

# Net-Zero America - delaware 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 <a href="https://netzeroamerica.prince-ton.edu">https://netzeroamerica.prince-ton.edu</a>.
- 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 statelevel 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 -      |       | 3,472 | 3,883 |       |      |      |      |
| Cumulative 5-yr (million \$2018)           |       |       |       |       |      |      |      |
| Sales of cooking units - Electric          | 32    | 46    | 79.9  | 86.5  | 86.9 | 86.9 | 86.9 |
| Resistance (%)                             |       |       |       |       |      |      |      |
| Sales of cooking units - Gas (%)           | 68    | 54    | 20.1  | 13.5  | 13.1 | 13.1 | 13.1 |
| Sales of space heating units - Electric    | 1.53  | 28.2  | 70.6  | 83.7  | 85   | 85.1 | 85.1 |
| Heat Pump (%)                              |       |       |       |       |      |      |      |
| Sales of space heating units - Electric    | 1.94  | 8.4   | 10.6  | 12.7  | 13.1 | 13.1 | 13.1 |
| Resistance (%)                             |       |       |       |       |      |      |      |
| Sales of space heating units - Fossil (%)  | 12.2  | 4.23  | 0.808 | 0.035 | 0    | 0    | 0    |
| Sales of space heating units - Gas Furnace | 84.3  | 59.2  | 18.1  | 3.53  | 1.88 | 1.85 | 1.84 |
| (%)  |       |       |       |       |      |      |      |
| Sales of water heating units - Electric    | 0.078 | 10.5  | 54.6  | 64.4  | 64.9 | 64.9 | 64.9 |
| Heat Pump (%)                              |       |       |       |       |      |      |      |
| Sales of water heating units - Electric    | 1.96  | 10.8  | 28.3  | 32.2  | 32.4 | 32.4 | 32.4 |
| Resistance (%)                             |       |       |       |       |      |      |      |
| Sales of water heating units - Gas Furnace | 93.3  | 74.5  | 14.1  | 0.593 | 0    | 0    | 0    |
| (%)  |       |       |       |       |      |      |      |
| Sales of water heating units - Other (%)   | 4.67  | 4.25  | 3.03  | 2.72  | 2.72 | 2.72 | 2.71 |

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

| Item  | 2020 | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|---|------|-------|-------|-------|-------|-------|-------|
| Electricity distribution capital invested - |      | 0.526 | 0.536 | 0.919 | 0.973 | 0.907 | 0.947 |
| Cumulative 5-yr (billion \$2018)            |      |       |       |       |       |       |       |

