



# Net-Zero America - washington state report

2021-03-15

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

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## Notes

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

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

| Item   | 2020  | 2025   | 2030   | 2035  | 2040  | 2045  | 2050  |
|--|-------|--------|--------|-------|-------|-------|-------|
| Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018) |       | 22,776 | 24,705 |       |       |       |       |
| Sales of cooking units - Electric Resistance (%)                       | 27.5  | 41.7   | 78.2   | 85.4  | 85.8  | 85.8  | 85.8  |
| Sales of cooking units - Gas (%)                                       | 72.5  | 58.3   | 21.8   | 14.6  | 14.2  | 14.2  | 14.2  |
| Sales of space heating units - Electric Heat Pump (%)                  | 2.72  | 15.7   | 39.9   | 56.5  | 59    | 59.1  | 59.1  |
| Sales of space heating units - Electric Resistance (%)                 | 18.3  | 17.1   | 34.2   | 39.6  | 40.2  | 40.2  | 40.2  |
| Sales of space heating units - Fossil (%)                              | 0     | 0      | 0      | 0     | 0     | 0     | 0     |
| Sales of space heating units - Gas Furnace (%)                         | 79    | 67.2   | 25.9   | 3.88  | 0.83  | 0.698 | 0.698 |
| Sales of water heating units - Electric Heat Pump (%)                  | 1.12  | 9.5    | 48.6   | 62.9  | 64.3  | 64.4  | 64.4  |
| Sales of water heating units - Electric Resistance (%)                 | 3.42  | 6.18   | 24.2   | 33.6  | 34.9  | 34.9  | 34.9  |
| Sales of water heating units - Gas Furnace (%)                         | 94.6  | 83.7   | 26.6   | 2.84  | 0.138 | 0     | 0     |
| Sales of water heating units - Other (%)                               | 0.885 | 0.628  | 0.63   | 0.632 | 0.632 | 0.63  | 0.631 |

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

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--|------|------|------|------|------|------|------|
| Electricity distribution capital invested - Cumulative 5-yr (billion \$2018) |      | 3.77 | 3.88 | 6.5  | 6.9  | 5.9  | 6.14 |

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

| Item                                   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--|------|------|------|------|------|------|------|
| Final energy use - Commercial (PJ)     | 160  | 162  | 160  | 153  | 146  | 145  | 146  |
| Final energy use - Industry (PJ)       | 342  | 354  | 359  | 361  | 368  | 377  | 387  |
| Final energy use - Residential (PJ)    | 246  | 227  | 199  | 170  | 144  | 128  | 117  |
| Final energy use - Transportation (PJ) | 656  | 650  | 592  | 519  | 454  | 412  | 391  |

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

| Item  | 2020 | 2025 | 2030 | 2035  | 2040  | 2045  | 2050  |
|---|------|------|------|-------|-------|-------|-------|
| Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018) |      | 4.12 | 4.1  |       |       |       |       |
| Sales of cooking units - Electric Resistance (%)                                | 70.6 | 76.8 | 96   | 99.8  | 100   | 100   | 100   |
| Sales of cooking units - Gas (%)  | 29.4 | 23.2 | 3.96 | 0.2   | 0     | 0     | 0     |
| Sales of space heating units - Electric Heat Pump (%)                           | 14   | 25.2 | 47.6 | 59.1  | 60.7  | 60.7  | 60.6  |
| Sales of space heating units - Electric Resistance (%)                          | 35.6 | 41   | 35.5 | 30.7  | 30    | 30.2  | 30.3  |
| Sales of space heating units - Fossil (%)                                       | 8.89 | 13.2 | 9.93 | 8.85  | 8.62  | 8.41  | 8.39  |
| Sales of space heating units - Gas (%)  | 41.5 | 20.6 | 6.9  | 1.33  | 0.7   | 0.659 | 0.662 |
| Sales of water heating units - Electric Heat Pump (%)                           | 0    | 6.87 | 37.5 | 47.6  | 48.6  | 48.6  | 48.6  |
| Sales of water heating units - Electric Resistance (%)                          | 45.5 | 59.1 | 48.2 | 46.1  | 46.1  | 46.1  | 46.1  |
| Sales of water heating units - Gas Furnace (%)                                  | 47.5 | 28.5 | 9.06 | 0.967 | 0.047 | 0     | 0     |
| Sales of water heating units - Other (%)  | 6.95 | 5.52 | 5.27 | 5.27  | 5.28  | 5.27  | 5.28  |

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

| Item  | 2020  | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|---|-------|-------|-------|-------|-------|-------|-------|
| Light-duty vehicle capital costs - Cumulative 5-yr (million \$2018) |       | 1,331 | 3,547 | 5,529 | 8,462 | 9,115 | 8,742 |
| Public EV charging plugs - DC Fast (1000 units)                     | 0.551 |       | 2.62  |       | 9.97  |       | 15.8  |
| Public EV charging plugs - L2 (1000 units)                          | 2.37  |       | 63.1  |       | 240   |       | 381   |
| 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 (%)                             | 1.51  | 1.78  | 1.24  | 0.397 | 0.074 | 0.013 | 0     |
| Vehicle sales - Light-duty - EV (%)                                 | 4.05  | 15.6  | 47.1  | 82.1  | 96.4  | 99.3  | 100   |
| Vehicle sales - Light-duty - gasoline (%)                           | 89.7  | 77.5  | 48.1  | 16.3  | 3.26  | 0.589 | 0     |
| Vehicle sales - Light-duty - hybrid (%)                             | 4.56  | 4.64  | 3.26  | 1.21  | 0.294 | 0.065 | 0     |
| Vehicle sales - Light-duty - hydrogen FC (%)                        | 0.11  | 0.337 | 0.2   | 0.062 | 0.012 | 0.002 | 0     |
| Vehicle sales - Light-duty - other (%)                              | 0.1   | 0.096 | 0.062 | 0.022 | 0.004 | 0.001 | 0     |
| Vehicle sales - Medium-duty - diesel (%)                            | 64.7  | 59.7  | 42.3  | 14.4  | 2.59  | 0.384 | 0     |
| Vehicle sales - Medium-duty - EV (%)                                | 0.784 | 5.07  | 25.3  | 60.8  | 76.5  | 79.5  | 80    |
| Vehicle sales - Medium-duty - gasoline (%)                          | 33.7  | 33.3  | 25.5  | 9.32  | 1.77  | 0.277 | 0     |
| Vehicle sales - Medium-duty - hybrid (%)                            | 0.363 | 0.402 | 0.341 | 0.14  | 0.03  | 0.005 | 0     |
| Vehicle sales - Medium-duty - hydrogen FC (%)                       | 0.196 | 1.27  | 6.33  | 15.2  | 19.1  | 19.9  | 20    |
| Vehicle sales - Medium-duty - other (%)                             | 0.253 | 0.255 | 0.205 | 0.083 | 0.019 | 0.004 | 0     |

Table 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     | 0.003 | 0.249 | 0     | 0      | 0      | 0      |
| Capital invested - Biomass w/ccu allam power plant (billion \$2018)         | 0     | 0     | 0     | 0     | 0      | 0.008  | 0.044  |
| Capital invested - Biomass w/ccu power plant (billion \$2018)               | 0     | 0     | 0     | 0     | 0      | 0.02   | 0.172  |
| Capital invested - Solar PV - Base (billion \$2018)                         |       | 0     | 0     | 0     | 0      | 0      | 0      |
| Capital invested - Solar PV - Constrained (billion \$2018)                  |       | 0.2   | 0     | 0     | 0      | 0      | 0      |
| Capital invested - Wind - Base (billion \$2018)                             |       | 0     | 0.826 | 0.787 | 0.706  | 0.738  | 0.057  |
| Capital invested - Wind - Constrained (billion \$2018)                      |       | 0     | 2.11  | 3.35  | 11.6   | 9.51   | 1.16   |
| Installed renewables - OffshoreWind - Base land use assumptions (MW)        | 0     | 0     | 0     | 0     | 0      | 0      | 0      |
| Installed renewables - OffshoreWind - Constrained land use assumptions (MW) | 0     | 0     | 0     | 0     | 0      | 0      | 0      |
| Installed renewables - Rooftop PV (MW)                                      | 1,788 | 2,755 | 3,680 | 4,796 | 6,121  | 7,666  | 9,495  |
| Installed renewables - Solar - Base land use assumptions (MW)               | 721   | 721   | 721   | 721   | 721    | 721    | 721    |
| Installed renewables - Solar - Constrained land use assumptions (MW)        | 696   | 696   | 696   | 696   | 696    | 696    | 696    |
| Installed renewables - Wind - Base land use assumptions (MW)                | 3,388 | 3,388 | 3,866 | 4,354 | 4,813  | 5,320  | 5,361  |
| Installed renewables - Wind - Constrained land use assumptions (MW)         | 3,421 | 3,421 | 4,686 | 6,666 | 14,261 | 20,324 | 21,419 |

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

| Item  | 2020   | 2025   | 2030   | 2035   | 2040   | 2045   | 2050   |
|---|--------|--------|--------|--------|--------|--------|--------|
| Biomass power plant (GWh)                             | 0      | 6.64   | 495    | 495    | 495    | 495    | 495    |
| Biomass w/ccu allam power plant (GWh)                 | 0      | 0      | 0      | 0      | 0      | 7.51   | 51.1   |
| Biomass w/ccu power plant (GWh)                       | 0      | 0      | 0      | 0      | 0      | 22.3   | 216    |
| OffshoreWind - Base land use assumptions (GWh)        | 0      | 0      | 0      | 0      | 0      | 0      | 0      |
| OffshoreWind - Constrained land use assumptions (GWh) | 0      | 0      | 0      | 0      | 0      | 0      | 0      |
| Solar - Base land use assumptions (GWh)               | 1,419  | 1,419  | 1,419  | 1,419  | 1,419  | 1,419  | 1,419  |
| Solar - Constrained land use assumptions (GWh)        | 1,371  | 1,371  | 1,371  | 1,371  | 1,371  | 1,371  | 1,371  |
| Wind - Base land use assumptions (GWh)                | 11,561 | 11,561 | 13,217 | 14,787 | 16,215 | 17,781 | 17,905 |
| Wind - Constrained land use assumptions (GWh)         | 11,682 | 11,682 | 15,810 | 21,726 | 43,208 | 59,787 | 62,739 |

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

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|--|------|------|------|------|------|------|-------|
| Biomass purchases (million \$2018/year)                          |      | 49.2 | 148  | 149  | 149  | 200  | 644   |
| Conversion capital investment - Cumulative 5-yr (million \$2018) |      | 3.83 | 277  | 22.3 | 0    | 927  | 8,114 |
| Number of facilities - Allam power w ccu (quantity)              | 0    | 0    | 0    | 0    | 0    | 1    | 2     |
| Number of facilities - Beccs hydrogen (quantity)                 | 0    | 0    | 0    | 0    | 0    | 1    | 8     |
| Number of facilities - Diesel (quantity)                         | 0    | 0    | 0    | 1    | 1    | 1    | 1     |
| Number of facilities - Diesel ccu (quantity)                     | 0    | 0    | 0    | 0    | 0    | 1    | 2     |
| Number of facilities - Power (quantity)                          | 0    | 1    | 1    | 1    | 1    | 1    | 1     |
| Number of facilities - Power ccu (quantity)                      | 0    | 0    | 0    | 0    | 0    | 1    | 2     |
| Number of facilities - Pyrolysis (quantity)                      | 0    | 0    | 0    | 1    | 1    | 1    | 1     |
| Number of facilities - Pyrolysis ccu (quantity)                  | 0    | 0    | 0    | 0    | 0    | 1    | 3     |
| Number of facilities - Sng (quantity)                            | 0    | 1    | 1    | 1    | 1    | 1    | 1     |
| Number of facilities - Sng ccu (quantity)                        | 0    | 0    | 0    | 0    | 0    | 1    | 1     |

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

| Item                               | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|------------------------------------|------|------|------|------|------|------|------|
| Annual - All (MMT)                 |      | 0    | 0    | 3.35 | 3.32 | 4.6  | 15   |
| Annual - BECCS (MMT)               |      | 0    | 0    | 0    | 0    | 1.17 | 11.5 |
| Annual - Cement and lime (MMT)     |      | 0    | 0    | 3.35 | 3.32 | 3.42 | 3.53 |
| Annual - NGCC (MMT)                |      | 0    | 0    | 0    | 0    | 0    | 0    |
| Cumulative - All (MMT)             |      | 0    | 0    | 3.35 | 6.67 | 11.3 | 26.3 |
| Cumulative - BECCS (MMT)           |      | 0    | 0    | 0    | 0    | 1.17 | 12.7 |
| Cumulative - Cement and lime (MMT) |      | 0    | 0    | 3.35 | 6.67 | 10.1 | 13.6 |
| Cumulative - NGCC (MMT)            |      | 0    | 0    | 0    | 0    | 0    | 0    |

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

| Item   | 2020 | 2025 | 2030 | 2035  | 2040  | 2045  | 2050  |
|--|------|------|------|-------|-------|-------|-------|
| All (km)                                       |      | 0    | 0    | 776   | 776   | 1,019 | 2,201 |
| Cumulative investment - All (million \$2018)   |      | 0    | 0    | 1,802 | 1,801 | 1,948 | 2,738 |
| Cumulative investment - Spur (million \$2018)  |      | 0    | 0    | 99.8  | 99.3  | 246   | 1,036 |
| Cumulative investment - Trunk (million \$2018) |      | 0    | 0    | 1,702 | 1,702 | 1,702 | 1,702 |
| Spur (km)                                      |      | 0    | 0    | 101   | 101   | 344   | 1,526 |
| Trunk (km)                                     |      | 0    | 0    | 675   | 675   | 675   | 675   |

