 0 | 35,061 |
| Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y) | 0 | 0 | 3,106 |
| Carbon sink potential - High - Extend rotation length (1000 tCO2e/y) | 0 | 0 | 11,028 |
| Carbon sink potential - High - Improve plantations (1000 tCO2e/y) | 0 | 0 | 1,209 |
| Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y) | 0 | 0 | 7,563 |
| Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y) | 0 | 0 | 1,511 |
| Carbon sink potential - High - Reforest cropland (1000 tCO2e/y) | 0 | 0 | 944 |
| Carbon sink potential - High - Reforest pasture (1000 tCO2e/y) | 0 | 0 | 4,759 |
| Carbon sink potential - High - Restore productivity (1000 tCO2e/y) | 0 | 0 | 4,537 |
| Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y) | 0 | 0 | 202 |
| Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y) | 0 | 0 | 10,983 |
| Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y) | 0 | 0 | 518 |
| Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y) | 0 | 0 | 4,236 |
| Carbon sink potential - Low - Improve plantations (1000 tCO2e/y) | 0 | 0 | 615 |
| Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y) | 0 | 0 | 2,521 |
| Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y) | 0 | 0 | 529 |
| Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y) | 0 | 0 | 472 |
| Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y) | 0 | 0 | 361 |
| Carbon sink potential - Low - Restore productivity (1000 tCO2e/y) | 0 | 0 | 1,529 |
| Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y) | 0 | 0 | 303 |
| Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y) | 0 | 0 | 23,011 |
| Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y) | 0 | 0 | 1,812 |
| Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y) | 0 | 0 | 7,632 |
| Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y) | 0 | 0 | 901 |
| Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y) | 0 | 0 | 5,042 |

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 | 1,020 |
| Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y) | 0 | 0 | 708 |
| Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y) | 0 | 0 | 2,560 |
| Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y) | 0 | 0 | 3,033 |
| Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares) | 0 | 0 | 66 |
| Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares) | 0 | 0 | 421 |
| Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares) | 0 | 0 | 5,624 |
| Land impacted for carbon sink potential - High - Improve plantations (1000 hectares) | 0 | 0 | 445 |
| 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 | 144 |
| Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares) | 0 | 0 | 62.4 |
| Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares) | 0 | 0 | 135 |
| Land impacted for carbon sink potential - High - Restore productivity (1000 hectares) | 0 | 0 | 1,504 |
| Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares) | 0 | 0 | 8,401 |
| Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares) | 0 | 0 | 33 |
| Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares) | 0 | 0 | 395 |
| Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares) | 0 | 0 | 2,155 |
| Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares) | 0 | 0 | 223 |
| 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 | 75.6 |
| Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares) | 0 | 0 | 31.2 |
| Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares) | 0 | 0 | 23.4 |
| Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares) | 0 | 0 | 910 |
| Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares) | 0 | 0 | 3,845 |
| Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares) | 0 | 0 | 49.5 |
| Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares) | 0 | 0 | 408 |
| Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares) | 0 | 0 | 3,889 |
| Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares) | 0 | 0 | 335 |
| 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 | 110 |

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 | 46.8 |
| Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares) | 0 | 0 | 169 |
| Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares) | 0 | 0 | 1,833 |
| Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares) | 0 | 0 | 6,840 |

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

| Item | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|
| Monetary damages from air pollution - Coal (million 2019$) | 0 | 1,023 | 0.95 | 0.934 | 0.8 | 0.548 | 0.041 |
| Monetary damages from air pollution - Natural Gas (million 2019$) | 0 | 287 | 219 | 144 | 131 | 70 | 29.4 |
| Monetary damages from air pollution - Transportation (million 2019$) | 0 | 2,671 | 2,473 | 1,869 | 1,078 | 494 | 199 |
| Premature deaths from air pollution - Coal (deaths) | 0 | 115 | 0.107 | 0.105 | 0.09 | 0.062 | 0.005 |
| Premature deaths from air pollution - Natural Gas (deaths) | 0 | 32.4 | 24.8 | 16.3 | 14.8 | 7.91 | 3.33 |
| Premature deaths from air pollution - Transportation (deaths) | 0 | 300 | 278 | 210 | 121 | 55.5 | 22.4 |

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

| Item | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|
| By economic sector - Agriculture (jobs) | 750 | 775 | 973 | 712 | 420 | 131 | 1,058 |
| By economic sector - Construction (jobs) | 7,771 | 7,460 | 10,518 | 14,669 | 16,757 | 15,262 | 15,653 |
| By economic sector - Manufacturing (jobs) | 6,643 | 13,094 | 15,886 | 20,840 | 20,380 | 16,067 | 21,000 |
| By economic sector - Mining (jobs) | 5,904 | 4,478 | 3,235 | 2,220 | 1,394 | 828 | 473 |
| By economic sector - Other (jobs) | 418 | 374 | 642 | 1,476 | 1,637 | 1,931 | 1,950 |
| By economic sector - Pipeline (jobs) | 919 | 908 | 962 | 630 | 487 | 340 | 381 |
| By economic sector - Professional (jobs) | 4,932 | 4,463 | 6,055 | 8,285 | 9,953 | 9,303 | 10,733 |
| By economic sector - Trade (jobs) | 4,537 | 3,639 | 4,031 | 5,166 | 5,780 | 5,505 | 5,816 |
| By economic sector - Utilities (jobs) | 11,543 | 10,590 | 12,006 | 14,499 | 18,070 | 14,512 | 15,534 |
| By education level - All sectors - Associates degree or some college (jobs) | 13,172 | 14,038 | 16,886 | 21,656 | 24,031 | 20,580 | 23,108 |
| By education level - All sectors - Bachelors degree (jobs) | 9,578 | 9,884 | 11,372 | 14,029 | 15,264 | 13,041 | 14,783 |
| By education level - All sectors - Doctoral degree (jobs) | 312 | 294 | 352 | 442 | 495 | 445 | 502 |
| By education level - All sectors - High school diploma or less (jobs) | 18,066 | 19,295 | 23,061 | 29,100 | 31,459 | 26,667 | 30,660 |
| By education level - All sectors - Masters or professional degree (jobs) | 2,290 | 2,271 | 2,638 | 3,270 | 3,629 | 3,146 | 3,545 |
| By resource sector - Biomass (jobs) | 2,097 | 2,189 | 2,402 | 1,676 | 1,059 | 505 | 4,613 |
| By resource sector - CO2 (jobs) | 0 | 0 | 1,568 | 160 | 270 | 348 | 1,462 |
| By resource sector - Coal (jobs) | 3,707 | 1,528 | 195 | 0 | 0 | 0 | 0 |
| By resource sector - Grid (jobs) | 10,172 | 9,805 | 13,685 | 21,282 | 28,444 | 23,875 | 26,299 |
| By resource sector - Natural Gas (jobs) | 10,154 | 9,760 | 7,781 | 6,815 | 7,236 | 4,509 | 3,489 |
| By resource sector - Nuclear (jobs) | 2,213 | 2,009 | 1,739 | 1,253 | 586 | 340 | 0 |
| By resource sector - Oil (jobs) | 9,954 | 8,747 | 7,126 | 5,367 | 3,718 | 2,557 | 1,677 |
| By resource sector - Solar (jobs) | 2,615 | 5,130 | 6,140 | 12,687 | 11,538 | 13,013 | 15,391 |
| By resource sector - Wind (jobs) | 2,505 | 6,615 | 13,673 | 19,256 | 22,027 | 18,733 | 19,667 |
| Median wages - Annual - All ($2019 per job) | 61,339 | 60,837 | 61,054 | 61,281 | 62,652 | 63,521 | 63,774 |
| On-Site or In-Plant Training - Total jobs - 1 to 4 years (jobs) | 6,906 | 7,264 | 8,694 | 11,057 | 12,242 | 10,464 | 11,695 |
| On-Site or In-Plant Training - Total jobs - 4 to 10 years (jobs) | 2,794 | 2,734 | 3,316 | 4,218 | 4,807 | 4,164 | 4,505 |
| On-Site or In-Plant Training - Total jobs - None (jobs) | 6,964 | 7,426 | 8,845 | 11,188 | 12,178 | 10,440 | 11,920 |