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

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

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

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

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

| Item                                       | 2020  | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|--|-------|-------|-------|-------|-------|-------|-------|
| Light-duty vehicle capital costs -         |       | 193   | 496   | 803   | 1,217 | 1,325 | 1,263 |
| Cumulative 5-yr (million \$2018)           |       |       |       |       |       |       |       |
| Public EV charging plugs - DC Fast (1000   | 0.065 |       | 0.324 |       | 1.42  |       | 2.3   |
| units)                                     |       |       |       |       |       |       |       |
| Public EV charging plugs - L2 (1000 units) | 0.118 |       | 7.8   |       | 34.2  |       | 55.3  |
| Vehicle sales - Heavy-duty - diesel (%)    | 97.2  | 92.1  | 67    | 23.3  | 4.22  | 0.628 | 0     |
| Vehicle sales - Heavy-duty - EV (%)        | 0.588 | 3.81  | 19    | 45.6  | 57.4  | 59.6  | 60    |
| Vehicle sales - Heavy-duty - gasoline (%)  | 0.227 | 0.227 | 0.176 | 0.066 | 0.013 | 0.002 | 0     |
| Vehicle sales - Heavy-duty - hybrid (%)    | 0.082 | 0.09  | 0.077 | 0.031 | 0.007 | 0.001 | 0     |
| Vehicle sales - Heavy-duty - hydrogen FC   | 0.392 | 2.54  | 12.7  | 30.4  | 38.2  | 39.7  | 40    |
| (%)  |       |       |       |       |       |       |       |
| Vehicle sales - Heavy-duty - other (%)     | 1.5   | 1.23  | 1.07  | 0.568 | 0.163 | 0.038 | 0     |
| Vehicle sales - Light-duty - diesel (%)    | 1.43  | 1.71  | 1.21  | 0.386 | 0.073 | 0.013 | 0     |
| Vehicle sales - Light-duty - EV (%)        | 4.31  | 16.4  | 48.3  | 82.5  | 96.4  | 99.3  | 100   |
| Vehicle sales - Light-duty - gasoline (%)  | 89.2  | 76.6  | 46.9  | 15.8  | 3.2   | 0.587 | 0     |
| Vehicle sales - Light-duty - hybrid (%)    | 4.8   | 4.82  | 3.34  | 1.23  | 0.301 | 0.066 | 0     |
| Vehicle sales - Light-duty - hydrogen FC   | 0.11  | 0.333 | 0.194 | 0.06  | 0.012 | 0.002 | 0     |
| (%)  |       |       |       |       |       |       |       |
| Vehicle sales - Light-duty - other (%)     | 0.096 | 0.092 | 0.059 | 0.021 | 0.004 | 0.001 | 0     |
| Vehicle sales - Medium-duty - diesel (%)   | 64.7  | 59.7  | 42.3  | 14.4  | 2.59  | 0.384 | 0     |
| Vehicle sales - Medium-duty - EV (%)       | 0.784 | 5.07  | 25.3  | 60.8  | 76.5  | 79.5  | 80    |
| Vehicle sales - Medium-duty - gasoline (%) | 33.7  | 33.3  | 25.5  | 9.32  | 1.77  | 0.277 | 0     |
| Vehicle sales - Medium-duty - hybrid (%)   | 0.363 | 0.402 | 0.341 | 0.14  | 0.03  | 0.005 | 0     |
| Vehicle sales - Medium-duty - hydrogen     | 0.196 | 1.27  | 6.33  | 15.2  | 19.1  | 19.9  | 20    |
| FC (%)                                     |       |       |       |       |       |       |       |
| 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     | 0     | 0     | 0    | 0     | 0     |
| Capital invested - Biomass w/ccu allam power plant (billion \$2018)            | 0    | 0     | 0     | 0     | 0    | 0     | 0     |
| Capital invested - Biomass w/ccu power plant (billion \$2018)                  | 0    | 0     | 0     | 0     | 0    | 0     | 0     |
| Capital invested - Offshore Wind - Base (billion \$2018)                       |      | 0     | 0     | 0     | 0    | 5.99  | 5.64  |
| Capital invested - Offshore Wind -<br>Constrained (billion \$2018)             |      | 0     | 0     | 0     | 0    | 3.3   | 8.06  |
| Capital invested - Solar PV - Base (billion \$2018)                            |      | 0.167 | 0.173 | 0.318 | 0    | 0     | 0     |
| Capital invested - Solar PV - Constrained (billion \$2018)                     |      | 0.144 | 0.276 | 0.328 | 0    | 0     | 0     |
| Installed renewables - OffshoreWind -<br>Base land use assumptions (MW)        | 0    | 0     | 0     | 0     | 0    | 4,059 | 8,319 |
| Installed renewables - OffshoreWind -<br>Constrained land use assumptions (MW) | 0    | 0     | 0     | 0     | 0    | 4,059 | 8,319 |
| Installed renewables - Rooftop PV (MW)   | 110  | 165   | 219   | 290   | 375  | 472   | 584   |
| Installed renewables - Solar - Base land use assumptions (MW)                  | 39.8 | 186   | 355   | 692   | 692  | 692   | 692   |
| Installed renewables - Solar -<br>Constrained land use assumptions (MW)        | 0    | 0     | 112   | 326   | 326  | 326   | 326   |
| Installed renewables - Wind - Base land use assumptions (MW)                   | 2    | 2     | 2     | 2     | 2    | 2     | 2     |
| Installed renewables - Wind - Constrained land use assumptions (MW)            | 2    | 2     | 2     | 2     | 2    | 2     | 2     |