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

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

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

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050   |
|--|------|------|------|------|------|------|--------|
| Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)          |      |      |      |      |      |      | 0      |
| Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)                       |      |      |      |      |      |      | -1,981 |
| Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)            |      |      |      |      |      |      | -147   |
| Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)                                   |      |      |      |      |      |      | -2,129 |
| Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)            |      |      |      |      |      |      | 0      |
| Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)                         |      |      |      |      |      |      | -1,027 |
| Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)              |      |      |      |      |      |      | -73.6  |
| Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)                                     |      |      |      |      |      |      | -1,101 |
| Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares) |      |      |      |      |      |      | 0      |
| Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)              |      |      |      |      |      |      | 2,798  |
| Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)   |      |      |      |      |      |      | 235    |
| Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)                          |      |      |      |      |      |      | 3,033  |
| Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)   |      |      |      |      |      |      | 0      |
| Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)                |      |      |      |      |      |      | 1,458  |
| Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)     |      |      |      |      |      |      | 117    |
| Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)                            |      |      |      |      |      |      | 1,575  |

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

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050    |
|---|------|------|------|------|------|------|---------|
| Carbon sink potential - High - Accelerate regeneration (1000 tCO <sub>2</sub> e/y)        |      |      |      |      |      |      | -2,170  |
| Carbon sink potential - High - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)     |      |      |      |      |      |      | -71,521 |
| Carbon sink potential - High - Avoid deforestation (1000 tCO <sub>2</sub> e/y)            |      |      |      |      |      |      | -1,904  |
| Carbon sink potential - High - Extend rotation length (1000 tCO <sub>2</sub> e/y)         |      |      |      |      |      |      | -9,494  |
| Carbon sink potential - High - Improve plantations (1000 tCO <sub>2</sub> e/y)            |      |      |      |      |      |      | -4,080  |
| Carbon sink potential - High - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)      |      |      |      |      |      |      | -29,790 |
| Carbon sink potential - High - Increase trees outside forests (1000 tCO <sub>2</sub> e/y) |      |      |      |      |      |      | -1,078  |
| Carbon sink potential - High - Reforest cropland (1000 tCO <sub>2</sub> e/y)              |      |      |      |      |      |      | -14,981 |
| Carbon sink potential - High - Reforest pasture (1000 tCO <sub>2</sub> e/y)               |      |      |      |      |      |      | -2,477  |
| Carbon sink potential - High - Restore productivity (1000 tCO <sub>2</sub> e/y)           |      |      |      |      |      |      | -5,545  |
| Carbon sink potential - Low - Accelerate regeneration (1000 tCO <sub>2</sub> e/y)         |      |      |      |      |      |      | -1,087  |
| Carbon sink potential - Low - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)      |      |      |      |      |      |      | -26,982 |
| Carbon sink potential - Low - Avoid deforestation (1000 tCO <sub>2</sub> e/y)             |      |      |      |      |      |      | -317    |
| Carbon sink potential - Low - Extend rotation length (1000 tCO <sub>2</sub> e/y)          |      |      |      |      |      |      | -3,647  |
| Carbon sink potential - Low - Improve plantations (1000 tCO <sub>2</sub> e/y)             |      |      |      |      |      |      | -2,076  |
| Carbon sink potential - Low - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)       |      |      |      |      |      |      | -9,930  |
| Carbon sink potential - Low - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)  |      |      |      |      |      |      | -377    |
| Carbon sink potential - Low - Reforest cropland (1000 tCO <sub>2</sub> e/y)               |      |      |      |      |      |      | -7,491  |
| Carbon sink potential - Low - Reforest pasture (1000 tCO <sub>2</sub> e/y)                |      |      |      |      |      |      | -188    |
| Carbon sink potential - Low - Restore productivity (1000 tCO <sub>2</sub> e/y)            |      |      |      |      |      |      | -1,869  |
| Carbon sink potential - Mid - Accelerate regeneration (1000 tCO <sub>2</sub> e/y)         |      |      |      |      |      |      | -1,629  |
| Carbon sink potential - Mid - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)      |      |      |      |      |      |      | -49,216 |
| Carbon sink potential - Mid - Avoid deforestation (1000 tCO <sub>2</sub> e/y)             |      |      |      |      |      |      | -1,111  |
| Carbon sink potential - Mid - Extend rotation length (1000 tCO <sub>2</sub> e/y)          |      |      |      |      |      |      | -6,570  |
| Carbon sink potential - Mid - Improve plantations (1000 tCO <sub>2</sub> e/y)             |      |      |      |      |      |      | -3,042  |
| Carbon sink potential - Mid - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)       |      |      |      |      |      |      | -19,860 |
| Carbon sink potential - Mid - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)  |      |      |      |      |      |      | -728    |
| Carbon sink potential - Mid - Reforest cropland (1000 tCO <sub>2</sub> e/y)               |      |      |      |      |      |      | -11,236 |
| Carbon sink potential - Mid - Reforest pasture (1000 tCO <sub>2</sub> e/y)                |      |      |      |      |      |      | -1,332  |
| Carbon sink potential - Mid - Restore productivity (1000 tCO <sub>2</sub> e/y)            |      |      |      |      |      |      | -3,707  |



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

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|--|------|------|------|------|------|------|-------|
| Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)             |      |      |      |      |      |      | 355   |
| Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares) |      |      |      |      |      |      | 258   |
| Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)              |      |      |      |      |      |      | 4,841 |
| Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)                 |      |      |      |      |      |      | 1,503 |
| Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)           |      |      |      |      |      |      | 0     |
| Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)      |      |      |      |      |      |      | 102   |
| Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)                   |      |      |      |      |      |      | 990   |
| Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)                    |      |      |      |      |      |      | 70.4  |
| Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)                |      |      |      |      |      |      | 1,838 |
| Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)      |      |      |      |      |      |      | 9,959 |
| Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)              |      |      |      |      |      |      | 178   |
| Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)  |      |      |      |      |      |      | 242   |
| Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)               |      |      |      |      |      |      | 1,855 |
| Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)                  |      |      |      |      |      |      | 752   |
| Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)            |      |      |      |      |      |      | 0     |
| Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)       |      |      |      |      |      |      | 53.9  |
| Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)                    |      |      |      |      |      |      | 495   |
| Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)                     |      |      |      |      |      |      | 12.2  |
| Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)                 |      |      |      |      |      |      | 1,112 |
| Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)       |      |      |      |      |      |      | 4,699 |
| Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)              |      |      |      |      |      |      | 266   |

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

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|---|------|------|------|------|------|------|-------|
| Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares) |      |      |      |      |      |      | 250   |
| Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)              |      |      |      |      |      |      | 3,348 |
| Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)                 |      |      |      |      |      |      | 1,131 |
| Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)           |      |      |      |      |      |      | 0     |
| Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)      |      |      |      |      |      |      | 78.2  |
| Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)                   |      |      |      |      |      |      | 743   |
| Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)                    |      |      |      |      |      |      | 88.2  |
| Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)                |      |      |      |      |      |      | 2,240 |
| Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)      |      |      |      |      |      |      | 8,144 |

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

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|---|------|------|------|------|------|------|-------|
| Natural gas consumption - Annual (tcf)      |      | 238  | 201  | 161  | 121  | 76.3 | 52.9  |
| Natural gas consumption - Cumulative (tcf)  |      |      |      |      |      |      | 4,854 |
| Natural gas production - Annual (tcf)       |      | 0    | 0    | 0    | 0    | 0    | 0     |
| Oil consumption - Annual (million bbls)     |      | 135  | 119  | 96.2 | 74.7 | 57.8 | 41.8  |
| Oil consumption - Cumulative (million bbls) |      |      |      |      |      |      | 2,955 |
| Oil production - Annual (million bbls)      |      | 0    | 0    | 0    | 0    | 0    | 0     |

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

| Item  | 2020 | 2025  | 2030  | 2035  | 2040  | 2045  | 2050 |
|---|------|-------|-------|-------|-------|-------|------|
| Monetary damages from air pollution - Coal (million 2019\$)           |      | 63.6  | 0.07  | 0.07  | 0.053 | 0.033 | 0    |
| Monetary damages from air pollution - Natural Gas (million 2019\$)    |      | 59.3  | 35.2  | 31.1  | 30.1  | 25.2  | 20.2 |
| Monetary damages from air pollution - Transportation (million 2019\$) |      | 1,113 | 1,077 | 847   | 507   | 238   | 95   |
| Premature deaths from air pollution - Coal (deaths)                   |      | 7.18  | 0.008 | 0.008 | 0.006 | 0.004 | 0    |
| Premature deaths from air pollution - Natural Gas (deaths)            |      | 6.69  | 3.97  | 3.51  | 3.4   | 2.84  | 2.28 |
| Premature deaths from air pollution - Transportation (deaths)         |      | 125   | 121   | 95.3  | 57    | 26.7  | 10.7 |

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

| Item                                      | 2020 | 2025  | 2030  | 2035   | 2040   | 2045  | 2050   |
|---|------|-------|-------|--------|--------|-------|--------|
| By economic sector - Agriculture (jobs)   |      | 125   | 364   | 389    | 329    | 334   | 783    |
| By economic sector - Construction (jobs)  |      | 8,570 | 8,392 | 10,289 | 10,284 | 9,831 | 13,352 |
| By economic sector - Manufacturing (jobs) |      | 4,850 | 7,540 | 9,472  | 8,742  | 7,531 | 8,676  |
| By economic sector - Mining (jobs)        |      | 2,249 | 1,645 | 1,105  | 712    | 448   | 269    |

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

| Item  | 2020 | 2025   | 2030   | 2035   | 2040   | 2045   | 2050   |
|---|------|--------|--------|--------|--------|--------|--------|
| By economic sector - Other (jobs)   |      | 1,146  | 1,192  | 1,469  | 1,726  | 1,924  | 3,451  |
| By economic sector - Pipeline (jobs)  |      | 418    | 361    | 502    | 229    | 169    | 210    |
| By economic sector - Professional (jobs)                                    |      | 3,915  | 4,130  | 4,718  | 5,032  | 5,150  | 7,796  |
| By economic sector - Trade (jobs)   |      | 3,140  | 2,993  | 3,186  | 3,344  | 3,411  | 5,119  |
| By economic sector - Utilities (jobs)                                       |      | 4,450  | 5,095  | 7,657  | 7,723  | 6,900  | 7,084  |
| By education level - All sectors - Associates degree or some college (jobs) |      | 8,906  | 9,838  | 12,304 | 12,151 | 11,388 | 14,823 |
| By education level - All sectors - Bachelors degree (jobs)                  |      | 6,016  | 6,502  | 7,700  | 7,523  | 7,058  | 9,267  |
| By education level - All sectors - Doctoral degree (jobs)                   |      | 217    | 223    | 250    | 252    | 249    | 361    |
| By education level - All sectors - High school diploma or less (jobs)       |      | 12,287 | 13,619 | 16,728 | 16,401 | 15,290 | 19,982 |
| By education level - All sectors - Masters or professional degree (jobs)    |      | 1,437  | 1,531  | 1,805  | 1,794  | 1,711  | 2,305  |
| By resource sector - Biomass (jobs)   |      | 537    | 1,003  | 1,107  | 989    | 1,216  | 3,342  |
| By resource sector - CO2 (jobs)   |      | 0      | 0      | 1,741  | 53.5   | 90     | 814    |
| By resource sector - Coal (jobs)  |      | 98.8   | 0      | 0      | 0      | 0      | 0      |
| By resource sector - Grid (jobs)  |      | 5,671  | 7,561  | 11,493 | 14,009 | 12,552 | 11,879 |
| By resource sector - Natural Gas (jobs)                                     |      | 2,549  | 2,064  | 2,014  | 1,796  | 1,380  | 1,366  |
| By resource sector - Nuclear (jobs)   |      | 606    | 596    | 346    | 0.015  | 0.019  | 0.038  |
| By resource sector - Oil (jobs)   |      | 6,006  | 4,868  | 3,624  | 2,612  | 1,888  | 1,284  |
| By resource sector - Solar (jobs)   |      | 9,420  | 9,518  | 12,164 | 13,095 | 14,032 | 23,686 |
| By resource sector - Wind (jobs)  |      | 3,976  | 6,104  | 6,298  | 5,567  | 4,538  | 4,367  |
| Median wages - Annual - All (\$2019 per job)                                |      | 68,136 | 68,415 | 69,492 | 70,588 | 71,567 | 71,977 |
| On-Site or In-Plant Training - Total jobs - 1 to 4 years (jobs)             |      | 4,656  | 5,087  | 6,322  | 6,221  | 5,810  | 7,507  |
| On-Site or In-Plant Training - Total jobs - 4 to 10 years (jobs)            |      | 1,923  | 2,005  | 2,514  | 2,489  | 2,347  | 3,065  |
| On-Site or In-Plant Training - Total jobs - None (jobs)                     |      | 4,750  | 5,226  | 6,339  | 6,219  | 5,850  | 7,782  |
| On-Site or In-Plant Training - Total jobs - Over 10 years (jobs)            |      | 235    | 259    | 331    | 329    | 309    | 398    |
| On-Site or In-Plant Training - Total jobs - Up to 1 year (jobs)             |      | 17,299 | 19,136 | 23,281 | 22,863 | 21,380 | 27,987 |
| On-the-Job Training - All sectors - 1 to 4 years (jobs)                     |      | 5,969  | 6,503  | 8,110  | 7,982  | 7,458  | 9,623  |
| On-the-Job Training - All sectors - 4 to 10 years (jobs)                    |      | 1,871  | 1,950  | 2,470  | 2,458  | 2,326  | 3,050  |
| On-the-Job Training - All sectors - None (jobs)                             |      | 1,632  | 1,753  | 2,087  | 2,054  | 1,945  | 2,628  |
| On-the-Job Training - All sectors - Over 10 years (jobs)                    |      | 300    | 331    | 401    | 386    | 358    | 469    |
| On-the-Job Training - All sectors - Up to 1 year (jobs)                     |      | 19,093 | 21,176 | 25,719 | 25,241 | 23,610 | 30,969 |
| Related work experience - All sectors - 1 to 4 years (jobs)                 |      | 10,375 | 11,351 | 13,836 | 13,598 | 12,729 | 16,616 |
| Related work experience - All sectors - 4 to 10 years (jobs)                |      | 6,683  | 7,277  | 8,931  | 8,767  | 8,201  | 10,645 |
| Related work experience - All sectors - None (jobs)                         |      | 4,124  | 4,537  | 5,603  | 5,519  | 5,179  | 6,817  |
| Related work experience - All sectors - Over 10 years (jobs)                |      | 1,784  | 1,983  | 2,424  | 2,366  | 2,195  | 2,807  |
| Related work experience - All sectors - Up to 1 year (jobs)                 |      | 5,897  | 6,565  | 7,993  | 7,871  | 7,393  | 9,853  |
| Wage income - All (million \$2019)  |      | 1,967  | 2,170  | 2,696  | 2,691  | 2,555  | 3,365  |