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) | 350 | 369 | 451 | 581 | 656 | 561 | 626 |
| On-Site or In-Plant Training - Total jobs - Up to 1 year (jobs) | 26,405 | 27,990 | 33,000 | 41,453 | 44,995 | 38,250 | 43,851 |
| On-the-Job Training - All sectors - 1 to 4 years (jobs) | 8,857 | 9,284 | 11,138 | 14,181 | 15,774 | 13,499 | 15,020 |
| On-the-Job Training - All sectors - 4 to 10 years (jobs) | 2,651 | 2,578 | 3,175 | 4,087 | 4,702 | 4,094 | 4,408 |
| On-the-Job Training - All sectors - None (jobs) | 2,380 | 2,464 | 2,887 | 3,632 | 3,917 | 3,377 | 3,830 |
| On-the-Job Training - All sectors - Over 10 years (jobs) | 402 | 463 | 557 | 712 | 755 | 643 | 729 |
| On-the-Job Training - All sectors - Up to 1 year (jobs) | 29,127 | 30,993 | 36,551 | 45,885 | 49,730 | 42,267 | 48,612 |
| Related work experience - All sectors - 1 to 4 years (jobs) | 15,815 | 16,483 | 19,435 | 24,414 | 26,774 | 22,874 | 25,883 |
| Related work experience - All sectors - 4 to 10 years (jobs) | 10,117 | 10,587 | 12,551 | 15,837 | 17,482 | 14,946 | 16,773 |
| Related work experience - All sectors - None (jobs) | 6,225 | 6,541 | 7,768 | 9,782 | 10,720 | 9,135 | 10,407 |
| Related work experience - All sectors - Over 10 years (jobs) | 2,740 | 2,983 | 3,511 | 4,423 | 4,810 | 4,075 | 4,623 |
| Related work experience - All sectors - Up to 1 year (jobs) | 8,520 | 9,189 | 11,042 | 14,041 | 15,092 | 12,850 | 14,912 |
| Wage income - All (million $2019) | 2,663 | 2,785 | 3,316 | 4,198 | 4,692 | 4,058 | 4,630 |

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

| Item | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|
| Natural gas consumption - Annual (tcf) | 736 | 747 | 630 | 505 | 380 | 239 | 166 |
| Natural gas consumption - Cumulative (tcf) | 0 | 0 | 0 | 0 | 0 | 0 | 15,217 |
| Natural gas production - Annual (tcf) | 97.1 | 108 | 102 | 88.6 | 74.9 | 59.4 | 46.2 |
| Oil consumption - Annual (million bbls) | 171 | 161 | 139 | 108 | 79 | 56.3 | 40.2 |
| Oil consumption - Cumulative (million bbls) | 0 | 0 | 0 | 0 | 0 | 0 | 3,351 |
| Oil production - Annual (million bbls) | 6.48 | 7.01 | 7.03 | 7.02 | 5.56 | 4.52 | 3.01 |

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 | 7.67 | 9.61 | 0 | 0 | 0 | 0 |
| Sales of cooking units - Electric Resistance (%) | 35.5 | 37.1 | 43 | 58.6 | 80.3 | 93.6 | 98.3 |
| Sales of cooking units - Gas (%) | 64.5 | 62.9 | 57 | 41.4 | 19.7 | 6.37 | 1.71 |
| Sales of space heating units - Electric Heat Pump (%) | 2.17 | 5.44 | 8.25 | 17.5 | 39.1 | 65.5 | 80.9 |
| Sales of space heating units - Electric Resistance (%) | 5.77 | 9.38 | 9.14 | 8.42 | 6.65 | 4.54 | 3.4 |
| Sales of space heating units - Fossil (%) | 6.93 | 13.2 | 12.9 | 11.7 | 9.27 | 6.38 | 4.68 |
| Sales of space heating units - Gas (%) | 85.1 | 72 | 69.7 | 62.4 | 45 | 23.5 | 11 |
| Sales of water heating units - Electric Heat Pump (%) | 0 | 0.449 | 1.69 | 5.81 | 15.8 | 28.5 | 36 |
| Sales of water heating units - Electric Resistance (%) | 13.3 | 25.5 | 26.2 | 29.4 | 37 | 46.8 | 52.5 |
| Sales of water heating units - Gas Furnace (%) | 86.7 | 74 | 72 | 64.7 | 47.1 | 24.6 | 11.4 |
| Sales of water heating units - Other (%) | 0.036 | 0.089 | 0.089 | 0.089 | 0.089 | 0.089 | 0.089 |

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 | 260 | 547 | 1,847 | 5,817 | 8,473 |
| Public EV charging plugs - DC Fast (1000 units) | 0.242 | 0 | 0.872 | 0 | 4.63 | 0 | 13 |
| Public EV charging plugs - L2 (1000 units) | 0.857 | 0 | 21 | 0 | 111 | 0 | 311 |
| 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 (%) | 1.64 | 2.03 | 2.07 | 1.65 | 1.06 | 0.547 | 0.234 |
| Vehicle sales - Light-duty - EV (%) | 1.8 | 4.49 | 11.5 | 25.2 | 47.7 | 71.6 | 87.4 |
| Vehicle sales - Light-duty - gasoline (%) | 92 | 87.8 | 80.2 | 67.5 | 47 | 25.3 | 11.2 |
| Vehicle sales - Light-duty - hybrid (%) | 4.33 | 5.15 | 5.81 | 5.32 | 4.03 | 2.4 | 1.17 |
| Vehicle sales - Light-duty - hydrogen FC (%) | 0.113 | 0.382 | 0.33 | 0.254 | 0.181 | 0.101 | 0.047 |
| Vehicle sales - Light-duty - other (%) | 0.106 | 0.11 | 0.1 | 0.087 | 0.063 | 0.035 | 0.016 |
| Vehicle sales - Medium-duty - diesel (%) | 64.8 | 62.2 | 57.7 | 49.4 | 35.6 | 19.6 | 8.37 |
| Vehicle sales - Medium-duty - EV (%) | 0.664 | 1.94 | 5.49 | 14.3 | 31.4 | 52.6 | 68 |
| Vehicle sales - Medium-duty - gasoline (%) | 33.8 | 34.7 | 34.7 | 31.9 | 24.4 | 14.2 | 6.33 |
| Vehicle sales - Medium-duty - hybrid (%) | 0.363 | 0.418 | 0.464 | 0.478 | 0.414 | 0.275 | 0.141 |
| Vehicle sales - Medium-duty - hydrogen FC (%) | 0.166 | 0.485 | 1.37 | 3.58 | 7.86 | 13.2 | 17 |
| Vehicle sales - Medium-duty - other (%) | 0.253 | 0.266 | 0.279 | 0.286 | 0.258 | 0.184 | 0.102 |

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

| Item | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|
| Final energy use - Commercial (PJ) | 316 | 311 | 304 | 297 | 288 | 275 | 260 |
| Final energy use - Industry (PJ) | 501 | 510 | 521 | 522 | 536 | 546 | 548 |
| Final energy use - Residential (PJ) | 562 | 525 | 498 | 472 | 439 | 392 | 339 |
| Final energy use - Transportation (PJ) | 809 | 757 | 687 | 629 | 583 | 530 | 468 |

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 | 29,338 | 32,023 | 0 | 0 | 0 | 0 |
| Sales of cooking units - Electric Resistance (%) | 41 | 45.8 | 49.8 | 60.5 | 75.4 | 84.5 | 87.7 |
| Sales of cooking units - Gas (%) | 59 | 54.2 | 50.2 | 39.5 | 24.6 | 15.5 | 12.3 |
| Sales of space heating units - Electric Heat Pump (%) | 0.384 | 4.93 | 7.53 | 16.1 | 36.4 | 61.5 | 76.2 |
| Sales of space heating units - Electric Resistance (%) | 1.64 | 3.4 | 3.62 | 4.32 | 6.01 | 8.19 | 9.45 |
| Sales of space heating units - Fossil (%) | 2.54 | 2.74 | 2.58 | 1.99 | 1.1 | 0.499 | 0.282 |
| Sales of space heating units - Gas Furnace (%) | 95.4 | 88.9 | 86.3 | 77.6 | 56.5 | 29.8 | 14.1 |
| Sales of water heating units - Electric Heat Pump (%) | 0.161 | 0.855 | 2.27 | 6.98 | 18.4 | 32.9 | 41.5 |
| Sales of water heating units - Electric Resistance (%) | 1.64 | 3.69 | 5.06 | 9.72 | 21 | 35.3 | 43.8 |
| Sales of water heating units - Gas Furnace (%) | 98.1 | 95.3 | 92.5 | 83.1 | 60.4 | 31.6 | 14.6 |
| Sales of water heating units - Other (%) | 0.093 | 0.184 | 0.185 | 0.186 | 0.185 | 0.186 | 0.186 |

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 | 4.21 | 4.23 | 5.79 | 5.99 | 8.36 | 8.82 |

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 | -699 |
| Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y) | 0 | 0 | -4,144 |
| Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y) | 0 | 0 | -148 |
| Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y) | 0 | 0 | -4,990 |