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

| Item                                     | 2020 | 2025 | 2030 | 2035  | 2040  | 2045   | 2050   |
|--|------|------|------|-------|-------|--------|--------|
| Biomass power plant (GWh)                | 0    | 0    | 0    | 0     | 0     | 0      | 0      |
| Biomass w/ccu allam power plant (GWh)    | 0    | 0    | 0    | 0     | 0     | 0      | 0      |
| Biomass w/ccu power plant (GWh)          | 0    | 0    | 0    | 0     | 0     | 0      | 0      |
| OffshoreWind - Base land use             | 0    | 0    | 0    | 0     | 0     | 17,643 | 37,615 |
| assumptions (GWh)                        |      |      |      |       |       |        |        |
| OffshoreWind - Constrained land use      | 0    | 0    | 0    | 0     | 0     | 17,643 | 37,615 |
| assumptions (GWh)                        |      |      |      |       |       |        |        |
| Solar - Base land use assumptions (GWh)  | 75.2 | 309  | 579  | 1,122 | 1,122 | 1,122  | 1,122  |
| Solar - Constrained land use assumptions | 0    | 0    | 180  | 522   | 522   | 522    | 522    |
| (GWh)                                    |      |      |      |       |       |        |        |
| Wind - Base land use assumptions (GWh)   | 8.07 | 8.07 | 8.07 | 8.07  | 8.07  | 8.07   | 8.07   |
| Wind - Constrained land use assumptions  | 8.07 | 8.07 | 8.07 | 8.07  | 8.07  | 8.07   | 8.07   |
| (GWh)                                    |      |      |      |       |       |        |        |

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

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

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

| Item                               | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|------------------------------------|------|------|------|------|------|------|------|
| Annual - All (MMT)                 |      | 0    | 0    | 0    | 0    | 0    | 0    |
| Annual - BECCS (MMT)               |      | 0    | 0    | 0    | 0    | 0    | 0    |
| Annual - Cement and lime (MMT)     |      | 0    | 0    | 0    | 0    | 0    | 0    |
| Annual - NGCC (MMT)                |      | 0    | 0    | 0    | 0    | 0    | 0    |
| Cumulative - All (MMT)             |      | 0    | 0    | 0    | 0    | 0    | 0    |
| Cumulative - BECCS (MMT)           |      | 0    | 0    | 0    | 0    | 0    | 0    |
| Cumulative - Cement and lime (MMT) |      | 0    | 0    | 0    | 0    | 0    | 0    |
| 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    | 0    | 0    | 0    | 166  |
| Cumulative investment - All (million<br>\$2018)   |      | 0    | 0    | 0    | 0    | 0    | 122  |
| Cumulative investment - Spur (million<br>\$2018)  |      | 0    | 0    | 0    | 0    | 0    | 122  |
| Cumulative investment - Trunk (million<br>\$2018) |      | 0    | 0    | 0    | 0    | 0    | 0    |
| Spur (km)   |      | 0    | 0    | 0    | 0    | 0    | 166  |
| Trunk (km)  |      | 0    | 0    | 0    | 0    | 0    | 0    |