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

| Item   | 2020  | 2025   | 2030   | 2035  | 2040  | 2045 | 2050  |
|--|-------|--------|--------|-------|-------|------|-------|
| Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018) |       | 22,723 | 24,348 |       |       |      |       |
| Sales of cooking units - Electric Resistance (%)                       | 27.5  | 31     | 36.1   | 49.7  | 68.6  | 80.2 | 84.3  |
| Sales of cooking units - Gas (%)                                       | 72.5  | 69     | 63.9   | 50.3  | 31.4  | 19.8 | 15.7  |
| Sales of space heating units - Electric Heat Pump (%)                  | 2.72  | 11.9   | 14.6   | 22.8  | 37.2  | 49.8 | 55.8  |
| Sales of space heating units - Electric Resistance (%)                 | 18.3  | 13.9   | 15.8   | 21.6  | 30.6  | 36.8 | 39.3  |
| Sales of space heating units - Fossil (%)                              | 0     | 0      | 0      | 0     | 0     | 0    | 0     |
| Sales of space heating units - Gas Furnace (%)                         | 79    | 74.3   | 69.5   | 55.6  | 32.2  | 13.3 | 4.9   |
| Sales of water heating units - Electric Heat Pump (%)                  | 1.12  | 2.39   | 6.84   | 19.8  | 40.6  | 55.7 | 61.7  |
| Sales of water heating units - Electric Resistance (%)                 | 3.42  | 3.14   | 5.18   | 11.2  | 21.3  | 29.5 | 33.1  |
| Sales of water heating units - Gas Furnace (%)                         | 94.6  | 93.8   | 87.3   | 68.4  | 37.5  | 14.2 | 4.65  |
| Sales of water heating units - Other (%)                               | 0.885 | 0.628  | 0.63   | 0.632 | 0.632 | 0.63 | 0.631 |

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

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--|------|------|------|------|------|------|------|
| Electricity distribution capital invested - Cumulative 5-yr (billion \$2018) |      | 2.95 | 2.96 | 4.08 | 4.22 | 5.76 | 6.07 |

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

| Item                                   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--|------|------|------|------|------|------|------|
| Final energy use - Commercial (PJ)     | 160  | 163  | 165  | 166  | 164  | 162  | 160  |
| Final energy use - Industry (PJ)       | 342  | 355  | 361  | 367  | 376  | 385  | 395  |
| Final energy use - Residential (PJ)    | 246  | 227  | 207  | 188  | 169  | 150  | 133  |
| Final energy use - Transportation (PJ) | 657  | 654  | 611  | 573  | 544  | 510  | 470  |

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

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|---|------|------|------|------|------|------|-------|
| Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018) |      | 4.1  | 4.04 |      |      |      |       |
| Sales of cooking units - Electric Resistance (%)                                | 70.4 | 71.2 | 73.9 | 81.1 | 91   | 97.1 | 99.2  |
| Sales of cooking units - Gas (%)  | 29.6 | 28.8 | 26.1 | 18.9 | 9.03 | 2.91 | 0.784 |
| Sales of space heating units - Electric Heat Pump (%)                           | 14   | 21.3 | 23.9 | 31.4 | 44.1 | 54.1 | 58.4  |
| Sales of space heating units - Electric Resistance (%)                          | 35.6 | 41.8 | 41.1 | 39.2 | 35.8 | 32.7 | 31    |
| Sales of space heating units - Fossil (%)                                       | 8.89 | 13.8 | 13.5 | 12.4 | 10.6 | 9.24 | 8.81  |
| Sales of space heating units - Gas (%)  | 41.5 | 23   | 21.5 | 17   | 9.58 | 4.03 | 1.76  |
| Sales of water heating units - Electric Heat Pump (%)                           | 0    | 1.23 | 4.71 | 14.8 | 30.9 | 42.3 | 46.7  |
| Sales of water heating units - Electric Resistance (%)                          | 45.5 | 61.3 | 60   | 56.4 | 51   | 47.6 | 46.5  |
| Sales of water heating units - Gas Furnace (%)                                  | 47.5 | 31.9 | 29.8 | 23.3 | 12.8 | 4.87 | 1.59  |
| Sales of water heating units - Other (%)  | 6.95 | 5.56 | 5.52 | 5.49 | 5.39 | 5.31 | 5.28  |

Table 21: E- scenario - PILLAR 1: Efficiency/Electrification - Transportation

| Item  | 2020  | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|---|-------|-------|-------|-------|-------|-------|-------|
| Light-duty vehicle capital costs - Cumulative 5-yr (million \$2018) |       | 0     | 239   | 450   | 1,569 | 4,778 | 7,016 |
| Public EV charging plugs - DC Fast (1000 units)                     | 0.551 |       | 1.02  |       | 3.86  |       | 10.1  |
| Public EV charging plugs - L2 (1000 units)                          | 2.37  |       | 24.5  |       | 92.8  |       | 244   |
| 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 (%)                             | 1.52  | 1.94  | 2.05  | 1.63  | 1.04  | 0.532 | 0.228 |
| Vehicle sales - Light-duty - EV (%)                                 | 1.94  | 4.79  | 12.1  | 26.2  | 48.8  | 72.3  | 87.7  |
| Vehicle sales - Light-duty - gasoline (%)                           | 91.6  | 87.3  | 79.3  | 66.2  | 45.8  | 24.6  | 10.9  |
| Vehicle sales - Light-duty - hybrid (%)                             | 4.73  | 5.52  | 6.19  | 5.61  | 4.19  | 2.46  | 1.19  |
| Vehicle sales - Light-duty - hydrogen FC (%)                        | 0.113 | 0.379 | 0.324 | 0.246 | 0.174 | 0.096 | 0.045 |
| Vehicle sales - Light-duty - other (%)                              | 0.101 | 0.105 | 0.095 | 0.083 | 0.059 | 0.033 | 0.015 |
| Vehicle sales - Medium-duty - diesel (%)                            | 64.8  | 62.2  | 57.7  | 49.4  | 35.6  | 19.6  | 8.37  |
| Vehicle sales - Medium-duty - EV (%)                                | 0.664 | 1.94  | 5.49  | 14.3  | 31.4  | 52.6  | 68    |
| Vehicle sales - Medium-duty - gasoline (%)                          | 33.8  | 34.7  | 34.7  | 31.9  | 24.4  | 14.2  | 6.33  |
| Vehicle sales - Medium-duty - hybrid (%)                            | 0.363 | 0.418 | 0.464 | 0.478 | 0.414 | 0.275 | 0.141 |
| Vehicle sales - Medium-duty - hydrogen FC (%)                       | 0.166 | 0.485 | 1.37  | 3.58  | 7.86  | 13.2  | 17    |
| Vehicle sales - Medium-duty - other (%)                             | 0.253 | 0.266 | 0.279 | 0.286 | 0.258 | 0.184 | 0.102 |

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

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050   |
|--|------|------|------|------|------|------|--------|
| Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)          |      |      |      |      |      |      | 0      |
| Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)                       |      |      |      |      |      |      | -1,981 |
| Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)            |      |      |      |      |      |      | -147   |
| Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)                                   |      |      |      |      |      |      | -2,129 |
| Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)            |      |      |      |      |      |      | 0      |
| Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)                         |      |      |      |      |      |      | -1,027 |
| Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)              |      |      |      |      |      |      | -73.6  |
| Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)                                     |      |      |      |      |      |      | -1,101 |
| Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares) |      |      |      |      |      |      | 0      |
| Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)              |      |      |      |      |      |      | 2,798  |
| Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)   |      |      |      |      |      |      | 235    |

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

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|--|------|------|------|------|------|------|-------|
| Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)                        |      |      |      |      |      |      | 3,033 |
| Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares) |      |      |      |      |      |      | 0     |
| Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)              |      |      |      |      |      |      | 1,458 |
| Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)   |      |      |      |      |      |      | 117   |
| Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)                          |      |      |      |      |      |      | 1,575 |

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

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050    |
|---|------|------|------|------|------|------|---------|
| Carbon sink potential - High - Accelerate regeneration (1000 tCO <sub>2</sub> e/y)        |      |      |      |      |      |      | -2,170  |
| Carbon sink potential - High - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)     |      |      |      |      |      |      | -71,521 |
| Carbon sink potential - High - Avoid deforestation (1000 tCO <sub>2</sub> e/y)            |      |      |      |      |      |      | -1,904  |
| Carbon sink potential - High - Extend rotation length (1000 tCO <sub>2</sub> e/y)         |      |      |      |      |      |      | -9,494  |
| Carbon sink potential - High - Improve plantations (1000 tCO <sub>2</sub> e/y)            |      |      |      |      |      |      | -4,080  |
| Carbon sink potential - High - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)      |      |      |      |      |      |      | -29,790 |
| Carbon sink potential - High - Increase trees outside forests (1000 tCO <sub>2</sub> e/y) |      |      |      |      |      |      | -1,078  |
| Carbon sink potential - High - Reforest cropland (1000 tCO <sub>2</sub> e/y)              |      |      |      |      |      |      | -14,981 |
| Carbon sink potential - High - Reforest pasture (1000 tCO <sub>2</sub> e/y)               |      |      |      |      |      |      | -2,477  |
| Carbon sink potential - High - Restore productivity (1000 tCO <sub>2</sub> e/y)           |      |      |      |      |      |      | -5,545  |
| Carbon sink potential - Low - Accelerate regeneration (1000 tCO <sub>2</sub> e/y)         |      |      |      |      |      |      | -1,087  |
| Carbon sink potential - Low - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)      |      |      |      |      |      |      | -26,982 |
| Carbon sink potential - Low - Avoid deforestation (1000 tCO <sub>2</sub> e/y)             |      |      |      |      |      |      | -317    |
| Carbon sink potential - Low - Extend rotation length (1000 tCO <sub>2</sub> e/y)          |      |      |      |      |      |      | -3,647  |
| Carbon sink potential - Low - Improve plantations (1000 tCO <sub>2</sub> e/y)             |      |      |      |      |      |      | -2,076  |
| Carbon sink potential - Low - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)       |      |      |      |      |      |      | -9,930  |
| Carbon sink potential - Low - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)  |      |      |      |      |      |      | -377    |
| Carbon sink potential - Low - Reforest cropland (1000 tCO <sub>2</sub> e/y)               |      |      |      |      |      |      | -7,491  |
| Carbon sink potential - Low - Reforest pasture (1000 tCO <sub>2</sub> e/y)                |      |      |      |      |      |      | -188    |
| Carbon sink potential - Low - Restore productivity (1000 tCO <sub>2</sub> e/y)            |      |      |      |      |      |      | -1,869  |
| Carbon sink potential - Mid - Accelerate regeneration (1000 tCO <sub>2</sub> e/y)         |      |      |      |      |      |      | -1,629  |

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

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050    |
|--|------|------|------|------|------|------|---------|
| Carbon sink potential - Mid - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)                 |      |      |      |      |      |      | -49,216 |
| Carbon sink potential - Mid - Avoid deforestation (1000 tCO <sub>2</sub> e/y)                        |      |      |      |      |      |      | -1,111  |
| Carbon sink potential - Mid - Extend rotation length (1000 tCO <sub>2</sub> e/y)                     |      |      |      |      |      |      | -6,570  |
| Carbon sink potential - Mid - Improve plantations (1000 tCO <sub>2</sub> e/y)                        |      |      |      |      |      |      | -3,042  |
| Carbon sink potential - Mid - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)                  |      |      |      |      |      |      | -19,860 |
| Carbon sink potential - Mid - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)             |      |      |      |      |      |      | -728    |
| Carbon sink potential - Mid - Reforest cropland (1000 tCO <sub>2</sub> e/y)                          |      |      |      |      |      |      | -11,236 |
| Carbon sink potential - Mid - Reforest pasture (1000 tCO <sub>2</sub> e/y)                           |      |      |      |      |      |      | -1,332  |
| Carbon sink potential - Mid - Restore productivity (1000 tCO <sub>2</sub> e/y)                       |      |      |      |      |      |      | -3,707  |
| Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)             |      |      |      |      |      |      | 355     |
| Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares) |      |      |      |      |      |      | 258     |
| Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)              |      |      |      |      |      |      | 4,841   |
| Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)                 |      |      |      |      |      |      | 1,503   |
| Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)           |      |      |      |      |      |      | 0       |
| Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)      |      |      |      |      |      |      | 102     |
| Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)                   |      |      |      |      |      |      | 990     |
| Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)                    |      |      |      |      |      |      | 70.4    |
| Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)                |      |      |      |      |      |      | 1,838   |
| Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)      |      |      |      |      |      |      | 9,959   |
| Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)              |      |      |      |      |      |      | 178     |
| Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)  |      |      |      |      |      |      | 242     |
| Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)               |      |      |      |      |      |      | 1,855   |
| Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)                  |      |      |      |      |      |      | 752     |
| Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)            |      |      |      |      |      |      | 0       |

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

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|---|------|------|------|------|------|------|-------|
| Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)      |      |      |      |      |      |      | 53.9  |
| Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)                   |      |      |      |      |      |      | 495   |
| Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)                    |      |      |      |      |      |      | 12.2  |
| Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)                |      |      |      |      |      |      | 1,112 |
| Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)      |      |      |      |      |      |      | 4,699 |
| Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)             |      |      |      |      |      |      | 266   |
| Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares) |      |      |      |      |      |      | 250   |
| Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)              |      |      |      |      |      |      | 3,348 |
| Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)                 |      |      |      |      |      |      | 1,131 |
| Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)           |      |      |      |      |      |      | 0     |
| Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)      |      |      |      |      |      |      | 78.2  |
| Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)                   |      |      |      |      |      |      | 743   |
| Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)                    |      |      |      |      |      |      | 88.2  |
| Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)                |      |      |      |      |      |      | 2,240 |
| Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)      |      |      |      |      |      |      | 8,144 |