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 | -699 |
| Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y) | 0 | 0 | -2,176 |
| Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y) | 0 | 0 | -74 |
| Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y) | 0 | 0 | -2,949 |
| Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares) | 0 | 0 | 292 |
| Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares) | 0 | 0 | 2,649 |
| Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares) | 0 | 0 | 269 |
| Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares) | 0 | 0 | 3,209 |
| Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares) | 0 | 0 | 292 |
| Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares) | 0 | 0 | 1,392 |
| Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares) | 0 | 0 | 135 |
| Land impacted for carbon sink - Moderate deployment - Total (1000 hectares) | 0 | 0 | 1,818 |

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

| Item | 2020 | 2025 | 2050 |
|---|---|---|---|
| Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y) | 0 | 0 | 403 |
| Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y) | 0 | 0 | 35,061 |
| Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y) | 0 | 0 | 3,106 |
| Carbon sink potential - High - Extend rotation length (1000 tCO2e/y) | 0 | 0 | 11,028 |
| Carbon sink potential - High - Improve plantations (1000 tCO2e/y) | 0 | 0 | 1,209 |
| Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y) | 0 | 0 | 7,563 |
| Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y) | 0 | 0 | 1,511 |
| Carbon sink potential - High - Reforest cropland (1000 tCO2e/y) | 0 | 0 | 944 |
| Carbon sink potential - High - Reforest pasture (1000 tCO2e/y) | 0 | 0 | 4,759 |
| Carbon sink potential - High - Restore productivity (1000 tCO2e/y) | 0 | 0 | 4,537 |
| Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y) | 0 | 0 | 202 |
| Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y) | 0 | 0 | 10,983 |
| Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y) | 0 | 0 | 518 |
| Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y) | 0 | 0 | 4,236 |
| Carbon sink potential - Low - Improve plantations (1000 tCO2e/y) | 0 | 0 | 615 |

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 | 2,521 |
| Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y) | 0 | 0 | 529 |
| Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y) | 0 | 0 | 472 |
| Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y) | 0 | 0 | 361 |
| Carbon sink potential - Low - Restore productivity (1000 tCO2e/y) | 0 | 0 | 1,529 |
| Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y) | 0 | 0 | 303 |
| Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y) | 0 | 0 | 23,011 |
| Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y) | 0 | 0 | 1,812 |
| Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y) | 0 | 0 | 7,632 |
| Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y) | 0 | 0 | 901 |
| Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y) | 0 | 0 | 5,042 |
| Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y) | 0 | 0 | 1,020 |
| Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y) | 0 | 0 | 708 |
| Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y) | 0 | 0 | 2,560 |
| Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y) | 0 | 0 | 3,033 |
| Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares) | 0 | 0 | 66 |
| Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares) | 0 | 0 | 421 |
| Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares) | 0 | 0 | 5,624 |
| Land impacted for carbon sink potential - High - Improve plantations (1000 hectares) | 0 | 0 | 445 |
| 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 | 144 |
| Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares) | 0 | 0 | 62.4 |
| Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares) | 0 | 0 | 135 |
| Land impacted for carbon sink potential - High - Restore productivity (1000 hectares) | 0 | 0 | 1,504 |
| Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares) | 0 | 0 | 8,401 |
| Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares) | 0 | 0 | 33 |
| Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares) | 0 | 0 | 395 |
| Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares) | 0 | 0 | 2,155 |
| Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares) | 0 | 0 | 223 |
| 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 | 75.6 |
| Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares) | 0 | 0 | 31.2 |
| Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares) | 0 | 0 | 23.4 |
| Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares) | 0 | 0 | 910 |
| Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares) | 0 | 0 | 3,845 |
| Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares) | 0 | 0 | 49.5 |
| Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares) | 0 | 0 | 408 |
| Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares) | 0 | 0 | 3,889 |
| Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares) | 0 | 0 | 335 |
| 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 | 110 |
| Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares) | 0 | 0 | 46.8 |
| Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares) | 0 | 0 | 169 |
| Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares) | 0 | 0 | 1,833 |
| Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares) | 0 | 0 | 6,840 |

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

| Item | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|
| Monetary damages from air pollution - Coal (million 2019$) | 0 | 1,023 | 0.95 | 0.934 | 0.8 | 0.548 | 0.041 |
| Monetary damages from air pollution - Natural Gas (million 2019$) | 0 | 259 | 165 | 71.9 | 33.3 | 10.2 | 6.87 |
| Monetary damages from air pollution - Transportation (million 2019$) | 0 | 2,716 | 2,725 | 2,633 | 2,356 | 1,865 | 1,273 |
| Premature deaths from air pollution - Coal (deaths) | 0 | 115 | 0.107 | 0.105 | 0.09 | 0.062 | 0.005 |
| Premature deaths from air pollution - Natural Gas (deaths) | 0 | 29.3 | 18.6 | 8.12 | 3.77 | 1.15 | 0.776 |
| Premature deaths from air pollution - Transportation (deaths) | 0 | 306 | 307 | 296 | 265 | 210 | 143 |

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 | 7.71 | 9.81 | 0 | 0 | 0 | 0 |
| Sales of cooking units - Electric Resistance (%) | 35.7 | 49.4 | 91.3 | 99.6 | 100 | 100 | 100 |
| Sales of cooking units - Gas (%) | 64.3 | 50.6 | 8.66 | 0.436 | 0 | 0 | 0 |
| Sales of space heating units - Electric Heat Pump (%) | 2.17 | 6.93 | 32.9 | 84 | 93.6 | 94.2 | 94.2 |
| Sales of space heating units - Electric Resistance (%) | 5.77 | 9.31 | 7.39 | 3.21 | 2.39 | 2.33 | 2.44 |
| Sales of space heating units - Fossil (%) | 6.93 | 12.9 | 9.76 | 4.29 | 3.31 | 3.24 | 3.18 |
| Sales of space heating units - Gas (%) | 85.1 | 70.8 | 50 | 8.51 | 0.73 | 0.191 | 0.189 |
| Sales of water heating units - Electric Heat Pump (%) | 0 | 0.892 | 12.3 | 37.3 | 42 | 42.4 | 42.4 |

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 (%) | 13.3 | 25.8 | 34.3 | 53.6 | 57.3 | 57.5 | 57.5 |
| Sales of water heating units - Gas Furnace (%) | 86.7 | 73.2 | 53.3 | 9.02 | 0.593 | 0.008 | 0 |
| Sales of water heating units - Other (%) | 0.036 | 0.089 | 0.089 | 0.089 | 0.088 | 0.088 | 0.089 |

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 | 1,610 | 4,124 | 6,688 | 10,128 | 11,025 | 10,511 |
| Public EV charging plugs - DC Fast (1000 units) | 0.242 | 0 | 2.84 | 0 | 12.5 | 0 | 20.2 |
| Public EV charging plugs - L2 (1000 units) | 0.857 | 0 | 68.2 | 0 | 300 | 0 | 486 |
| 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 (%) | 1.62 | 1.88 | 1.29 | 0.413 | 0.076 | 0.013 | 0 |
| Vehicle sales - Light-duty - EV (%) | 3.67 | 14.4 | 45.3 | 81.3 | 96.3 | 99.3 | 100 |
| Vehicle sales - Light-duty - gasoline (%) | 90.3 | 78.9 | 50 | 17 | 3.35 | 0.592 | 0 |
| Vehicle sales - Light-duty - hybrid (%) | 4.18 | 4.37 | 3.13 | 1.17 | 0.284 | 0.062 | 0 |
| Vehicle sales - Light-duty - hydrogen FC (%) | 0.111 | 0.344 | 0.209 | 0.065 | 0.013 | 0.002 | 0 |
| Vehicle sales - Light-duty - other (%) | 0.105 | 0.101 | 0.067 | 0.023 | 0.005 | 0.001 | 0 |
| Vehicle sales - Medium-duty - diesel (%) | 64.7 | 59.7 | 42.3 | 14.4 | 2.59 | 0.384 | 0 |
| Vehicle sales - Medium-duty - EV (%) | 0.784 | 5.07 | 25.3 | 60.8 | 76.5 | 79.5 | 80 |
| Vehicle sales - Medium-duty - gasoline (%) | 33.7 | 33.3 | 25.5 | 9.32 | 1.77 | 0.277 | 0 |
| Vehicle sales - Medium-duty - hybrid (%) | 0.363 | 0.402 | 0.341 | 0.14 | 0.03 | 0.005 | 0 |
| Vehicle sales - Medium-duty - hydrogen FC (%) | 0.196 | 1.27 | 6.33 | 15.2 | 19.1 | 19.9 | 20 |
| Vehicle sales - Medium-duty - other (%) | 0.253 | 0.255 | 0.205 | 0.083 | 0.019 | 0.004 | 0 |

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

| Item | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|
| Final energy use - Commercial (PJ) | 316 | 311 | 299 | 277 | 251 | 231 | 220 |
| Final energy use - Industry (PJ) | 501 | 510 | 519 | 515 | 526 | 536 | 540 |
| Final energy use - Residential (PJ) | 562 | 524 | 489 | 423 | 347 | 286 | 245 |
| Final energy use - Transportation (PJ) | 808 | 750 | 656 | 541 | 437 | 372 | 341 |

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 | 29,341 | 32,040 | 0 | 0 | 0 | 0 |
| Sales of cooking units - Electric Resistance (%) | 41 | 54.2 | 82.9 | 88.6 | 88.9 | 88.9 | 88.9 |
| Sales of cooking units - Gas (%) | 59 | 45.8 | 17.1 | 11.4 | 11.1 | 11.1 | 11.1 |
| Sales of space heating units - Electric Heat Pump (%) | 0.384 | 6.16 | 30.1 | 79.2 | 88.5 | 89.1 | 89.1 |
| Sales of space heating units - Electric Resistance (%) | 1.64 | 3.48 | 5.48 | 9.74 | 10.5 | 10.6 | 10.6 |
| Sales of space heating units - Fossil (%) | 2.54 | 2.36 | 0.454 | 0.019 | 0 | 0 | 0 |
| Sales of space heating units - Gas Furnace (%) | 95.4 | 88 | 64 | 11.1 | 1.06 | 0.368 | 0.359 |
| Sales of water heating units - Electric Heat Pump (%) | 0.161 | 1.36 | 14.4 | 43 | 48.4 | 48.8 | 48.8 |
| Sales of water heating units - Electric Resistance (%) | 1.64 | 4.19 | 17 | 45.3 | 50.6 | 51 | 51 |
| Sales of water heating units - Gas Furnace (%) | 98.1 | 94.3 | 68.5 | 11.6 | 0.763 | 0.01 | 0 |
| Sales of water heating units - Other (%) | 0.093 | 0.184 | 0.185 | 0.186 | 0.185 | 0.186 | 0.186 |

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 | 5.19 | 5.33 | 9.38 | 9.99 | 8.85 | 9.24 |

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

| Item | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|
| Capital invested - Solar PV - Base (billion $2018) | 0 | 0 | 2.69 | 7.27 | 8.63 | 37.6 | 2.37 |
| Capital invested - Wind - Base (billion $2018) | 0 | 0 | 14.8 | 10.1 | 6.56 | 1.26 | 1.91 |

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

| Item | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|
| Solar - Base land use assumptions (GWh) | 155 | 0 | 3,829 | 11,163 | 14,052 | 65,032 | 4,372 |
| Solar - Constrained land use assumptions (GWh) | 155 | 181 | 643 | 12,304 | 19,085 | 36,333 | 10,390 |
| Wind - Base land use assumptions (GWh) | 9,704 | 0 | 36,344 | 25,754 | 17,732 | 3,907 | 6,141 |
| Wind - Constrained land use assumptions (GWh) | 9,704 | 0 | 26,516 | 1,933 | 1,165 | 1,330 | 60,971 |

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 | -699 |
| Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y) | 0 | 0 | -4,144 |
| Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y) | 0 | 0 | -148 |
| Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y) | 0 | 0 | -4,990 |
| Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y) | 0 | 0 | -699 |
| Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y) | 0 | 0 | -2,176 |
| Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y) | 0 | 0 | -74 |
| Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y) | 0 | 0 | -2,949 |
| Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares) | 0 | 0 | 292 |
| Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares) | 0 | 0 | 2,649 |
| Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares) | 0 | 0 | 269 |
| Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares) | 0 | 0 | 3,209 |
| Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares) | 0 | 0 | 292 |
| Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares) | 0 | 0 | 1,392 |
| Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares) | 0 | 0 | 135 |
| Land impacted for carbon sink - Moderate deployment - Total (1000 hectares) | 0 | 0 | 1,818 |

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 | 403 |
| Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y) | 0 | 0 | 35,061 |
| Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y) | 0 | 0 | 3,106 |
| Carbon sink potential - High - Extend rotation length (1000 tCO2e/y) | 0 | 0 | 11,028 |
| Carbon sink potential - High - Improve plantations (1000 tCO2e/y) | 0 | 0 | 1,209 |
| Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y) | 0 | 0 | 7,563 |
| Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y) | 0 | 0 | 1,511 |
| Carbon sink potential - High - Reforest cropland (1000 tCO2e/y) | 0 | 0 | 944 |
| Carbon sink potential - High - Reforest pasture (1000 tCO2e/y) | 0 | 0 | 4,759 |
| Carbon sink potential - High - Restore productivity (1000 tCO2e/y) | 0 | 0 | 4,537 |
| Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y) | 0 | 0 | 202 |
| Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y) | 0 | 0 | 10,983 |
| Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y) | 0 | 0 | 518 |
| Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y) | 0 | 0 | 4,236 |
| Carbon sink potential - Low - Improve plantations (1000 tCO2e/y) | 0 | 0 | 615 |
| Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y) | 0 | 0 | 2,521 |
| Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y) | 0 | 0 | 529 |
| Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y) | 0 | 0 | 472 |
| Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y) | 0 | 0 | 361 |
| Carbon sink potential - Low - Restore productivity (1000 tCO2e/y) | 0 | 0 | 1,529 |
| Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y) | 0 | 0 | 303 |
| Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y) | 0 | 0 | 23,011 |
| Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y) | 0 | 0 | 1,812 |
| Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y) | 0 | 0 | 7,632 |
| Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y) | 0 | 0 | 901 |
| Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y) | 0 | 0 | 5,042 |
| Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y) | 0 | 0 | 1,020 |
| Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y) | 0 | 0 | 708 |
| Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y) | 0 | 0 | 2,560 |
| Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y) | 0 | 0 | 3,033 |
| Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares) | 0 | 0 | 66 |

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 | 421 |
| Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares) | 0 | 0 | 5,624 |
| Land impacted for carbon sink potential - High - Improve plantations (1000 hectares) | 0 | 0 | 445 |
| 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 | 144 |
| Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares) | 0 | 0 | 62.4 |
| Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares) | 0 | 0 | 135 |
| Land impacted for carbon sink potential - High - Restore productivity (1000 hectares) | 0 | 0 | 1,504 |
| Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares) | 0 | 0 | 8,401 |
| Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares) | 0 | 0 | 33 |
| Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares) | 0 | 0 | 395 |
| Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares) | 0 | 0 | 2,155 |
| Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares) | 0 | 0 | 223 |
| 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 | 75.6 |
| Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares) | 0 | 0 | 31.2 |
| Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares) | 0 | 0 | 23.4 |
| Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares) | 0 | 0 | 910 |
| Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares) | 0 | 0 | 3,845 |
| Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares) | 0 | 0 | 49.5 |
| Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares) | 0 | 0 | 408 |
| Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares) | 0 | 0 | 3,889 |
| Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares) | 0 | 0 | 335 |
| 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 | 110 |
| Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares) | 0 | 0 | 46.8 |
| Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares) | 0 | 0 | 169 |
| Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares) | 0 | 0 | 1,833 |
| Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares) | 0 | 0 | 6,840 |

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

| Item | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|
| Monetary damages from air pollution - Coal (million 2019$) | 0 | 1,023 | 0.95 | 0.934 | 0.8 | 0.548 | 0.041 |
| Monetary damages from air pollution - Natural Gas (million 2019$) | 0 | 248 | 181 | 104 | 72.5 | 24 | 6.18 |
| Monetary damages from air pollution - Transportation (million 2019$) | 0 | 2,671 | 2,473 | 1,869 | 1,078 | 494 | 199 |
| Premature deaths from air pollution - Coal (deaths) | 0 | 115 | 0.107 | 0.105 | 0.09 | 0.062 | 0.005 |
| Premature deaths from air pollution - Natural Gas (deaths) | 0 | 28 | 20.4 | 11.8 | 8.18 | 2.71 | 0.698 |
| Premature deaths from air pollution - Transportation (deaths) | 0 | 300 | 278 | 210 | 121 | 55.5 | 22.4 |