Table 24: E- scenario - IMPACTS - Health

| Item  | 2020 | 2025  | 2030  | 2035  | 2040  | 2045  | 2050 |
|---|------|-------|-------|-------|-------|-------|------|
| Monetary damages from air pollution - Coal (million 2019\$)           |      | 63.6  | 0.07  | 0.07  | 0.053 | 0.033 | 0    |
| Monetary damages from air pollution - Natural Gas (million 2019\$)    |      | 62.4  | 33.3  | 23    | 17.6  | 14.2  | 14.7 |
| Monetary damages from air pollution - Transportation (million 2019\$) |      | 1,133 | 1,189 | 1,198 | 1,115 | 917   | 648  |
| Premature deaths from air pollution - Coal (deaths)                   |      | 7.18  | 0.008 | 0.008 | 0.006 | 0.004 | 0    |
| Premature deaths from air pollution - Natural Gas (deaths)            |      | 7.04  | 3.76  | 2.59  | 1.98  | 1.6   | 1.65 |
| Premature deaths from air pollution - Transportation (deaths)         |      | 127   | 134   | 135   | 125   | 103   | 72.9 |



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

| Item   | 2020  | 2025   | 2030   | 2035  | 2040  | 2045  | 2050  |
|--|-------|--------|--------|-------|-------|-------|-------|
| Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018) |       | 22,776 | 24,705 |       |       |       |       |
| Sales of cooking units - Electric Resistance (%)                       | 27.5  | 41.7   | 78.2   | 85.4  | 85.8  | 85.8  | 85.8  |
| Sales of cooking units - Gas (%)                                       | 72.5  | 58.3   | 21.8   | 14.6  | 14.2  | 14.2  | 14.2  |
| Sales of space heating units - Electric Heat Pump (%)                  | 2.72  | 15.7   | 39.9   | 56.5  | 59    | 59.1  | 59.1  |
| Sales of space heating units - Electric Resistance (%)                 | 18.3  | 17.1   | 34.2   | 39.6  | 40.2  | 40.2  | 40.2  |
| Sales of space heating units - Fossil (%)                              | 0     | 0      | 0      | 0     | 0     | 0     | 0     |
| Sales of space heating units - Gas Furnace (%)                         | 79    | 67.2   | 25.9   | 3.88  | 0.83  | 0.698 | 0.698 |
| Sales of water heating units - Electric Heat Pump (%)                  | 1.12  | 9.5    | 48.6   | 62.9  | 64.3  | 64.4  | 64.4  |
| Sales of water heating units - Electric Resistance (%)                 | 3.42  | 6.18   | 24.2   | 33.6  | 34.9  | 34.9  | 34.9  |
| Sales of water heating units - Gas Furnace (%)                         | 94.6  | 83.7   | 26.6   | 2.84  | 0.138 | 0     | 0     |
| Sales of water heating units - Other (%)                               | 0.885 | 0.628  | 0.63   | 0.632 | 0.632 | 0.63  | 0.631 |

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

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--|------|------|------|------|------|------|------|
| Electricity distribution capital invested - Cumulative 5-yr (billion \$2018) |      | 3.77 | 3.88 | 6.5  | 6.9  | 5.9  | 6.14 |

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

| Item                                   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--|------|------|------|------|------|------|------|
| Final energy use - Commercial (PJ)     | 160  | 162  | 160  | 153  | 146  | 145  | 146  |
| Final energy use - Industry (PJ)       | 342  | 354  | 359  | 361  | 368  | 377  | 387  |
| Final energy use - Residential (PJ)    | 246  | 227  | 199  | 170  | 144  | 128  | 117  |
| Final energy use - Transportation (PJ) | 656  | 650  | 592  | 519  | 454  | 412  | 391  |

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

| Item  | 2020 | 2025 | 2030 | 2035  | 2040  | 2045  | 2050  |
|---|------|------|------|-------|-------|-------|-------|
| Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018) |      | 4.12 | 4.1  |       |       |       |       |
| Sales of cooking units - Electric Resistance (%)                                | 70.6 | 76.8 | 96   | 99.8  | 100   | 100   | 100   |
| Sales of cooking units - Gas (%)  | 29.4 | 23.2 | 3.96 | 0.2   | 0     | 0     | 0     |
| Sales of space heating units - Electric Heat Pump (%)                           | 14   | 25.2 | 47.6 | 59.1  | 60.7  | 60.7  | 60.6  |
| Sales of space heating units - Electric Resistance (%)                          | 35.6 | 41   | 35.5 | 30.7  | 30    | 30.2  | 30.3  |
| Sales of space heating units - Fossil (%)                                       | 8.89 | 13.2 | 9.93 | 8.85  | 8.62  | 8.41  | 8.39  |
| Sales of space heating units - Gas (%)  | 41.5 | 20.6 | 6.9  | 1.33  | 0.7   | 0.659 | 0.662 |
| Sales of water heating units - Electric Heat Pump (%)                           | 0    | 6.87 | 37.5 | 47.6  | 48.6  | 48.6  | 48.6  |
| Sales of water heating units - Electric Resistance (%)                          | 45.5 | 59.1 | 48.2 | 46.1  | 46.1  | 46.1  | 46.1  |
| Sales of water heating units - Gas Furnace (%)                                  | 47.5 | 28.5 | 9.06 | 0.967 | 0.047 | 0     | 0     |
| Sales of water heating units - Other (%)  | 6.95 | 5.52 | 5.27 | 5.27  | 5.28  | 5.27  | 5.28  |

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

| Item  | 2020  | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|---|-------|-------|-------|-------|-------|-------|-------|
| Light-duty vehicle capital costs - Cumulative 5-yr (million \$2018) |       | 1,331 | 3,547 | 5,529 | 8,462 | 9,115 | 8,742 |
| Public EV charging plugs - DC Fast (1000 units)                     | 0.551 |       | 2.62  |       | 9.97  |       | 15.8  |
| Public EV charging plugs - L2 (1000 units)                          | 2.37  |       | 63.1  |       | 240   |       | 381   |
| 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 (%)                             | 1.51  | 1.78  | 1.24  | 0.397 | 0.074 | 0.013 | 0     |
| Vehicle sales - Light-duty - EV (%)                                 | 4.05  | 15.6  | 47.1  | 82.1  | 96.4  | 99.3  | 100   |
| Vehicle sales - Light-duty - gasoline (%)                           | 89.7  | 77.5  | 48.1  | 16.3  | 3.26  | 0.589 | 0     |
| Vehicle sales - Light-duty - hybrid (%)                             | 4.56  | 4.64  | 3.26  | 1.21  | 0.294 | 0.065 | 0     |
| Vehicle sales - Light-duty - hydrogen FC (%)                        | 0.11  | 0.337 | 0.2   | 0.062 | 0.012 | 0.002 | 0     |
| Vehicle sales - Light-duty - other (%)                              | 0.1   | 0.096 | 0.062 | 0.022 | 0.004 | 0.001 | 0     |
| Vehicle sales - Medium-duty - diesel (%)                            | 64.7  | 59.7  | 42.3  | 14.4  | 2.59  | 0.384 | 0     |
| Vehicle sales - Medium-duty - EV (%)                                | 0.784 | 5.07  | 25.3  | 60.8  | 76.5  | 79.5  | 80    |
| Vehicle sales - Medium-duty - gasoline (%)                          | 33.7  | 33.3  | 25.5  | 9.32  | 1.77  | 0.277 | 0     |
| Vehicle sales - Medium-duty - hybrid (%)                            | 0.363 | 0.402 | 0.341 | 0.14  | 0.03  | 0.005 | 0     |
| Vehicle sales - Medium-duty - hydrogen FC (%)                       | 0.196 | 1.27  | 6.33  | 15.2  | 19.1  | 19.9  | 20    |
| Vehicle sales - Medium-duty - other (%)                             | 0.253 | 0.255 | 0.205 | 0.083 | 0.019 | 0.004 | 0     |

Table 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     | 0      | 0      | 0       | 6.65    |
| Capital invested - Wind - Base (billion \$2018)                             |       | 0     | 0.898 | 1.32   | 2.71   | 4.51    | 10.6    |
| Installed renewables - OffshoreWind - Base land use assumptions (MW)        | 0     | 0     | 0     | 0      | 0      | 0       | 0       |
| Installed renewables - OffshoreWind - Constrained land use assumptions (MW) | 0     | 0     | 0     | 0      | 0      | 0       | 0       |
| Installed renewables - Solar - Base land use assumptions (MW)               | 721   | 721   | 721   | 721    | 721    | 721     | 9,125   |
| Installed renewables - Solar - Constrained land use assumptions (MW)        | 1,442 | 1,442 | 1,442 | 1,442  | 1,442  | 1,442   | 28,690  |
| Installed renewables - Wind - Base land use assumptions (MW)                | 3,388 | 3,388 | 3,907 | 4,728  | 6,492  | 9,583   | 17,262  |
| Installed renewables - Wind - Constrained land use assumptions (MW)         | 6,917 | 6,917 | 9,456 | 25,814 | 58,410 | 116,720 | 193,532 |

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

| Item  | 2020   | 2025   | 2030   | 2035   | 2040    | 2045    | 2050    |
|---|--------|--------|--------|--------|---------|---------|---------|
| OffshoreWind - Base land use assumptions (GWh)        | 0      | 0      | 0      | 0      | 0       | 0       | 0       |
| OffshoreWind - Constrained land use assumptions (GWh) | 0      | 0      | 0      | 0      | 0       | 0       | 0       |
| Solar - Base land use assumptions (GWh)               | 1,419  | 1,419  | 1,419  | 1,419  | 1,419   | 1,419   | 15,515  |
| Solar - Constrained land use assumptions (GWh)        | 2,837  | 2,837  | 2,837  | 2,837  | 2,837   | 2,837   | 48,345  |
| Wind - Base land use assumptions (GWh)                | 11,561 | 11,561 | 13,355 | 15,953 | 21,315  | 30,373  | 52,064  |
| Wind - Constrained land use assumptions (GWh)         | 23,634 | 23,634 | 31,885 | 78,964 | 166,657 | 311,488 | 472,062 |

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

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050   |
|--|------|------|------|------|------|------|--------|
| Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO <sub>2</sub> e/y) |      |      |      |      |      |      | 0      |
| Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO <sub>2</sub> e/y)              |      |      |      |      |      |      | -1,981 |
| Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO <sub>2</sub> e/y)   |      |      |      |      |      |      | -147   |
| Carbon sink potential - Aggressive deployment - Total (1000 tCO <sub>2</sub> e/y)                          |      |      |      |      |      |      | -2,129 |
| Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO <sub>2</sub> e/y)   |      |      |      |      |      |      | 0      |
| Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO <sub>2</sub> e/y)                |      |      |      |      |      |      | -1,027 |
| Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO <sub>2</sub> e/y)     |      |      |      |      |      |      | -73.6  |
| Carbon sink potential - Moderate deployment - Total (1000 tCO <sub>2</sub> e/y)                            |      |      |      |      |      |      | -1,101 |
| Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)     |      |      |      |      |      |      | 0      |
| Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)                  |      |      |      |      |      |      | 2,798  |
| Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)       |      |      |      |      |      |      | 235    |
| Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)                              |      |      |      |      |      |      | 3,033  |
| Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)       |      |      |      |      |      |      | 0      |
| Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)                    |      |      |      |      |      |      | 1,458  |
| Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)         |      |      |      |      |      |      | 117    |
| Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)                                |      |      |      |      |      |      | 1,575  |

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

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050    |
|---|------|------|------|------|------|------|---------|
| Carbon sink potential - High - Accelerate regeneration (1000 tCO <sub>2</sub> e/y)    |      |      |      |      |      |      | -2,170  |
| Carbon sink potential - High - All (not counting overlap) (1000 tCO <sub>2</sub> e/y) |      |      |      |      |      |      | -71,521 |
| Carbon sink potential - High - Avoid deforestation (1000 tCO <sub>2</sub> e/y)        |      |      |      |      |      |      | -1,904  |
| Carbon sink potential - High - Extend rotation length (1000 tCO <sub>2</sub> e/y)     |      |      |      |      |      |      | -9,494  |
| Carbon sink potential - High - Improve plantations (1000 tCO <sub>2</sub> e/y)        |      |      |      |      |      |      | -4,080  |
| Carbon sink potential - High - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)  |      |      |      |      |      |      | -29,790 |

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

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050    |
|--|------|------|------|------|------|------|---------|
| Carbon sink potential - High - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)            |      |      |      |      |      |      | -1,078  |
| Carbon sink potential - High - Reforest cropland (1000 tCO <sub>2</sub> e/y)                         |      |      |      |      |      |      | -14,981 |
| Carbon sink potential - High - Reforest pasture (1000 tCO <sub>2</sub> e/y)                          |      |      |      |      |      |      | -2,477  |
| Carbon sink potential - High - Restore productivity (1000 tCO <sub>2</sub> e/y)                      |      |      |      |      |      |      | -5,545  |
| Carbon sink potential - Low - Accelerate regeneration (1000 tCO <sub>2</sub> e/y)                    |      |      |      |      |      |      | -1,087  |
| Carbon sink potential - Low - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)                 |      |      |      |      |      |      | -26,982 |
| Carbon sink potential - Low - Avoid deforestation (1000 tCO <sub>2</sub> e/y)                        |      |      |      |      |      |      | -317    |
| Carbon sink potential - Low - Extend rotation length (1000 tCO <sub>2</sub> e/y)                     |      |      |      |      |      |      | -3,647  |
| Carbon sink potential - Low - Improve plantations (1000 tCO <sub>2</sub> e/y)                        |      |      |      |      |      |      | -2,076  |
| Carbon sink potential - Low - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)                  |      |      |      |      |      |      | -9,930  |
| Carbon sink potential - Low - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)             |      |      |      |      |      |      | -377    |
| Carbon sink potential - Low - Reforest cropland (1000 tCO <sub>2</sub> e/y)                          |      |      |      |      |      |      | -7,491  |
| Carbon sink potential - Low - Reforest pasture (1000 tCO <sub>2</sub> e/y)                           |      |      |      |      |      |      | -188    |
| Carbon sink potential - Low - Restore productivity (1000 tCO <sub>2</sub> e/y)                       |      |      |      |      |      |      | -1,869  |
| Carbon sink potential - Mid - Accelerate regeneration (1000 tCO <sub>2</sub> e/y)                    |      |      |      |      |      |      | -1,629  |
| Carbon sink potential - Mid - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)                 |      |      |      |      |      |      | -49,216 |
| Carbon sink potential - Mid - Avoid deforestation (1000 tCO <sub>2</sub> e/y)                        |      |      |      |      |      |      | -1,111  |
| Carbon sink potential - Mid - Extend rotation length (1000 tCO <sub>2</sub> e/y)                     |      |      |      |      |      |      | -6,570  |
| Carbon sink potential - Mid - Improve plantations (1000 tCO <sub>2</sub> e/y)                        |      |      |      |      |      |      | -3,042  |
| Carbon sink potential - Mid - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)                  |      |      |      |      |      |      | -19,860 |
| Carbon sink potential - Mid - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)             |      |      |      |      |      |      | -728    |
| Carbon sink potential - Mid - Reforest cropland (1000 tCO <sub>2</sub> e/y)                          |      |      |      |      |      |      | -11,236 |
| Carbon sink potential - Mid - Reforest pasture (1000 tCO <sub>2</sub> e/y)                           |      |      |      |      |      |      | -1,332  |
| Carbon sink potential - Mid - Restore productivity (1000 tCO <sub>2</sub> e/y)                       |      |      |      |      |      |      | -3,707  |
| Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)             |      |      |      |      |      |      | 355     |
| Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares) |      |      |      |      |      |      | 258     |
| Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)              |      |      |      |      |      |      | 4,841   |
| Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)                 |      |      |      |      |      |      | 1,503   |