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 | 7.71 | 9.81 | 0 | 0 | 0 | 0 |
| Sales of cooking units - Electric Resistance (%) | 35.7 | 49.4 | 91.3 | 99.6 | 100 | 100 | 100 |
| Sales of cooking units - Gas (%) | 64.3 | 50.6 | 8.66 | 0.436 | 0 | 0 | 0 |
| Sales of space heating units - Electric Heat Pump (%) | 2.17 | 6.93 | 32.9 | 84 | 93.6 | 94.2 | 94.2 |
| Sales of space heating units - Electric Resistance (%) | 5.77 | 9.31 | 7.39 | 3.21 | 2.39 | 2.33 | 2.44 |
| Sales of space heating units - Fossil (%) | 6.93 | 12.9 | 9.76 | 4.29 | 3.31 | 3.24 | 3.18 |
| Sales of space heating units - Gas (%) | 85.1 | 70.8 | 50 | 8.51 | 0.73 | 0.191 | 0.189 |
| Sales of water heating units - Electric Heat Pump (%) | 0 | 0.892 | 12.3 | 37.3 | 42 | 42.4 | 42.4 |
| Sales of water heating units - Electric Resistance (%) | 13.3 | 25.8 | 34.3 | 53.6 | 57.3 | 57.5 | 57.5 |
| Sales of water heating units - Gas Furnace (%) | 86.7 | 73.2 | 53.3 | 9.02 | 0.593 | 0.008 | 0 |
| Sales of water heating units - Other (%) | 0.036 | 0.089 | 0.089 | 0.089 | 0.088 | 0.088 | 0.089 |

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 | 1,610 | 4,124 | 6,688 | 10,128 | 11,025 | 10,511 |
| Public EV charging plugs - DC Fast (1000 units) | 0.242 | 0 | 2.84 | 0 | 12.5 | 0 | 20.2 |
| Public EV charging plugs - L2 (1000 units) | 0.857 | 0 | 68.2 | 0 | 300 | 0 | 486 |
| 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 (%) | 1.62 | 1.88 | 1.29 | 0.413 | 0.076 | 0.013 | 0 |
| Vehicle sales - Light-duty - EV (%) | 3.67 | 14.4 | 45.3 | 81.3 | 96.3 | 99.3 | 100 |
| Vehicle sales - Light-duty - gasoline (%) | 90.3 | 78.9 | 50 | 17 | 3.35 | 0.592 | 0 |
| Vehicle sales - Light-duty - hybrid (%) | 4.18 | 4.37 | 3.13 | 1.17 | 0.284 | 0.062 | 0 |
| Vehicle sales - Light-duty - hydrogen FC (%) | 0.111 | 0.344 | 0.209 | 0.065 | 0.013 | 0.002 | 0 |
| Vehicle sales - Light-duty - other (%) | 0.105 | 0.101 | 0.067 | 0.023 | 0.005 | 0.001 | 0 |
| Vehicle sales - Medium-duty - diesel (%) | 64.7 | 59.7 | 42.3 | 14.4 | 2.59 | 0.384 | 0 |
| Vehicle sales - Medium-duty - EV (%) | 0.784 | 5.07 | 25.3 | 60.8 | 76.5 | 79.5 | 80 |
| Vehicle sales - Medium-duty - gasoline (%) | 33.7 | 33.3 | 25.5 | 9.32 | 1.77 | 0.277 | 0 |
| Vehicle sales - Medium-duty - hybrid (%) | 0.363 | 0.402 | 0.341 | 0.14 | 0.03 | 0.005 | 0 |
| Vehicle sales - Medium-duty - hydrogen FC (%) | 0.196 | 1.27 | 6.33 | 15.2 | 19.1 | 19.9 | 20 |
| Vehicle sales - Medium-duty - other (%) | 0.253 | 0.255 | 0.205 | 0.083 | 0.019 | 0.004 | 0 |

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

| Item | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|
| Final energy use - Commercial (PJ) | 316 | 311 | 299 | 277 | 251 | 231 | 220 |
| Final energy use - Industry (PJ) | 501 | 510 | 519 | 515 | 526 | 536 | 540 |
| Final energy use - Residential (PJ) | 562 | 524 | 489 | 423 | 347 | 286 | 245 |
| Final energy use - Transportation (PJ) | 808 | 750 | 656 | 541 | 437 | 372 | 341 |

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 | 29,341 | 32,040 | 0 | 0 | 0 | 0 |
| Sales of cooking units - Electric Resistance (%) | 41 | 54.2 | 82.9 | 88.6 | 88.9 | 88.9 | 88.9 |
| Sales of cooking units - Gas (%) | 59 | 45.8 | 17.1 | 11.4 | 11.1 | 11.1 | 11.1 |
| Sales of space heating units - Electric Heat Pump (%) | 0.384 | 6.16 | 30.1 | 79.2 | 88.5 | 89.1 | 89.1 |
| Sales of space heating units - Electric Resistance (%) | 1.64 | 3.48 | 5.48 | 9.74 | 10.5 | 10.6 | 10.6 |
| Sales of space heating units - Fossil (%) | 2.54 | 2.36 | 0.454 | 0.019 | 0 | 0 | 0 |
| Sales of space heating units - Gas Furnace (%) | 95.4 | 88 | 64 | 11.1 | 1.06 | 0.368 | 0.359 |
| Sales of water heating units - Electric Heat Pump (%) | 0.161 | 1.36 | 14.4 | 43 | 48.4 | 48.8 | 48.8 |
| Sales of water heating units - Electric Resistance (%) | 1.64 | 4.19 | 17 | 45.3 | 50.6 | 51 | 51 |
| Sales of water heating units - Gas Furnace (%) | 98.1 | 94.3 | 68.5 | 11.6 | 0.763 | 0.01 | 0 |
| Sales of water heating units - Other (%) | 0.093 | 0.184 | 0.185 | 0.186 | 0.185 | 0.186 | 0.186 |

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 | 5.19 | 5.33 | 9.38 | 9.99 | 8.85 | 9.24 |

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

| Item | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|
| Capital invested - Solar PV - Base (billion $2018) | 0 | 0 | 0 | 0 | 0.519 | 0.537 | 0 |
| Capital invested - Solar PV - Constrained (billion $2018) | 0 | 0 | 0 | 0.254 | 0 | 0.933 | 0 |
| Capital invested - Wind - Base (billion $2018) | 0 | 0.555 | 4.61 | 0 | 0.985 | 0.262 | 0.194 |
| Capital invested - Wind - Constrained (billion $2018) | 0 | 0.211 | 3.64 | 0.086 | 0.901 | 0.436 | 0.169 |

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

| Item | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|
| Solar - Base land use assumptions (GWh) | 155 | 0 | 0 | 0 | 851 | 930 | 0 |
| Solar - Constrained land use assumptions (GWh) | 155 | 0 | 0 | 394 | 0 | 1,621 | 0 |
| Wind - Base land use assumptions (GWh) | 9,704 | 1,310 | 11,527 | 0 | 2,687 | 750 | 593 |
| Wind - Constrained land use assumptions (GWh) | 9,704 | 490 | 8,885 | 248 | 2,527 | 1,292 | 523 |

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 | -699 |
| Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y) | 0 | 0 | -4,144 |
| Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y) | 0 | 0 | -148 |
| Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y) | 0 | 0 | -4,990 |
| Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y) | 0 | 0 | -699 |

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

| Item | 2020 | 2025 | 2050 |
|---|---|---|---|
| Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y) | 0 | 0 | -2,176 |
| Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y) | 0 | 0 | -74 |
| Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y) | 0 | 0 | -2,949 |
| Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares) | 0 | 0 | 292 |
| Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares) | 0 | 0 | 2,649 |
| Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares) | 0 | 0 | 269 |
| Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares) | 0 | 0 | 3,209 |
| Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares) | 0 | 0 | 292 |
| Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares) | 0 | 0 | 1,392 |
| Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares) | 0 | 0 | 135 |
| Land impacted for carbon sink - Moderate deployment - Total (1000 hectares) | 0 | 0 | 1,818 |

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 | 403 |
| Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y) | 0 | 0 | 35,061 |
| Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y) | 0 | 0 | 3,106 |
| Carbon sink potential - High - Extend rotation length (1000 tCO2e/y) | 0 | 0 | 11,028 |
| Carbon sink potential - High - Improve plantations (1000 tCO2e/y) | 0 | 0 | 1,209 |
| Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y) | 0 | 0 | 7,563 |
| Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y) | 0 | 0 | 1,511 |
| Carbon sink potential - High - Reforest cropland (1000 tCO2e/y) | 0 | 0 | 944 |
| Carbon sink potential - High - Reforest pasture (1000 tCO2e/y) | 0 | 0 | 4,759 |
| Carbon sink potential - High - Restore productivity (1000 tCO2e/y) | 0 | 0 | 4,537 |
| Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y) | 0 | 0 | 202 |
| Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y) | 0 | 0 | 10,983 |
| Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y) | 0 | 0 | 518 |
| Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y) | 0 | 0 | 4,236 |
| Carbon sink potential - Low - Improve plantations (1000 tCO2e/y) | 0 | 0 | 615 |
| Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y) | 0 | 0 | 2,521 |

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

| Item | 2020 | 2025 | 2050 |
|---|---|---|---|
| Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y) | 0 | 0 | 529 |
| Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y) | 0 | 0 | 472 |
| Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y) | 0 | 0 | 361 |
| Carbon sink potential - Low - Restore productivity (1000 tCO2e/y) | 0 | 0 | 1,529 |
| Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y) | 0 | 0 | 303 |
| Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y) | 0 | 0 | 23,011 |
| Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y) | 0 | 0 | 1,812 |
| Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y) | 0 | 0 | 7,632 |
| Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y) | 0 | 0 | 901 |
| Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y) | 0 | 0 | 5,042 |
| Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y) | 0 | 0 | 1,020 |
| Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y) | 0 | 0 | 708 |
| Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y) | 0 | 0 | 2,560 |
| Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y) | 0 | 0 | 3,033 |
| Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares) | 0 | 0 | 66 |
| Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares) | 0 | 0 | 421 |
| Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares) | 0 | 0 | 5,624 |
| Land impacted for carbon sink potential - High - Improve plantations (1000 hectares) | 0 | 0 | 445 |
| 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 | 144 |
| Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares) | 0 | 0 | 62.4 |
| Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares) | 0 | 0 | 135 |
| Land impacted for carbon sink potential - High - Restore productivity (1000 hectares) | 0 | 0 | 1,504 |
| Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares) | 0 | 0 | 8,401 |
| Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares) | 0 | 0 | 33 |
| Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares) | 0 | 0 | 395 |
| Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares) | 0 | 0 | 2,155 |
| Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares) | 0 | 0 | 223 |
| 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 | 75.6 |

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

| Item | 2020 | 2025 | 2050 |
|---|---|---|---|
| Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares) | 0 | 0 | 31.2 |
| Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares) | 0 | 0 | 23.4 |
| Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares) | 0 | 0 | 910 |
| Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares) | 0 | 0 | 3,845 |
| Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares) | 0 | 0 | 49.5 |
| Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares) | 0 | 0 | 408 |
| Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares) | 0 | 0 | 3,889 |
| Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares) | 0 | 0 | 335 |
| 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 | 110 |
| Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares) | 0 | 0 | 46.8 |
| Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares) | 0 | 0 | 169 |
| Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares) | 0 | 0 | 1,833 |
| Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares) | 0 | 0 | 6,840 |

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

| Item | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|
| Monetary damages from air pollution - Coal (million 2019$) | 0 | 1,023 | 0.95 | 0.934 | 0.8 | 0.548 | 0.041 |
| Monetary damages from air pollution - Natural Gas (million 2019$) | 0 | 283 | 215 | 271 | 199 | 68.7 | 22.1 |
| Monetary damages from air pollution - Transportation (million 2019$) | 0 | 2,671 | 2,473 | 1,869 | 1,078 | 494 | 199 |
| Premature deaths from air pollution - Coal (deaths) | 0 | 115 | 0.107 | 0.105 | 0.09 | 0.062 | 0.005 |
| Premature deaths from air pollution - Natural Gas (deaths) | 0 | 31.9 | 24.2 | 30.6 | 22.5 | 7.76 | 2.49 |
| Premature deaths from air pollution - Transportation (deaths) | 0 | 300 | 278 | 210 | 121 | 55.5 | 22.4 |

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 | 7.67 | 9.61 | 0 | 0 | 0 | 0 |
| Sales of cooking units - Electric Resistance (%) | 35.5 | 37.1 | 43 | 58.6 | 80.3 | 93.6 | 98.3 |
| Sales of cooking units - Gas (%) | 64.5 | 62.9 | 57 | 41.4 | 19.7 | 6.37 | 1.71 |
| Sales of space heating units - Electric Heat Pump (%) | 2.17 | 5.44 | 8.25 | 17.5 | 39.1 | 65.5 | 80.9 |
| Sales of space heating units - Electric Resistance (%) | 5.77 | 9.38 | 9.14 | 8.42 | 6.65 | 4.54 | 3.4 |
| Sales of space heating units - Fossil (%) | 6.93 | 13.2 | 12.9 | 11.7 | 9.27 | 6.38 | 4.68 |
| Sales of space heating units - Gas (%) | 85.1 | 72 | 69.7 | 62.4 | 45 | 23.5 | 11 |
| Sales of water heating units - Electric Heat Pump (%) | 0 | 0.449 | 1.69 | 5.81 | 15.8 | 28.5 | 36 |
| Sales of water heating units - Electric Resistance (%) | 13.3 | 25.5 | 26.2 | 29.4 | 37 | 46.8 | 52.5 |

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

| Item | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|
| Sales of water heating units - Gas Furnace (%) | 86.7 | 74 | 72 | 64.7 | 47.1 | 24.6 | 11.4 |
| Sales of water heating units - Other (%) | 0.036 | 0.089 | 0.089 | 0.089 | 0.089 | 0.089 | 0.089 |

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 | 260 | 547 | 1,847 | 5,817 | 8,473 |
| Public EV charging plugs - DC Fast (1000 units) | 0.242 | 0 | 0.872 | 0 | 4.63 | 0 | 13 |
| Public EV charging plugs - L2 (1000 units) | 0.857 | 0 | 21 | 0 | 111 | 0 | 311 |
| 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 (%) | 1.64 | 2.03 | 2.07 | 1.65 | 1.06 | 0.547 | 0.234 |
| Vehicle sales - Light-duty - EV (%) | 1.8 | 4.49 | 11.5 | 25.2 | 47.7 | 71.6 | 87.4 |
| Vehicle sales - Light-duty - gasoline (%) | 92 | 87.8 | 80.2 | 67.5 | 47 | 25.3 | 11.2 |
| Vehicle sales - Light-duty - hybrid (%) | 4.33 | 5.15 | 5.81 | 5.32 | 4.03 | 2.4 | 1.17 |
| Vehicle sales - Light-duty - hydrogen FC (%) | 0.113 | 0.382 | 0.33 | 0.254 | 0.181 | 0.101 | 0.047 |
| Vehicle sales - Light-duty - other (%) | 0.106 | 0.11 | 0.1 | 0.087 | 0.063 | 0.035 | 0.016 |
| Vehicle sales - Medium-duty - diesel (%) | 64.8 | 62.2 | 57.7 | 49.4 | 35.6 | 19.6 | 8.37 |
| Vehicle sales - Medium-duty - EV (%) | 0.664 | 1.94 | 5.49 | 14.3 | 31.4 | 52.6 | 68 |
| Vehicle sales - Medium-duty - gasoline (%) | 33.8 | 34.7 | 34.7 | 31.9 | 24.4 | 14.2 | 6.33 |
| Vehicle sales - Medium-duty - hybrid (%) | 0.363 | 0.418 | 0.464 | 0.478 | 0.414 | 0.275 | 0.141 |
| Vehicle sales - Medium-duty - hydrogen FC (%) | 0.166 | 0.485 | 1.37 | 3.58 | 7.86 | 13.2 | 17 |
| Vehicle sales - Medium-duty - other (%) | 0.253 | 0.266 | 0.279 | 0.286 | 0.258 | 0.184 | 0.102 |

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

| Item | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|
| Final energy use - Commercial (PJ) | 316 | 311 | 304 | 297 | 288 | 275 | 260 |
| Final energy use - Industry (PJ) | 501 | 510 | 521 | 522 | 536 | 546 | 548 |
| Final energy use - Residential (PJ) | 562 | 525 | 498 | 472 | 439 | 392 | 339 |
| Final energy use - Transportation (PJ) | 809 | 757 | 687 | 629 | 583 | 530 | 468 |

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 | 29,338 | 32,023 | 0 | 0 | 0 | 0 |
| Sales of cooking units - Electric Resistance (%) | 41 | 45.8 | 49.8 | 60.5 | 75.4 | 84.5 | 87.7 |
| Sales of cooking units - Gas (%) | 59 | 54.2 | 50.2 | 39.5 | 24.6 | 15.5 | 12.3 |
| Sales of space heating units - Electric Heat Pump (%) | 0.384 | 4.93 | 7.53 | 16.1 | 36.4 | 61.5 | 76.2 |
| Sales of space heating units - Electric Resistance (%) | 1.64 | 3.4 | 3.62 | 4.32 | 6.01 | 8.19 | 9.45 |
| Sales of space heating units - Fossil (%) | 2.54 | 2.74 | 2.58 | 1.99 | 1.1 | 0.499 | 0.282 |
| Sales of space heating units - Gas Furnace (%) | 95.4 | 88.9 | 86.3 | 77.6 | 56.5 | 29.8 | 14.1 |
| Sales of water heating units - Electric Heat Pump (%) | 0.161 | 0.855 | 2.27 | 6.98 | 18.4 | 32.9 | 41.5 |
| Sales of water heating units - Electric Resistance (%) | 1.64 | 3.69 | 5.06 | 9.72 | 21 | 35.3 | 43.8 |
| Sales of water heating units - Gas Furnace (%) | 98.1 | 95.3 | 92.5 | 83.1 | 60.4 | 31.6 | 14.6 |
| Sales of water heating units - Other (%) | 0.093 | 0.184 | 0.185 | 0.186 | 0.185 | 0.186 | 0.186 |