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

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|---|------|------|------|------|------|------|-------|
| Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)          |      |      |      |      |      |      | 0     |
| Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)     |      |      |      |      |      |      | 102   |
| Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)                  |      |      |      |      |      |      | 990   |
| Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)                   |      |      |      |      |      |      | 70.4  |
| Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)               |      |      |      |      |      |      | 1,838 |
| Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)     |      |      |      |      |      |      | 9,959 |
| Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)             |      |      |      |      |      |      | 178   |
| Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares) |      |      |      |      |      |      | 242   |
| Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)              |      |      |      |      |      |      | 1,855 |
| Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)                 |      |      |      |      |      |      | 752   |
| Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)           |      |      |      |      |      |      | 0     |
| Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)      |      |      |      |      |      |      | 53.9  |
| Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)                   |      |      |      |      |      |      | 495   |
| Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)                    |      |      |      |      |      |      | 12.2  |
| Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)                |      |      |      |      |      |      | 1,112 |
| Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)      |      |      |      |      |      |      | 4,699 |
| Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)             |      |      |      |      |      |      | 266   |
| Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares) |      |      |      |      |      |      | 250   |
| Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)              |      |      |      |      |      |      | 3,348 |
| Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)                 |      |      |      |      |      |      | 1,131 |
| Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)           |      |      |      |      |      |      | 0     |
| Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)      |      |      |      |      |      |      | 78.2  |

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

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|--|------|------|------|------|------|------|-------|
| Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)              |      |      |      |      |      |      | 743   |
| Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)               |      |      |      |      |      |      | 88.2  |
| Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)           |      |      |      |      |      |      | 2,240 |
| Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares) |      |      |      |      |      |      | 8,144 |

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

| Item  | 2020 | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|---|------|-------|-------|-------|-------|-------|-------|
| Monetary damages from air pollution - Coal (million 2019\$)           |      | 63.6  | 0.07  | 0.07  | 0.053 | 0.033 | 0     |
| Monetary damages from air pollution - Natural Gas (million 2019\$)    |      | 55.2  | 26.2  | 16.9  | 15.4  | 13    | 4.18  |
| Monetary damages from air pollution - Transportation (million 2019\$) |      | 1,113 | 1,077 | 847   | 507   | 238   | 95    |
| Premature deaths from air pollution - Coal (deaths)                   |      | 7.18  | 0.008 | 0.008 | 0.006 | 0.004 | 0     |
| Premature deaths from air pollution - Natural Gas (deaths)            |      | 6.23  | 2.96  | 1.9   | 1.73  | 1.47  | 0.472 |
| Premature deaths from air pollution - Transportation (deaths)         |      | 125   | 121   | 95.3  | 57    | 26.7  | 10.7  |

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

| Item   | 2020  | 2025   | 2030   | 2035  | 2040  | 2045  | 2050  |
|--|-------|--------|--------|-------|-------|-------|-------|
| Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018) |       | 22,776 | 24,705 |       |       |       |       |
| Sales of cooking units - Electric Resistance (%)                       | 27.5  | 41.7   | 78.2   | 85.4  | 85.8  | 85.8  | 85.8  |
| Sales of cooking units - Gas (%)                                       | 72.5  | 58.3   | 21.8   | 14.6  | 14.2  | 14.2  | 14.2  |
| Sales of space heating units - Electric Heat Pump (%)                  | 2.72  | 15.7   | 39.9   | 56.5  | 59    | 59.1  | 59.1  |
| Sales of space heating units - Electric Resistance (%)                 | 18.3  | 17.1   | 34.2   | 39.6  | 40.2  | 40.2  | 40.2  |
| Sales of space heating units - Fossil (%)                              | 0     | 0      | 0      | 0     | 0     | 0     | 0     |
| Sales of space heating units - Gas Furnace (%)                         | 79    | 67.2   | 25.9   | 3.88  | 0.83  | 0.698 | 0.698 |
| Sales of water heating units - Electric Heat Pump (%)                  | 1.12  | 9.5    | 48.6   | 62.9  | 64.3  | 64.4  | 64.4  |
| Sales of water heating units - Electric Resistance (%)                 | 3.42  | 6.18   | 24.2   | 33.6  | 34.9  | 34.9  | 34.9  |
| Sales of water heating units - Gas Furnace (%)                         | 94.6  | 83.7   | 26.6   | 2.84  | 0.138 | 0     | 0     |
| Sales of water heating units - Other (%)                               | 0.885 | 0.628  | 0.63   | 0.632 | 0.632 | 0.63  | 0.631 |

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

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--|------|------|------|------|------|------|------|
| Electricity distribution capital invested - Cumulative 5-yr (billion \$2018) |      | 3.77 | 3.88 | 6.5  | 6.9  | 5.9  | 6.14 |

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

| Item                               | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|------------------------------------|------|------|------|------|------|------|------|
| Final energy use - Commercial (PJ) | 160  | 162  | 160  | 153  | 146  | 145  | 146  |

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

| Item                                   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--|------|------|------|------|------|------|------|
| Final energy use - Industry (PJ)       | 342  | 354  | 359  | 361  | 368  | 377  | 387  |
| Final energy use - Residential (PJ)    | 246  | 227  | 199  | 170  | 144  | 128  | 117  |
| Final energy use - Transportation (PJ) | 656  | 650  | 592  | 519  | 454  | 412  | 391  |

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

| Item  | 2020 | 2025 | 2030 | 2035  | 2040  | 2045  | 2050  |
|---|------|------|------|-------|-------|-------|-------|
| Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018) |      | 4.12 | 4.1  |       |       |       |       |
| Sales of cooking units - Electric Resistance (%)                                | 70.6 | 76.8 | 96   | 99.8  | 100   | 100   | 100   |
| Sales of cooking units - Gas (%)  | 29.4 | 23.2 | 3.96 | 0.2   | 0     | 0     | 0     |
| Sales of space heating units - Electric Heat Pump (%)                           | 14   | 25.2 | 47.6 | 59.1  | 60.7  | 60.7  | 60.6  |
| Sales of space heating units - Electric Resistance (%)                          | 35.6 | 41   | 35.5 | 30.7  | 30    | 30.2  | 30.3  |
| Sales of space heating units - Fossil (%)                                       | 8.89 | 13.2 | 9.93 | 8.85  | 8.62  | 8.41  | 8.39  |
| Sales of space heating units - Gas (%)  | 41.5 | 20.6 | 6.9  | 1.33  | 0.7   | 0.659 | 0.662 |
| Sales of water heating units - Electric Heat Pump (%)                           | 0    | 6.87 | 37.5 | 47.6  | 48.6  | 48.6  | 48.6  |
| Sales of water heating units - Electric Resistance (%)                          | 45.5 | 59.1 | 48.2 | 46.1  | 46.1  | 46.1  | 46.1  |
| Sales of water heating units - Gas Furnace (%)                                  | 47.5 | 28.5 | 9.06 | 0.967 | 0.047 | 0     | 0     |
| Sales of water heating units - Other (%)  | 6.95 | 5.52 | 5.27 | 5.27  | 5.28  | 5.27  | 5.28  |

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

| Item  | 2020  | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|---|-------|-------|-------|-------|-------|-------|-------|
| Light-duty vehicle capital costs - Cumulative 5-yr (million \$2018) |       | 1,331 | 3,547 | 5,529 | 8,462 | 9,115 | 8,742 |
| Public EV charging plugs - DC Fast (1000 units)                     | 0.551 |       | 2.62  |       | 9.97  |       | 15.8  |
| Public EV charging plugs - L2 (1000 units)                          | 2.37  |       | 63.1  |       | 240   |       | 381   |
| 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 (%)                             | 1.51  | 1.78  | 1.24  | 0.397 | 0.074 | 0.013 | 0     |
| Vehicle sales - Light-duty - EV (%)                                 | 4.05  | 15.6  | 47.1  | 82.1  | 96.4  | 99.3  | 100   |
| Vehicle sales - Light-duty - gasoline (%)                           | 89.7  | 77.5  | 48.1  | 16.3  | 3.26  | 0.589 | 0     |
| Vehicle sales - Light-duty - hybrid (%)                             | 4.56  | 4.64  | 3.26  | 1.21  | 0.294 | 0.065 | 0     |
| Vehicle sales - Light-duty - hydrogen FC (%)                        | 0.11  | 0.337 | 0.2   | 0.062 | 0.012 | 0.002 | 0     |
| Vehicle sales - Light-duty - other (%)                              | 0.1   | 0.096 | 0.062 | 0.022 | 0.004 | 0.001 | 0     |
| Vehicle sales - Medium-duty - diesel (%)                            | 64.7  | 59.7  | 42.3  | 14.4  | 2.59  | 0.384 | 0     |
| Vehicle sales - Medium-duty - EV (%)                                | 0.784 | 5.07  | 25.3  | 60.8  | 76.5  | 79.5  | 80    |
| Vehicle sales - Medium-duty - gasoline (%)                          | 33.7  | 33.3  | 25.5  | 9.32  | 1.77  | 0.277 | 0     |
| Vehicle sales - Medium-duty - hybrid (%)                            | 0.363 | 0.402 | 0.341 | 0.14  | 0.03  | 0.005 | 0     |
| Vehicle sales - Medium-duty - hydrogen FC (%)                       | 0.196 | 1.27  | 6.33  | 15.2  | 19.1  | 19.9  | 20    |
| Vehicle sales - Medium-duty - other (%)                             | 0.253 | 0.255 | 0.205 | 0.083 | 0.019 | 0.004 | 0     |

Table 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     | 0.377  | 0      |
| Capital invested - Solar PV - Constrained (billion \$2018)                  |       | 0.437 | 0     | 0     | 1.54  | 0.688  | 0      |
| Capital invested - Wind - Base (billion \$2018)                             |       | 0.134 | 0.485 | 0.205 | 0.75  | 0.37   | 0      |
| Capital invested - Wind - Constrained (billion \$2018)                      |       | 0.094 | 1.29  | 0.695 | 3.43  | 5.19   | 0      |
| Installed renewables - OffshoreWind - Base land use assumptions (MW)        | 0     | 0     | 0     | 0     | 0     | 0      | 0      |
| Installed renewables - OffshoreWind - Constrained land use assumptions (MW) | 0     | 0     | 0     | 0     | 0     | 0      | 0      |
| Installed renewables - Solar - Base land use assumptions (MW)               | 721   | 721   | 721   | 721   | 721   | 1,171  | 1,171  |
| Installed renewables - Solar - Constrained land use assumptions (MW)        | 1,351 | 1,734 | 1,734 | 1,734 | 3,466 | 4,287  | 4,287  |
| Installed renewables - Wind - Base land use assumptions (MW)                | 3,388 | 3,459 | 3,739 | 3,866 | 4,354 | 4,607  | 4,607  |
| Installed renewables - Wind - Constrained land use assumptions (MW)         | 3,459 | 3,508 | 4,255 | 4,686 | 6,919 | 10,482 | 10,482 |

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

| Item  | 2020   | 2025   | 2030   | 2035   | 2040   | 2045   | 2050   |
|---|--------|--------|--------|--------|--------|--------|--------|
| OffshoreWind - Base land use assumptions (GWh)        | 0      | 0      | 0      | 0      | 0      | 0      | 0      |
| OffshoreWind - Constrained land use assumptions (GWh) | 0      | 0      | 0      | 0      | 0      | 0      | 0      |
| Solar - Base land use assumptions (GWh)               | 1,419  | 1,419  | 1,419  | 1,419  | 1,419  | 2,177  | 2,177  |
| Solar - Constrained land use assumptions (GWh)        | 2,487  | 3,131  | 3,131  | 3,131  | 6,048  | 7,413  | 7,413  |
| Wind - Base land use assumptions (GWh)                | 11,561 | 11,817 | 12,794 | 13,217 | 14,787 | 15,576 | 15,576 |
| Wind - Constrained land use assumptions (GWh)         | 11,817 | 11,993 | 14,463 | 15,810 | 22,465 | 32,717 | 32,717 |

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

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050   |
|---|------|------|------|------|------|------|--------|
| Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y) |      |      |      |      |      |      | 0      |
| Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)              |      |      |      |      |      |      | -1,981 |
| Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)   |      |      |      |      |      |      | -147   |
| Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)                          |      |      |      |      |      |      | -2,129 |
| Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)   |      |      |      |      |      |      | 0      |
| Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)                |      |      |      |      |      |      | -1,027 |
| Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)     |      |      |      |      |      |      | -73.6  |
| Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)                            |      |      |      |      |      |      | -1,101 |



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

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|--|------|------|------|------|------|------|-------|
| Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares) |      |      |      |      |      |      | 0     |
| Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)              |      |      |      |      |      |      | 2,798 |
| Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)   |      |      |      |      |      |      | 235   |
| Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)                          |      |      |      |      |      |      | 3,033 |
| Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)   |      |      |      |      |      |      | 0     |
| Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)                |      |      |      |      |      |      | 1,458 |
| Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)     |      |      |      |      |      |      | 117   |
| Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)                            |      |      |      |      |      |      | 1,575 |