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 | 4.21 | 4.23 | 5.79 | 5.99 | 8.36 | 8.82 |

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 | 2,362 |
| Conversion capital investment - Cumulative 5-yr (million $2018) | 0 | 0 | 0 | 0 | 0 | 0 | 25,514 |
| 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 | 18 |
| Number of facilities - Diesel (quantity) | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 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 | 8 |
| Number of facilities - Pyrolysis ccu (quantity) | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Number of facilities - Sng (quantity) | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Number of facilities - Sng ccu (quantity) | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

| Item | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|
| Annual - All (MMT) | 0 | 0 | 3.24 | 3.35 | 6.64 | 6.84 | 28.4 |
| Annual - BECCS (MMT) | 0 | 0 | 0 | 0 | 0 | 0 | 21.4 |
| Annual - Cement and lime (MMT) | 0 | 0 | 3.24 | 3.35 | 6.64 | 6.84 | 7.07 |
| Annual - NGCC (MMT) | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cumulative - All (MMT) | 0 | 0 | 3.24 | 6.59 | 13.2 | 20.1 | 48.5 |
| Cumulative - BECCS (MMT) | 0 | 0 | 0 | 0 | 0 | 0 | 21.4 |
| Cumulative - Cement and lime (MMT) | 0 | 0 | 3.24 | 6.59 | 13.2 | 20.1 | 27.1 |
| 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 | 638 | 638 | 751 | 751 | 1,610 |
| Cumulative investment - All (million $2018) | 0 | 0 | 1,576 | 1,580 | 1,691 | 2,036 | 2,844 |
| Cumulative investment - Spur (million $2018) | 0 | 0 | 200 | 204 | 315 | 320 | 1,128 |
| Cumulative investment - Trunk (million $2018) | 0 | 0 | 1,376 | 1,376 | 1,376 | 1,716 | 1,716 |
| Spur (km) | 0 | 0 | 201 | 201 | 314 | 314 | 1,173 |
| Trunk (km) | 0 | 0 | 437 | 437 | 437 | 437 | 437 |

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 | -809 |
| Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y) | 0 | 0 | -3,890 |
| 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 | -138 |
| Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y) | 0 | 0 | -4,837 |
| Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y) | 0 | 0 | -809 |
| Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y) | 0 | 0 | -2,042 |
| 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 | -69.1 |
| Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y) | 0 | 0 | -2,920 |
| Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares) | 0 | 0 | 462 |
| Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares) | 0 | 0 | 6,140 |
| Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares) | 0 | 0 | 9.95 |
| Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares) | 0 | 0 | 39 |
| Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares) | 0 | 0 | 251 |
| Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares) | 0 | 0 | 6,902 |
| Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares) | 0 | 0 | 462 |
| Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares) | 0 | 0 | 1,306 |
| Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares) | 0 | 0 | 9.95 |
| Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares) | 0 | 0 | 39 |
| Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares) | 0 | 0 | 126 |
| Land impacted for carbon sink - Moderate deployment - Total (1000 hectares) | 0 | 0 | 1,943 |

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 | 403 |
| Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y) | 0 | 0 | 35,061 |
| Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y) | 0 | 0 | 3,106 |
| Carbon sink potential - High - Extend rotation length (1000 tCO2e/y) | 0 | 0 | 11,028 |
| Carbon sink potential - High - Improve plantations (1000 tCO2e/y) | 0 | 0 | 1,209 |
| Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y) | 0 | 0 | 7,563 |
| Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y) | 0 | 0 | 1,511 |
| Carbon sink potential - High - Reforest cropland (1000 tCO2e/y) | 0 | 0 | 944 |
| Carbon sink potential - High - Reforest pasture (1000 tCO2e/y) | 0 | 0 | 4,759 |
| Carbon sink potential - High - Restore productivity (1000 tCO2e/y) | 0 | 0 | 4,537 |
| Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y) | 0 | 0 | 202 |
| Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y) | 0 | 0 | 10,983 |
| Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y) | 0 | 0 | 518 |
| Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y) | 0 | 0 | 4,236 |
| Carbon sink potential - Low - Improve plantations (1000 tCO2e/y) | 0 | 0 | 615 |
| Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y) | 0 | 0 | 2,521 |
| Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y) | 0 | 0 | 529 |
| Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y) | 0 | 0 | 472 |
| Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y) | 0 | 0 | 361 |
| Carbon sink potential - Low - Restore productivity (1000 tCO2e/y) | 0 | 0 | 1,529 |
| Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y) | 0 | 0 | 303 |
| Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y) | 0 | 0 | 23,011 |
| Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y) | 0 | 0 | 1,812 |
| Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y) | 0 | 0 | 7,632 |
| Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y) | 0 | 0 | 901 |
| Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y) | 0 | 0 | 5,042 |
| Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y) | 0 | 0 | 1,020 |
| Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y) | 0 | 0 | 708 |
| Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y) | 0 | 0 | 2,560 |
| Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y) | 0 | 0 | 3,033 |
| Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares) | 0 | 0 | 66 |

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 | 421 |
| Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares) | 0 | 0 | 5,624 |
| Land impacted for carbon sink potential - High - Improve plantations (1000 hectares) | 0 | 0 | 445 |
| 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 | 144 |
| Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares) | 0 | 0 | 62.4 |
| Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares) | 0 | 0 | 135 |
| Land impacted for carbon sink potential - High - Restore productivity (1000 hectares) | 0 | 0 | 1,504 |
| Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares) | 0 | 0 | 8,401 |
| Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares) | 0 | 0 | 33 |
| Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares) | 0 | 0 | 395 |
| Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares) | 0 | 0 | 2,155 |
| Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares) | 0 | 0 | 223 |
| 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 | 75.6 |
| Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares) | 0 | 0 | 31.2 |
| Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares) | 0 | 0 | 23.4 |
| Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares) | 0 | 0 | 910 |
| Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares) | 0 | 0 | 3,845 |
| Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares) | 0 | 0 | 49.5 |
| Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares) | 0 | 0 | 408 |
| Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares) | 0 | 0 | 3,889 |
| Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares) | 0 | 0 | 335 |
| 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 | 110 |
| Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares) | 0 | 0 | 46.8 |
| Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares) | 0 | 0 | 169 |
| Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares) | 0 | 0 | 1,833 |
| Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares) | 0 | 0 | 6,840 |

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 | 7.41 | 7.89 | 0 | 0 | 0 | 0 |
| Sales of cooking units - Electric Resistance (%) | 34.9 | 34.9 | 34.9 | 34.9 | 34.9 | 34.9 | 34.9 |
| Sales of cooking units - Gas (%) | 65.1 | 65.1 | 65.1 | 65.1 | 65.1 | 65.1 | 65.1 |
| Sales of space heating units - Electric Heat Pump (%) | 1.35 | 8.6 | 8.97 | 9.55 | 9.94 | 10.2 | 10.7 |
| Sales of space heating units - Electric Resistance (%) | 5.84 | 9.06 | 8.98 | 8.84 | 8.56 | 8.18 | 7.87 |
| Sales of space heating units - Fossil (%) | 7.19 | 12.3 | 12 | 11.8 | 11.8 | 11.8 | 11.8 |
| Sales of space heating units - Gas (%) | 85.6 | 70 | 70 | 69.8 | 69.7 | 69.7 | 69.7 |
| Sales of water heating units - Electric Heat Pump (%) | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sales of water heating units - Electric Resistance (%) | 13.3 | 25.1 | 24.9 | 24.9 | 24.9 | 24.8 | 24.8 |
| Sales of water heating units - Gas Furnace (%) | 86.7 | 74.8 | 75 | 75 | 75 | 75.1 | 75.1 |
| Sales of water heating units - Other (%) | 0.036 | 0.089 | 0.089 | 0.09 | 0.09 | 0.09 | 0.09 |