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

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050    |
|---|------|------|------|------|------|------|---------|
| Carbon sink potential - High - Accelerate regeneration (1000 tCO <sub>2</sub> e/y)        |      |      |      |      |      |      | -2,170  |
| Carbon sink potential - High - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)     |      |      |      |      |      |      | -71,521 |
| Carbon sink potential - High - Avoid deforestation (1000 tCO <sub>2</sub> e/y)            |      |      |      |      |      |      | -1,904  |
| Carbon sink potential - High - Extend rotation length (1000 tCO <sub>2</sub> e/y)         |      |      |      |      |      |      | -9,494  |
| Carbon sink potential - High - Improve plantations (1000 tCO <sub>2</sub> e/y)            |      |      |      |      |      |      | -4,080  |
| Carbon sink potential - High - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)      |      |      |      |      |      |      | -29,790 |
| Carbon sink potential - High - Increase trees outside forests (1000 tCO <sub>2</sub> e/y) |      |      |      |      |      |      | -1,078  |
| Carbon sink potential - High - Reforest cropland (1000 tCO <sub>2</sub> e/y)              |      |      |      |      |      |      | -14,981 |
| Carbon sink potential - High - Reforest pasture (1000 tCO <sub>2</sub> e/y)               |      |      |      |      |      |      | -2,477  |
| Carbon sink potential - High - Restore productivity (1000 tCO <sub>2</sub> e/y)           |      |      |      |      |      |      | -5,545  |
| Carbon sink potential - Low - Accelerate regeneration (1000 tCO <sub>2</sub> e/y)         |      |      |      |      |      |      | -1,087  |
| Carbon sink potential - Low - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)      |      |      |      |      |      |      | -26,982 |
| Carbon sink potential - Low - Avoid deforestation (1000 tCO <sub>2</sub> e/y)             |      |      |      |      |      |      | -317    |
| Carbon sink potential - Low - Extend rotation length (1000 tCO <sub>2</sub> e/y)          |      |      |      |      |      |      | -3,647  |
| Carbon sink potential - Low - Improve plantations (1000 tCO <sub>2</sub> e/y)             |      |      |      |      |      |      | -2,076  |
| Carbon sink potential - Low - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)       |      |      |      |      |      |      | -9,930  |
| Carbon sink potential - Low - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)  |      |      |      |      |      |      | -377    |

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

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050    |
|--|------|------|------|------|------|------|---------|
| Carbon sink potential - Low - Reforest cropland (1000 tCO <sub>2</sub> e/y)                          |      |      |      |      |      |      | -7,491  |
| Carbon sink potential - Low - Reforest pasture (1000 tCO <sub>2</sub> e/y)                           |      |      |      |      |      |      | -188    |
| Carbon sink potential - Low - Restore productivity (1000 tCO <sub>2</sub> e/y)                       |      |      |      |      |      |      | -1,869  |
| Carbon sink potential - Mid - Accelerate regeneration (1000 tCO <sub>2</sub> e/y)                    |      |      |      |      |      |      | -1,629  |
| Carbon sink potential - Mid - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)                 |      |      |      |      |      |      | -49,216 |
| Carbon sink potential - Mid - Avoid deforestation (1000 tCO <sub>2</sub> e/y)                        |      |      |      |      |      |      | -1,111  |
| Carbon sink potential - Mid - Extend rotation length (1000 tCO <sub>2</sub> e/y)                     |      |      |      |      |      |      | -6,570  |
| Carbon sink potential - Mid - Improve plantations (1000 tCO <sub>2</sub> e/y)                        |      |      |      |      |      |      | -3,042  |
| Carbon sink potential - Mid - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)                  |      |      |      |      |      |      | -19,860 |
| Carbon sink potential - Mid - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)             |      |      |      |      |      |      | -728    |
| Carbon sink potential - Mid - Reforest cropland (1000 tCO <sub>2</sub> e/y)                          |      |      |      |      |      |      | -11,236 |
| Carbon sink potential - Mid - Reforest pasture (1000 tCO <sub>2</sub> e/y)                           |      |      |      |      |      |      | -1,332  |
| Carbon sink potential - Mid - Restore productivity (1000 tCO <sub>2</sub> e/y)                       |      |      |      |      |      |      | -3,707  |
| Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)             |      |      |      |      |      |      | 355     |
| Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares) |      |      |      |      |      |      | 258     |
| Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)              |      |      |      |      |      |      | 4,841   |
| Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)                 |      |      |      |      |      |      | 1,503   |
| Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)           |      |      |      |      |      |      | 0       |
| Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)      |      |      |      |      |      |      | 102     |
| Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)                   |      |      |      |      |      |      | 990     |
| Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)                    |      |      |      |      |      |      | 70.4    |
| Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)                |      |      |      |      |      |      | 1,838   |
| Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)      |      |      |      |      |      |      | 9,959   |
| Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)              |      |      |      |      |      |      | 178     |
| Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)  |      |      |      |      |      |      | 242     |

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

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|---|------|------|------|------|------|------|-------|
| Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)              |      |      |      |      |      |      | 1,855 |
| Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)                 |      |      |      |      |      |      | 752   |
| Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)           |      |      |      |      |      |      | 0     |
| Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)      |      |      |      |      |      |      | 53.9  |
| Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)                   |      |      |      |      |      |      | 495   |
| Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)                    |      |      |      |      |      |      | 12.2  |
| Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)                |      |      |      |      |      |      | 1,112 |
| Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)      |      |      |      |      |      |      | 4,699 |
| Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)             |      |      |      |      |      |      | 266   |
| Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares) |      |      |      |      |      |      | 250   |
| Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)              |      |      |      |      |      |      | 3,348 |
| Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)                 |      |      |      |      |      |      | 1,131 |
| Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)           |      |      |      |      |      |      | 0     |
| Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)      |      |      |      |      |      |      | 78.2  |
| Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)                   |      |      |      |      |      |      | 743   |
| Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)                    |      |      |      |      |      |      | 88.2  |
| Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)                |      |      |      |      |      |      | 2,240 |
| Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)      |      |      |      |      |      |      | 8,144 |

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

| Item  | 2020 | 2025  | 2030  | 2035  | 2040  | 2045  | 2050 |
|---|------|-------|-------|-------|-------|-------|------|
| Monetary damages from air pollution - Coal (million 2019\$)           |      | 63.6  | 0.07  | 0.07  | 0.053 | 0.033 | 0    |
| Monetary damages from air pollution - Natural Gas (million 2019\$)    |      | 57.8  | 27.7  | 32.8  | 38.7  | 24.2  | 11.4 |
| Monetary damages from air pollution - Transportation (million 2019\$) |      | 1,113 | 1,077 | 847   | 507   | 238   | 95   |
| Premature deaths from air pollution - Coal (deaths)                   |      | 7.18  | 0.008 | 0.008 | 0.006 | 0.004 | 0    |

Table 44: *E+RE- scenario - IMPACTS - Health (continued)*

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|------|------|------|------|------|------|------|
| Premature deaths from air pollution - Natural Gas (deaths)    |      | 6.53 | 3.13 | 3.7  | 4.37 | 2.73 | 1.29 |
| Premature deaths from air pollution - Transportation (deaths) |      | 125  | 121  | 95.3 | 57   | 26.7 | 10.7 |

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

| Item   | 2020  | 2025   | 2030   | 2035  | 2040  | 2045 | 2050  |
|--|-------|--------|--------|-------|-------|------|-------|
| Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018) |       | 22,723 | 24,348 |       |       |      |       |
| Sales of cooking units - Electric Resistance (%)                       | 27.5  | 31     | 36.1   | 49.7  | 68.6  | 80.2 | 84.3  |
| Sales of cooking units - Gas (%)                                       | 72.5  | 69     | 63.9   | 50.3  | 31.4  | 19.8 | 15.7  |
| Sales of space heating units - Electric Heat Pump (%)                  | 2.72  | 11.9   | 14.6   | 22.8  | 37.2  | 49.8 | 55.8  |
| Sales of space heating units - Electric Resistance (%)                 | 18.3  | 13.9   | 15.8   | 21.6  | 30.6  | 36.8 | 39.3  |
| Sales of space heating units - Fossil (%)                              | 0     | 0      | 0      | 0     | 0     | 0    | 0     |
| Sales of space heating units - Gas Furnace (%)                         | 79    | 74.3   | 69.5   | 55.6  | 32.2  | 13.3 | 4.9   |
| Sales of water heating units - Electric Heat Pump (%)                  | 1.12  | 2.39   | 6.84   | 19.8  | 40.6  | 55.7 | 61.7  |
| Sales of water heating units - Electric Resistance (%)                 | 3.42  | 3.14   | 5.18   | 11.2  | 21.3  | 29.5 | 33.1  |
| Sales of water heating units - Gas Furnace (%)                         | 94.6  | 93.8   | 87.3   | 68.4  | 37.5  | 14.2 | 4.65  |
| Sales of water heating units - Other (%)                               | 0.885 | 0.628  | 0.63   | 0.632 | 0.632 | 0.63 | 0.631 |

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

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--|------|------|------|------|------|------|------|
| Electricity distribution capital invested - Cumulative 5-yr (billion \$2018) |      | 2.95 | 2.96 | 4.08 | 4.22 | 5.76 | 6.07 |

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

| Item                                   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--|------|------|------|------|------|------|------|
| Final energy use - Commercial (PJ)     | 160  | 163  | 165  | 166  | 164  | 162  | 160  |
| Final energy use - Industry (PJ)       | 342  | 355  | 361  | 367  | 376  | 385  | 395  |
| Final energy use - Residential (PJ)    | 246  | 227  | 207  | 188  | 169  | 150  | 133  |
| Final energy use - Transportation (PJ) | 657  | 654  | 611  | 573  | 544  | 510  | 470  |

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

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|---|------|------|------|------|------|------|-------|
| Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018) |      | 4.1  | 4.04 |      |      |      |       |
| Sales of cooking units - Electric Resistance (%)                                | 70.4 | 71.2 | 73.9 | 81.1 | 91   | 97.1 | 99.2  |
| Sales of cooking units - Gas (%)  | 29.6 | 28.8 | 26.1 | 18.9 | 9.03 | 2.91 | 0.784 |
| Sales of space heating units - Electric Heat Pump (%)                           | 14   | 21.3 | 23.9 | 31.4 | 44.1 | 54.1 | 58.4  |
| Sales of space heating units - Electric Resistance (%)                          | 35.6 | 41.8 | 41.1 | 39.2 | 35.8 | 32.7 | 31    |
| Sales of space heating units - Fossil (%)                                       | 8.89 | 13.8 | 13.5 | 12.4 | 10.6 | 9.24 | 8.81  |
| Sales of space heating units - Gas (%)  | 41.5 | 23   | 21.5 | 17   | 9.58 | 4.03 | 1.76  |
| Sales of water heating units - Electric Heat Pump (%)                           | 0    | 1.23 | 4.71 | 14.8 | 30.9 | 42.3 | 46.7  |
| Sales of water heating units - Electric Resistance (%)                          | 45.5 | 61.3 | 60   | 56.4 | 51   | 47.6 | 46.5  |

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

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--|------|------|------|------|------|------|------|
| Sales of water heating units - Gas Furnace (%) | 47.5 | 31.9 | 29.8 | 23.3 | 12.8 | 4.87 | 1.59 |
| Sales of water heating units - Other (%)       | 6.95 | 5.56 | 5.52 | 5.49 | 5.39 | 5.31 | 5.28 |

Table 49: E-B+ scenario - PILLAR 1: Efficiency/Electrification - Transportation

| Item  | 2020  | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|---|-------|-------|-------|-------|-------|-------|-------|
| Light-duty vehicle capital costs - Cumulative 5-yr (million \$2018) |       | 0     | 239   | 450   | 1,569 | 4,778 | 7,016 |
| Public EV charging plugs - DC Fast (1000 units)                     | 0.551 |       | 1.02  |       | 3.86  |       | 10.1  |
| Public EV charging plugs - L2 (1000 units)                          | 2.37  |       | 24.5  |       | 92.8  |       | 244   |
| 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 (%)                             | 1.52  | 1.94  | 2.05  | 1.63  | 1.04  | 0.532 | 0.228 |
| Vehicle sales - Light-duty - EV (%)                                 | 1.94  | 4.79  | 12.1  | 26.2  | 48.8  | 72.3  | 87.7  |
| Vehicle sales - Light-duty - gasoline (%)                           | 91.6  | 87.3  | 79.3  | 66.2  | 45.8  | 24.6  | 10.9  |
| Vehicle sales - Light-duty - hybrid (%)                             | 4.73  | 5.52  | 6.19  | 5.61  | 4.19  | 2.46  | 1.19  |
| Vehicle sales - Light-duty - hydrogen FC (%)                        | 0.113 | 0.379 | 0.324 | 0.246 | 0.174 | 0.096 | 0.045 |
| Vehicle sales - Light-duty - other (%)                              | 0.101 | 0.105 | 0.095 | 0.083 | 0.059 | 0.033 | 0.015 |
| Vehicle sales - Medium-duty - diesel (%)                            | 64.8  | 62.2  | 57.7  | 49.4  | 35.6  | 19.6  | 8.37  |
| Vehicle sales - Medium-duty - EV (%)                                | 0.664 | 1.94  | 5.49  | 14.3  | 31.4  | 52.6  | 68    |
| Vehicle sales - Medium-duty - gasoline (%)                          | 33.8  | 34.7  | 34.7  | 31.9  | 24.4  | 14.2  | 6.33  |
| Vehicle sales - Medium-duty - hybrid (%)                            | 0.363 | 0.418 | 0.464 | 0.478 | 0.414 | 0.275 | 0.141 |
| Vehicle sales - Medium-duty - hydrogen FC (%)                       | 0.166 | 0.485 | 1.37  | 3.58  | 7.86  | 13.2  | 17    |
| Vehicle sales - Medium-duty - other (%)                             | 0.253 | 0.266 | 0.279 | 0.286 | 0.258 | 0.184 | 0.102 |

Table 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    | 0.004 | 0.227 | 0    | 0     | 0    | 0    |
| Capital invested - Biomass w/ccu allam power plant (billion \$2018) | 0    | 0     | 0     | 0    | 0.008 | 0    | 0    |
| Capital invested - Biomass w/ccu power plant (billion \$2018)       | 0    | 0     | 0     | 0    | 0.063 | 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    | 7.38 | 452  | 452  | 452  | 452  | 452  |
| Biomass w/ccu allam power plant (GWh) | 0    | 0    | 0    | 0    | 8.4  | 8.4  | 8.4  |
| Biomass w/ccu power plant (GWh)       | 0    | 0    | 0    | 0    | 70.4 | 70.4 | 70.4 |

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

| Item   | 2020 | 2025 | 2030 | 2035 | 2040  | 2045  | 2050 |
|--|------|------|------|------|-------|-------|------|
| Biomass purchases (million \$2018/year)                          |      | 63.7 | 192  | 194  | 290   | 684   | 729  |
| Conversion capital investment - Cumulative 5-yr (million \$2018) |      | 4.26 | 253  | 26.4 | 1,350 | 5,424 | 624  |
| Number of facilities - Allam power w ccu (quantity)              | 0    | 0    | 0    | 0    | 1     | 1     | 1    |

Table 52: E-B+ scenario - PILLAR 3: Clean fuels - Bioenergy (continued)

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--|------|------|------|------|------|------|------|
| Number of facilities - Beccs hydrogen (quantity) | 0    | 0    | 0    | 0    | 1    | 6    | 7    |
| Number of facilities - Diesel (quantity)         | 0    | 0    | 0    | 1    | 1    | 1    | 1    |
| Number of facilities - Diesel ccu (quantity)     | 0    | 0    | 0    | 0    | 1    | 1    | 1    |
| Number of facilities - Power (quantity)          | 0    | 1    | 1    | 1    | 1    | 1    | 1    |
| Number of facilities - Power ccu (quantity)      | 0    | 0    | 0    | 0    | 1    | 1    | 1    |
| Number of facilities - Pyrolysis (quantity)      | 0    | 0    | 0    | 1    | 1    | 1    | 1    |
| Number of facilities - Pyrolysis ccu (quantity)  | 0    | 0    | 0    | 0    | 1    | 1    | 1    |
| Number of facilities - Sng (quantity)            | 0    | 1    | 1    | 1    | 1    | 1    | 1    |
| Number of facilities - Sng ccu (quantity)        | 0    | 0    | 0    | 0    | 0    | 0    | 0    |

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

| Item                               | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|------------------------------------|------|------|------|------|------|------|------|
| Annual - All (MMT)                 |      | 0    | 0    | 3.35 | 5.03 | 12.1 | 13   |
| Annual - BECCS (MMT)               |      | 0    | 0    | 0    | 1.71 | 8.69 | 9.49 |
| Annual - Cement and lime (MMT)     |      | 0    | 0    | 3.35 | 3.32 | 3.42 | 3.53 |
| Annual - NGCC (MMT)                |      | 0    | 0    | 0    | 0    | 0    | 0    |
| Cumulative - All (MMT)             |      | 0    | 0    | 3.35 | 8.38 | 20.5 | 33.5 |
| Cumulative - BECCS (MMT)           |      | 0    | 0    | 0    | 1.71 | 10.4 | 19.9 |
| Cumulative - Cement and lime (MMT) |      | 0    | 0    | 3.35 | 6.67 | 10.1 | 13.6 |
| Cumulative - NGCC (MMT)            |      | 0    | 0    | 0    | 0    | 0    | 0    |

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

| Item   | 2020 | 2025 | 2030 | 2035  | 2040  | 2045  | 2050  |
|--|------|------|------|-------|-------|-------|-------|
| All (km)                                       |      | 0    | 0    | 776   | 984   | 1,486 | 1,688 |
| Cumulative investment - All (million \$2018)   |      | 0    | 0    | 1,800 | 1,935 | 2,313 | 2,443 |
| Cumulative investment - Spur (million \$2018)  |      | 0    | 0    | 98.6  | 233   | 611   | 741   |
| Cumulative investment - Trunk (million \$2018) |      | 0    | 0    | 1,702 | 1,702 | 1,702 | 1,702 |
| Spur (km)                                      |      | 0    | 0    | 101   | 309   | 811   | 1,013 |
| Trunk (km)                                     |      | 0    | 0    | 675   | 675   | 675   | 675   |

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

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

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

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050   |
|---|------|------|------|------|------|------|--------|
| Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y) |      |      |      |      |      |      | -0.035 |
| Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)              |      |      |      |      |      |      | -1,981 |
| Carbon sink potential - Aggressive deployment - Cropland to woody energy crops (1000 tCO2e/y) |      |      |      |      |      |      | 0      |

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

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050   |
|--|------|------|------|------|------|------|--------|
| Carbon sink potential - Aggressive deployment - Pasture to energy crops (1000 tCO <sub>2</sub> e/y)      |      |      |      |      |      |      | 0      |
| Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO <sub>2</sub> e/y) |      |      |      |      |      |      | -147   |
| Carbon sink potential - Aggressive deployment - Total (1000 tCO <sub>2</sub> e/y)                        |      |      |      |      |      |      | -2,129 |
| Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO <sub>2</sub> e/y) |      |      |      |      |      |      | -0.035 |
| Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO <sub>2</sub> e/y)              |      |      |      |      |      |      | -1,027 |
| Carbon sink potential - Moderate deployment - Cropland to woody energy crops (1000 tCO <sub>2</sub> e/y) |      |      |      |      |      |      | 0      |
| Carbon sink potential - Moderate deployment - Pasture to energy crops (1000 tCO <sub>2</sub> e/y)        |      |      |      |      |      |      | 0      |
| Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO <sub>2</sub> e/y)   |      |      |      |      |      |      | -73.6  |
| Carbon sink potential - Moderate deployment - Total (1000 tCO <sub>2</sub> e/y)                          |      |      |      |      |      |      | -1,101 |
| Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)   |      |      |      |      |      |      | 0.062  |
| Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)                |      |      |      |      |      |      | 6,909  |
| Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)   |      |      |      |      |      |      | 0.016  |
| Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)          |      |      |      |      |      |      | 2.81   |
| Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)     |      |      |      |      |      |      | 235    |
| Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)                            |      |      |      |      |      |      | 7,146  |
| Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)     |      |      |      |      |      |      | 0.062  |
| Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)                  |      |      |      |      |      |      | 1,458  |
| Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)     |      |      |      |      |      |      | 0.016  |
| Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)            |      |      |      |      |      |      | 2.81   |
| Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)       |      |      |      |      |      |      | 117    |
| Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)                              |      |      |      |      |      |      | 1,578  |

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

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050    |
|---|------|------|------|------|------|------|---------|
| Carbon sink potential - High - Accelerate regeneration (1000 tCO <sub>2</sub> e/y)        |      |      |      |      |      |      | -2,170  |
| Carbon sink potential - High - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)     |      |      |      |      |      |      | -71,521 |
| Carbon sink potential - High - Avoid deforestation (1000 tCO <sub>2</sub> e/y)            |      |      |      |      |      |      | -1,904  |
| Carbon sink potential - High - Extend rotation length (1000 tCO <sub>2</sub> e/y)         |      |      |      |      |      |      | -9,494  |
| Carbon sink potential - High - Improve plantations (1000 tCO <sub>2</sub> e/y)            |      |      |      |      |      |      | -4,080  |
| Carbon sink potential - High - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)      |      |      |      |      |      |      | -29,790 |
| Carbon sink potential - High - Increase trees outside forests (1000 tCO <sub>2</sub> e/y) |      |      |      |      |      |      | -1,078  |
| Carbon sink potential - High - Reforest cropland (1000 tCO <sub>2</sub> e/y)              |      |      |      |      |      |      | -14,981 |
| Carbon sink potential - High - Reforest pasture (1000 tCO <sub>2</sub> e/y)               |      |      |      |      |      |      | -2,477  |
| Carbon sink potential - High - Restore productivity (1000 tCO <sub>2</sub> e/y)           |      |      |      |      |      |      | -5,545  |
| Carbon sink potential - Low - Accelerate regeneration (1000 tCO <sub>2</sub> e/y)         |      |      |      |      |      |      | -1,087  |
| Carbon sink potential - Low - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)      |      |      |      |      |      |      | -26,982 |
| Carbon sink potential - Low - Avoid deforestation (1000 tCO <sub>2</sub> e/y)             |      |      |      |      |      |      | -317    |
| Carbon sink potential - Low - Extend rotation length (1000 tCO <sub>2</sub> e/y)          |      |      |      |      |      |      | -3,647  |
| Carbon sink potential - Low - Improve plantations (1000 tCO <sub>2</sub> e/y)             |      |      |      |      |      |      | -2,076  |
| Carbon sink potential - Low - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)       |      |      |      |      |      |      | -9,930  |
| Carbon sink potential - Low - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)  |      |      |      |      |      |      | -377    |
| Carbon sink potential - Low - Reforest cropland (1000 tCO <sub>2</sub> e/y)               |      |      |      |      |      |      | -7,491  |
| Carbon sink potential - Low - Reforest pasture (1000 tCO <sub>2</sub> e/y)                |      |      |      |      |      |      | -188    |
| Carbon sink potential - Low - Restore productivity (1000 tCO <sub>2</sub> e/y)            |      |      |      |      |      |      | -1,869  |
| Carbon sink potential - Mid - Accelerate regeneration (1000 tCO <sub>2</sub> e/y)         |      |      |      |      |      |      | -1,629  |
| Carbon sink potential - Mid - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)      |      |      |      |      |      |      | -49,216 |
| Carbon sink potential - Mid - Avoid deforestation (1000 tCO <sub>2</sub> e/y)             |      |      |      |      |      |      | -1,111  |
| Carbon sink potential - Mid - Extend rotation length (1000 tCO <sub>2</sub> e/y)          |      |      |      |      |      |      | -6,570  |
| Carbon sink potential - Mid - Improve plantations (1000 tCO <sub>2</sub> e/y)             |      |      |      |      |      |      | -3,042  |
| Carbon sink potential - Mid - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)       |      |      |      |      |      |      | -19,860 |
| Carbon sink potential - Mid - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)  |      |      |      |      |      |      | -728    |
| Carbon sink potential - Mid - Reforest cropland (1000 tCO <sub>2</sub> e/y)               |      |      |      |      |      |      | -11,236 |
| Carbon sink potential - Mid - Reforest pasture (1000 tCO <sub>2</sub> e/y)                |      |      |      |      |      |      | -1,332  |
| Carbon sink potential - Mid - Restore productivity (1000 tCO <sub>2</sub> e/y)            |      |      |      |      |      |      | -3,707  |



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

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|--|------|------|------|------|------|------|-------|
| Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)             |      |      |      |      |      |      | 355   |
| Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares) |      |      |      |      |      |      | 258   |
| Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)              |      |      |      |      |      |      | 4,841 |
| Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)                 |      |      |      |      |      |      | 1,503 |
| Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)           |      |      |      |      |      |      | 0     |
| Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)      |      |      |      |      |      |      | 102   |
| Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)                   |      |      |      |      |      |      | 990   |
| Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)                    |      |      |      |      |      |      | 70.4  |
| Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)                |      |      |      |      |      |      | 1,838 |
| Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)      |      |      |      |      |      |      | 9,959 |
| Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)              |      |      |      |      |      |      | 178   |
| Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)  |      |      |      |      |      |      | 242   |
| Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)               |      |      |      |      |      |      | 1,855 |
| Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)                  |      |      |      |      |      |      | 752   |
| Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)            |      |      |      |      |      |      | 0     |
| Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)       |      |      |      |      |      |      | 53.9  |
| Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)                    |      |      |      |      |      |      | 495   |
| Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)                     |      |      |      |      |      |      | 12.2  |
| Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)                 |      |      |      |      |      |      | 1,112 |
| Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)       |      |      |      |      |      |      | 4,699 |
| Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)              |      |      |      |      |      |      | 266   |

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

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|---|------|------|------|------|------|------|-------|
| Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares) |      |      |      |      |      |      | 250   |
| Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)              |      |      |      |      |      |      | 3,348 |
| Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)                 |      |      |      |      |      |      | 1,131 |
| Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)           |      |      |      |      |      |      | 0     |
| Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)      |      |      |      |      |      |      | 78.2  |
| Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)                   |      |      |      |      |      |      | 743   |
| Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)                    |      |      |      |      |      |      | 88.2  |
| Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)                |      |      |      |      |      |      | 2,240 |
| Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)      |      |      |      |      |      |      | 8,144 |

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

| Item  | 2020 | 2025  | 2030  | 2035  | 2040  | 2045  | 2050 |
|---|------|-------|-------|-------|-------|-------|------|
| Monetary damages from air pollution - Coal (million 2019\$)           |      | 63.6  | 0.07  | 0.07  | 0.053 | 0.033 | 0    |
| Monetary damages from air pollution - Natural Gas (million 2019\$)    |      | 60.3  | 31.8  | 24.2  | 23.1  | 19.6  | 17.4 |
| Monetary damages from air pollution - Transportation (million 2019\$) |      | 1,133 | 1,189 | 1,198 | 1,115 | 917   | 648  |
| Premature deaths from air pollution - Coal (deaths)                   |      | 7.18  | 0.008 | 0.008 | 0.006 | 0.004 | 0    |
| Premature deaths from air pollution - Natural Gas (deaths)            |      | 6.81  | 3.58  | 2.73  | 2.6   | 2.21  | 1.96 |
| Premature deaths from air pollution - Transportation (deaths)         |      | 127   | 134   | 135   | 125   | 103   | 72.9 |

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

| Item   | 2020 | 2025   | 2030   | 2035  | 2040  | 2045  | 2050  |
|--|------|--------|--------|-------|-------|-------|-------|
| Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018) |      | 22,575 | 23,159 |       |       |       |       |
| Sales of cooking units - Electric Resistance (%)                       | 27.5 | 29     | 29     | 29    | 29    | 28.9  | 28.9  |
| Sales of cooking units - Gas (%)                                       | 72.5 | 71     | 71     | 71    | 71    | 71.1  | 71.1  |
| Sales of space heating units - Electric Heat Pump (%)                  | 2.72 | 21.4   | 53.8   | 64.1  | 65.2  | 65.3  | 65.3  |
| Sales of space heating units - Electric Resistance (%)                 | 18.3 | 16.1   | 25.2   | 30.3  | 33.5  | 33.9  | 34    |
| Sales of space heating units - Fossil (%)                              | 0    | 0      | 0      | 0     | 0     | 0     | 0     |
| Sales of space heating units - Gas Furnace (%)                         | 79   | 62.5   | 21     | 5.54  | 1.3   | 0.744 | 0.697 |
| Sales of water heating units - Electric Heat Pump (%)                  | 1.12 | 0.821  | 0.82   | 0.824 | 0.831 | 0.834 | 0.834 |
| Sales of water heating units - Electric Resistance (%)                 | 3.42 | 2.42   | 2.42   | 2.44  | 2.44  | 2.44  | 2.44  |