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 (%) | 1.63 | 2.03 | 2.2 | 2.04 | 1.84 | 1.72 | 1.63 |
| Vehicle sales - Light-duty - EV (%) | 3.32 | 5.28 | 6.04 | 7.4 | 9.04 | 10.5 | 11.7 |
| Vehicle sales - Light-duty - gasoline (%) | 90.6 | 87.1 | 85.1 | 83.4 | 81.3 | 79.4 | 77.8 |
| Vehicle sales - Light-duty - hybrid (%) | 4.2 | 5.06 | 6.2 | 6.77 | 7.36 | 7.97 | 8.47 |
| Vehicle sales - Light-duty - hydrogen FC (%) | 0.111 | 0.379 | 0.35 | 0.312 | 0.31 | 0.311 | 0.322 |
| Vehicle sales - Light-duty - other (%) | 0.105 | 0.109 | 0.106 | 0.106 | 0.106 | 0.105 | 0.108 |
| Vehicle sales - Medium-duty - diesel (%) | 65.2 | 63.5 | 61.6 | 59.6 | 58 | 56.5 | 55.2 |
| Vehicle sales - Medium-duty - EV (%) | 0.027 | 0.105 | 0.329 | 0.671 | 0.895 | 0.973 | 0.993 |
| Vehicle sales - Medium-duty - gasoline (%) | 34 | 35.5 | 37 | 38.5 | 39.7 | 40.8 | 41.7 |
| 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) | 316 | 316 | 313 | 306 | 298 | 298 | 306 |
| Final energy use - Industry (PJ) | 502 | 527 | 542 | 555 | 576 | 598 | 623 |
| Final energy use - Residential (PJ) | 562 | 526 | 505 | 490 | 480 | 473 | 466 |
| Final energy use - Transportation (PJ) | 808 | 759 | 697 | 659 | 657 | 674 | 697 |

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 | 29,025 | 30,109 | 0 | 0 | 0 | 0 |
| Sales of cooking units - Electric Resistance (%) | 41 | 44.2 | 44.3 | 44.3 | 44.3 | 44.4 | 44.5 |
| Sales of cooking units - Gas (%) | 59 | 55.8 | 55.7 | 55.7 | 55.7 | 55.6 | 55.5 |
| Sales of space heating units - Electric Heat Pump (%) | 0.384 | 11.5 | 43.9 | 70.8 | 75.3 | 75.8 | 75.8 |
| Sales of space heating units - Electric Resistance (%) | 1.64 | 4.29 | 8.99 | 17.2 | 22.8 | 23.7 | 23.8 |
| Sales of space heating units - Fossil (%) | 2.54 | 2.52 | 1.3 | 0.232 | 0.026 | 0.001 | 0 |
| Sales of space heating units - Gas Furnace (%) | 95.4 | 81.7 | 45.8 | 11.7 | 1.81 | 0.444 | 0.359 |
| Sales of water heating units - Electric Heat Pump (%) | 0.161 | 0.341 | 0.345 | 0.344 | 0.338 | 0.341 | 0.34 |

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 (%) | 1.64 | 3.18 | 3.15 | 3.16 | 3.15 | 3.14 | 3.14 |
| Sales of water heating units - Gas Furnace (%) | 98.1 | 96.3 | 96.3 | 96.3 | 96.3 | 96.3 | 96.3 |
| Sales of water heating units - Other (%) | 0.093 | 0.184 | 0.185 | 0.186 | 0.185 | 0.186 | 0.186 |

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 | 4.63 | 4.71 | 5.78 | 5.97 | 5.98 | 6.15 |

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

| Item | 2020 | 2025 | 2030 | 2050 |
|---|---|---|---|---|
| Business-as-usual carbon sink - Natural uptake (Mt CO2e/y) | -36.6 | 0 | -17.7 | -15.8 |
| Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y) | -2.06 | 0 | -3.7 | -3.85 |
| Business-as-usual carbon sink - Total (Mt CO2e/y) | -38.7 | 0 | -21.4 | -19.7 |
| Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y) | 0 | 0 | 0 | 403 |
| Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y) | 0 | 0 | 0 | 35,061 |
| Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y) | 0 | 0 | 0 | 3,106 |
| Carbon sink potential - High - Extend rotation length (1000 tCO2e/y) | 0 | 0 | 0 | 11,028 |
| Carbon sink potential - High - Improve plantations (1000 tCO2e/y) | 0 | 0 | 0 | 1,209 |
| Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y) | 0 | 0 | 0 | 7,563 |
| Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y) | 0 | 0 | 0 | 1,511 |
| Carbon sink potential - High - Reforest cropland (1000 tCO2e/y) | 0 | 0 | 0 | 944 |
| Carbon sink potential - High - Reforest pasture (1000 tCO2e/y) | 0 | 0 | 0 | 4,759 |
| Carbon sink potential - High - Restore productivity (1000 tCO2e/y) | 0 | 0 | 0 | 4,537 |
| Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y) | 0 | 0 | 0 | 202 |
| Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y) | 0 | 0 | 0 | 10,983 |
| Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y) | 0 | 0 | 0 | 518 |
| Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y) | 0 | 0 | 0 | 4,236 |
| Carbon sink potential - Low - Improve plantations (1000 tCO2e/y) | 0 | 0 | 0 | 615 |
| Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y) | 0 | 0 | 0 | 2,521 |
| Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y) | 0 | 0 | 0 | 529 |
| Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y) | 0 | 0 | 0 | 472 |
| Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y) | 0 | 0 | 0 | 361 |
| Carbon sink potential - Low - Restore productivity (1000 tCO2e/y) | 0 | 0 | 0 | 1,529 |
| Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y) | 0 | 0 | 0 | 303 |
| Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y) | 0 | 0 | 0 | 23,011 |

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 | 1,812 |
| Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y) | 0 | 0 | 0 | 7,632 |
| Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y) | 0 | 0 | 0 | 901 |
| Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y) | 0 | 0 | 0 | 5,042 |
| Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y) | 0 | 0 | 0 | 1,020 |
| Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y) | 0 | 0 | 0 | 708 |
| Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y) | 0 | 0 | 0 | 2,560 |
| Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y) | 0 | 0 | 0 | 3,033 |
| Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares) | 0 | 0 | 0 | 66 |
| Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares) | 0 | 0 | 0 | 421 |
| Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares) | 0 | 0 | 0 | 5,624 |
| Land impacted for carbon sink potential - High - Improve plantations (1000 hectares) | 0 | 0 | 0 | 445 |
| 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 | 144 |
| Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares) | 0 | 0 | 0 | 62.4 |
| Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares) | 0 | 0 | 0 | 135 |
| Land impacted for carbon sink potential - High - Restore productivity (1000 hectares) | 0 | 0 | 0 | 1,504 |
| Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares) | 0 | 0 | 0 | 8,401 |
| Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares) | 0 | 0 | 0 | 33 |
| Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares) | 0 | 0 | 0 | 395 |
| Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares) | 0 | 0 | 0 | 2,155 |
| Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares) | 0 | 0 | 0 | 223 |
| 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 | 75.6 |
| Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares) | 0 | 0 | 0 | 31.2 |
| Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares) | 0 | 0 | 0 | 23.4 |
| Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares) | 0 | 0 | 0 | 910 |
| Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares) | 0 | 0 | 0 | 3,845 |
| Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares) | 0 | 0 | 0 | 49.5 |
| Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares) | 0 | 0 | 0 | 408 |

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 | 3,889 |
| Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares) | 0 | 0 | 0 | 335 |
| 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 | 110 |
| Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares) | 0 | 0 | 0 | 46.8 |
| Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares) | 0 | 0 | 0 | 169 |
| Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares) | 0 | 0 | 0 | 1,833 |
| Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares) | 0 | 0 | 0 | 6,840 |

Table 64: *REF scenario - IMPACTS - Health*

| Item | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|
| Monetary damages from air pollution - Coal (million 2019$) | 0 | 3,371 | 2,056 | 1,592 | 1,391 | 1,315 | 1,252 |
| Monetary damages from air pollution - Natural Gas (million 2019$) | 0 | 241 | 267 | 356 | 336 | 306 | 272 |
| Monetary damages from air pollution - Transportation (million 2019$) | 0 | 2,712 | 2,758 | 2,801 | 2,856 | 2,909 | 2,963 |
| Premature deaths from air pollution - Coal (deaths) | 0 | 378 | 231 | 179 | 156 | 148 | 140 |
| Premature deaths from air pollution - Natural Gas (deaths) | 0 | 27.2 | 30.1 | 40.2 | 37.9 | 34.6 | 30.8 |
| Premature deaths from air pollution - Transportation (deaths) | 0 | 305 | 310 | 315 | 321 | 327 | 333 |