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

| Item   | 2020  | 2025  | 2030 | 2035  | 2040  | 2045 | 2050  |
|--|-------|-------|------|-------|-------|------|-------|
| Sales of water heating units - Gas Furnace (%) | 94.6  | 96.1  | 96.1 | 96.1  | 96.1  | 96.1 | 96.1  |
| Sales of water heating units - Other (%)       | 0.885 | 0.628 | 0.63 | 0.632 | 0.632 | 0.63 | 0.631 |

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

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--|------|------|------|------|------|------|------|
| Electricity distribution capital invested - Cumulative 5-yr (billion \$2018) |      | 3.38 | 3.44 | 3.99 | 4.11 | 3.95 | 4.04 |

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

| Item                                   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--|------|------|------|------|------|------|------|
| Final energy use - Commercial (PJ)     | 160  | 165  | 169  | 173  | 178  | 188  | 201  |
| Final energy use - Industry (PJ)       | 342  | 367  | 387  | 404  | 428  | 457  | 490  |
| Final energy use - Residential (PJ)    | 246  | 227  | 210  | 196  | 186  | 179  | 172  |
| Final energy use - Transportation (PJ) | 656  | 659  | 625  | 605  | 608  | 624  | 642  |

Table 62: REF scenario - PILLAR 1: Efficiency/Electrification - Residential

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|------|------|------|------|------|------|------|
| Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018) |      | 4.1  | 3.83 |      |      |      |      |
| Sales of cooking units - Electric Resistance (%)                                | 70.2 | 70.2 | 70.2 | 70.2 | 70.2 | 70.2 | 70.2 |
| Sales of cooking units - Gas (%)  | 29.8 | 29.8 | 29.8 | 29.8 | 29.8 | 29.8 | 29.8 |
| Sales of space heating units - Electric Heat Pump (%)                           | 12.4 | 29.8 | 30.5 | 31.7 | 33.2 | 35.3 | 38.5 |
| Sales of space heating units - Electric Resistance (%)                          | 36.2 | 36.9 | 36.4 | 35.6 | 34.5 | 32.5 | 29.2 |
| Sales of space heating units - Fossil (%)                                       | 9.05 | 12.7 | 11.5 | 10.8 | 10.6 | 10.5 | 10.6 |
| Sales of space heating units - Gas (%)  | 42.3 | 20.7 | 21.6 | 21.9 | 21.7 | 21.7 | 21.7 |
| Sales of water heating units - Electric Heat Pump (%)                           | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| Sales of water heating units - Electric Resistance (%)                          | 45.5 | 61.7 | 61.7 | 61.6 | 61.6 | 61.6 | 61.6 |
| Sales of water heating units - Gas Furnace (%)                                  | 47.5 | 32.7 | 32.8 | 32.8 | 32.8 | 32.8 | 32.8 |
| Sales of water heating units - Other (%)  | 6.95 | 5.57 | 5.55 | 5.6  | 5.61 | 5.61 | 5.61 |

Table 63: REF scenario - PILLAR 1: Efficiency/Electrification - Transportation

| Item   | 2020  | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|--|-------|-------|-------|-------|-------|-------|-------|
| Vehicle sales - Heavy-duty - diesel (%)      | 98.1  | 98.2  | 97.9  | 97    | 95.6  | 93.5  | 91.6  |
| Vehicle sales - Heavy-duty - EV (%)          | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| Vehicle sales - Heavy-duty - gasoline (%)    | 0.229 | 0.242 | 0.257 | 0.274 | 0.294 | 0.317 | 0.343 |
| Vehicle sales - Heavy-duty - hybrid (%)      | 0.083 | 0.096 | 0.112 | 0.13  | 0.15  | 0.174 | 0.202 |
| Vehicle sales - Heavy-duty - hydrogen FC (%) | 0.119 | 0.138 | 0.16  | 0.186 | 0.216 | 0.25  | 0.29  |
| Vehicle sales - Heavy-duty - other (%)       | 1.51  | 1.31  | 1.57  | 2.37  | 3.69  | 5.71  | 7.57  |
| Vehicle sales - Light-duty - diesel (%)      | 1.51  | 1.93  | 2.18  | 2.03  | 1.82  | 1.7   | 1.62  |
| Vehicle sales - Light-duty - EV (%)          | 3.7   | 5.77  | 6.57  | 8.08  | 9.83  | 11.3  | 12.5  |
| Vehicle sales - Light-duty - gasoline (%)    | 90    | 86.4  | 84.2  | 82.3  | 80.2  | 78.3  | 76.7  |
| Vehicle sales - Light-duty - hybrid (%)      | 4.57  | 5.41  | 6.62  | 7.18  | 7.74  | 8.3   | 8.72  |
| Vehicle sales - Light-duty - hydrogen FC (%) | 0.111 | 0.375 | 0.343 | 0.304 | 0.301 | 0.301 | 0.312 |
| Vehicle sales - Light-duty - other (%)       | 0.1   | 0.104 | 0.1   | 0.101 | 0.1   | 0.099 | 0.101 |
| Vehicle sales - Medium-duty - diesel (%)     | 65.2  | 63.5  | 61.6  | 59.6  | 58    | 56.5  | 55.2  |
| Vehicle sales - Medium-duty - EV (%)         | 0.027 | 0.105 | 0.329 | 0.671 | 0.895 | 0.973 | 0.993 |
| Vehicle sales - Medium-duty - gasoline (%)   | 34    | 35.5  | 37    | 38.5  | 39.7  | 40.8  | 41.7  |

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

| Item  | 2020  | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|---|-------|-------|-------|-------|-------|-------|-------|
| Vehicle sales - Medium-duty - hybrid (%)      | 0.365 | 0.427 | 0.496 | 0.577 | 0.674 | 0.793 | 0.929 |
| Vehicle sales - Medium-duty - hydrogen FC (%) | 0.175 | 0.208 | 0.242 | 0.285 | 0.339 | 0.409 | 0.487 |
| Vehicle sales - Medium-duty - other (%)       | 0.255 | 0.271 | 0.298 | 0.345 | 0.42  | 0.528 | 0.671 |

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

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050    |
|---|------|------|------|------|------|------|---------|
| Carbon sink potential - High - Accelerate regeneration (1000 tCO <sub>2</sub> e/y)        |      |      |      |      |      |      | -2,170  |
| Carbon sink potential - High - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)     |      |      |      |      |      |      | -71,521 |
| Carbon sink potential - High - Avoid deforestation (1000 tCO <sub>2</sub> e/y)            |      |      |      |      |      |      | -1,904  |
| Carbon sink potential - High - Extend rotation length (1000 tCO <sub>2</sub> e/y)         |      |      |      |      |      |      | -9,494  |
| Carbon sink potential - High - Improve plantations (1000 tCO <sub>2</sub> e/y)            |      |      |      |      |      |      | -4,080  |
| Carbon sink potential - High - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)      |      |      |      |      |      |      | -29,790 |
| Carbon sink potential - High - Increase trees outside forests (1000 tCO <sub>2</sub> e/y) |      |      |      |      |      |      | -1,078  |
| Carbon sink potential - High - Reforest cropland (1000 tCO <sub>2</sub> e/y)              |      |      |      |      |      |      | -14,981 |
| Carbon sink potential - High - Reforest pasture (1000 tCO <sub>2</sub> e/y)               |      |      |      |      |      |      | -2,477  |
| Carbon sink potential - High - Restore productivity (1000 tCO <sub>2</sub> e/y)           |      |      |      |      |      |      | -5,545  |
| Carbon sink potential - Low - Accelerate regeneration (1000 tCO <sub>2</sub> e/y)         |      |      |      |      |      |      | -1,087  |
| Carbon sink potential - Low - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)      |      |      |      |      |      |      | -26,982 |
| Carbon sink potential - Low - Avoid deforestation (1000 tCO <sub>2</sub> e/y)             |      |      |      |      |      |      | -317    |
| Carbon sink potential - Low - Extend rotation length (1000 tCO <sub>2</sub> e/y)          |      |      |      |      |      |      | -3,647  |
| Carbon sink potential - Low - Improve plantations (1000 tCO <sub>2</sub> e/y)             |      |      |      |      |      |      | -2,076  |
| Carbon sink potential - Low - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)       |      |      |      |      |      |      | -9,930  |
| Carbon sink potential - Low - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)  |      |      |      |      |      |      | -377    |
| Carbon sink potential - Low - Reforest cropland (1000 tCO <sub>2</sub> e/y)               |      |      |      |      |      |      | -7,491  |
| Carbon sink potential - Low - Reforest pasture (1000 tCO <sub>2</sub> e/y)                |      |      |      |      |      |      | -188    |
| Carbon sink potential - Low - Restore productivity (1000 tCO <sub>2</sub> e/y)            |      |      |      |      |      |      | -1,869  |
| Carbon sink potential - Mid - Accelerate regeneration (1000 tCO <sub>2</sub> e/y)         |      |      |      |      |      |      | -1,629  |
| Carbon sink potential - Mid - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)      |      |      |      |      |      |      | -49,216 |
| Carbon sink potential - Mid - Avoid deforestation (1000 tCO <sub>2</sub> e/y)             |      |      |      |      |      |      | -1,111  |
| Carbon sink potential - Mid - Extend rotation length (1000 tCO <sub>2</sub> e/y)          |      |      |      |      |      |      | -6,570  |
| Carbon sink potential - Mid - Improve plantations (1000 tCO <sub>2</sub> e/y)             |      |      |      |      |      |      | -3,042  |
| Carbon sink potential - Mid - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)       |      |      |      |      |      |      | -19,860 |

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

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050    |
|--|------|------|------|------|------|------|---------|
| Carbon sink potential - Mid - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)             |      |      |      |      |      |      | -728    |
| Carbon sink potential - Mid - Reforest cropland (1000 tCO <sub>2</sub> e/y)                          |      |      |      |      |      |      | -11,236 |
| Carbon sink potential - Mid - Reforest pasture (1000 tCO <sub>2</sub> e/y)                           |      |      |      |      |      |      | -1,332  |
| Carbon sink potential - Mid - Restore productivity (1000 tCO <sub>2</sub> e/y)                       |      |      |      |      |      |      | -3,707  |
| Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)             |      |      |      |      |      |      | 355     |
| Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares) |      |      |      |      |      |      | 258     |
| Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)              |      |      |      |      |      |      | 4,841   |
| Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)                 |      |      |      |      |      |      | 1,503   |
| Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)           |      |      |      |      |      |      | 0       |
| Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)      |      |      |      |      |      |      | 102     |
| Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)                   |      |      |      |      |      |      | 990     |
| Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)                    |      |      |      |      |      |      | 70.4    |
| Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)                |      |      |      |      |      |      | 1,838   |
| Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)      |      |      |      |      |      |      | 9,959   |
| Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)              |      |      |      |      |      |      | 178     |
| Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)  |      |      |      |      |      |      | 242     |
| Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)               |      |      |      |      |      |      | 1,855   |
| Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)                  |      |      |      |      |      |      | 752     |
| Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)            |      |      |      |      |      |      | 0       |
| Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)       |      |      |      |      |      |      | 53.9    |
| Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)                    |      |      |      |      |      |      | 495     |
| Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)                     |      |      |      |      |      |      | 12.2    |
| Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)                 |      |      |      |      |      |      | 1,112   |

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

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|---|------|------|------|------|------|------|-------|
| Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)      |      |      |      |      |      |      | 4,699 |
| Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)             |      |      |      |      |      |      | 266   |
| Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares) |      |      |      |      |      |      | 250   |
| Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)              |      |      |      |      |      |      | 3,348 |
| Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)                 |      |      |      |      |      |      | 1,131 |
| Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)           |      |      |      |      |      |      | 0     |
| Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)      |      |      |      |      |      |      | 78.2  |
| Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)                   |      |      |      |      |      |      | 743   |
| Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)                    |      |      |      |      |      |      | 88.2  |
| Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)                |      |      |      |      |      |      | 2,240 |
| Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)      |      |      |      |      |      |      | 8,144 |

Table 65: REF scenario - PILLAR 6: Land sinks - Forests - REF only

| Item   | 2020  | 2025 | 2030  | 2035 | 2040 | 2045 | 2050  |
|--|-------|------|-------|------|------|------|-------|
| Business-as-usual carbon sink - Natural uptake (Mt CO <sub>2</sub> e/y)                | -27.2 |      | -5.37 |      |      |      | -4.47 |
| Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO <sub>2</sub> e/y) | -8.11 |      | -13.6 |      |      |      | -14.3 |
| Business-as-usual carbon sink - Total (Mt CO <sub>2</sub> e/y)                         | -35.3 |      | -19   |      |      |      | -18.8 |

Table 66: REF scenario - IMPACTS - Health

| Item  | 2020 | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|---|------|-------|-------|-------|-------|-------|-------|
| Monetary damages from air pollution - Coal (million 2019\$)           |      | 271   | 195   | 35.8  | 28.1  | 25.7  | 24.2  |
| Monetary damages from air pollution - Natural Gas (million 2019\$)    |      | 72.7  | 72    | 75.4  | 61    | 55.4  | 57.5  |
| Monetary damages from air pollution - Transportation (million 2019\$) |      | 1,130 | 1,203 | 1,275 | 1,353 | 1,434 | 1,517 |
| Premature deaths from air pollution - Coal (deaths)                   |      | 30.6  | 22    | 4.05  | 3.18  | 2.91  | 2.73  |
| Premature deaths from air pollution - Natural Gas (deaths)            |      | 8.21  | 8.13  | 8.52  | 6.89  | 6.26  | 6.49  |
| Premature deaths from air pollution - Transportation (deaths)         |      | 127   | 135   | 143   | 152   | 161   | 171   |