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

| Table 12: E+ Scenario - PILLAR 6: Land Sink |      |      | 0000 | 0005 | 00/0 | 00/5 | 0050  |
|---|------|------|------|------|------|------|-------|
| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
| Carbon sink potential - Aggressive          |      |      |      |      |      |      | 0     |
| deployment - Corn-ethanol to energy         |      |      |      |      |      |      |       |
| grasses (1000 tC02e/y)                      |      |      |      |      |      |      | 0//   |
| Carbon sink potential - Aggressive          |      |      |      |      |      |      | -244  |
| deployment - Cropland measures (1000        |      |      |      |      |      |      |       |
| tCO2e/y)                                    |      |      |      |      |      |      |       |
| Carbon sink potential - Aggressive          |      |      |      |      |      |      | -6.43 |
| deployment - Permanent conservation         |      |      |      |      |      |      |       |
| cover (1000 tCO2e/y)                        |      |      |      |      |      |      |       |
| Carbon sink potential - Aggressive          |      |      |      |      |      |      | -250  |
| deployment - Total (1000 tCO2e/y)           |      |      |      |      |      |      |       |
| Carbon sink potential - Moderate            |      |      |      |      |      |      | 0     |
| deployment - Corn-ethanol to energy         |      |      |      |      |      |      |       |
| grasses (1000 tCO2e/y)                      |      |      |      |      |      |      |       |
| Carbon sink potential - Moderate            |      |      |      |      |      |      | -126  |
| deployment - Cropland measures (1000        |      |      |      |      |      |      |       |
| tCO2e/y)                                    |      |      |      |      |      |      |       |
| Carbon sink potential - Moderate            |      |      |      |      |      |      | -3.22 |
| deployment - Permanent conservation         |      |      |      |      |      |      |       |
| cover (1000 tCO2e/y)                        |      |      |      |      |      |      |       |
| Carbon sink potential - Moderate            |      |      |      |      |      |      | -129  |
| deployment - Total (1000 tCO2e/y)           |      |      |      |      |      |      |       |
| Land impacted for carbon sink -             |      |      |      |      |      |      | 0     |
| Aggressive deployment - Corn-ethanol to     |      |      |      |      |      |      |       |
| energy grasses (1000 hectares)              |      |      |      |      |      |      |       |
| Land impacted for carbon sink -             |      |      |      |      |      |      | 171   |
| Aggressive deployment - Cropland            |      |      |      |      |      |      |       |
| measures (1000 hectares)                    |      |      |      |      |      |      |       |
| Land impacted for carbon sink -             |      |      |      |      |      |      | 11.7  |
| Aggressive deployment - Permanent           |      |      |      |      |      |      |       |
| conservation cover (1000 hectares)          |      |      |      |      |      |      |       |
| Land impacted for carbon sink -             |      |      |      |      |      |      | 183   |
| Aggressive deployment - Total (1000         |      |      |      |      |      |      |       |
| hectares)                                   |      |      |      |      |      |      |       |
| Land impacted for carbon sink - Moderate    |      |      |      |      |      |      | 0     |
| deployment - Corn-ethanol to energy         |      |      |      |      |      |      |       |
| grasses (1000 hectares)                     |      |      |      |      |      |      |       |
| Land impacted for carbon sink - Moderate    |      |      |      |      |      |      | 88.6  |
| deployment - Cropland measures (1000        |      |      |      |      |      |      | 55.0  |
| hectares)                                   |      |      |      |      |      |      |       |
| Land impacted for carbon sink - Moderate    |      |      |      |      |      |      | 5.85  |
| deployment - Permanent conservation         |      |      |      |      |      |      | 0.00  |
| cover (1000 hectares)                       |      |      |      |      |      |      |       |
| Land impacted for carbon sink - Moderate    |      |      |      |      |      |      | 94.5  |
| deployment - Total (1000 hectares)          |      |      |      |      |      |      | 74.0  |
| acproyment - rotar (1000 nectal es)         |      |      |      |      |      |      |       |

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

| Table 13: E+ scenario - PILLAR 6: Land sin | ks - Forests |      |      |      |      |      |       |
|--|--------------|------|------|------|------|------|-------|
| Item                                       | 2020         | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
| Carbon sink potential - High - Accelerate  |              |      |      |      |      |      | -6.94 |
| regeneration (1000 tCO2e/y)                |              |      |      |      |      |      |       |
| Carbon sink potential - High - All (not    |              |      |      |      |      |      | -901  |
| counting overlap) (1000 tCO2e/y)           |              |      |      |      |      |      |       |
| Carbon sink potential - High - Avoid       |              |      |      |      |      |      | -206  |
| deforestation (1000 tC02e/y)               |              |      |      |      |      |      | 200   |
| Carbon sink potential - High - Extend      |              |      |      |      |      |      | -201  |
| ·  |              |      |      |      |      |      | -201  |
| rotation length (1000 tC02e/y)             |              |      |      |      |      |      | 07.0  |
| Carbon sink potential - High - Improve     |              |      |      |      |      |      | -27.3 |
| plantations (1000 tCO2e/y)                 |              |      |      |      |      |      |       |
| Carbon sink potential - High - Increase    |              |      |      |      |      |      | -208  |
| retention of HWP (1000 tCO2e/y)            |              |      |      |      |      |      |       |
| Carbon sink potential - High - Increase    |              |      |      |      |      |      | -83.5 |
| trees outside forests (1000 tCO2e/y)       |              |      |      |      |      |      |       |
| Carbon sink potential - High - Reforest    |              |      |      |      |      |      | -5.4  |
| cropland (1000 tCO2e/y)                    |              |      |      |      |      |      |       |
| Carbon sink potential - High - Reforest    |              |      |      |      |      |      | -85.9 |
| pasture (1000 tC02e/y)                     |              |      |      |      |      |      | 00.7  |
| Carbon sink potential - High - Restore     |              |      |      |      |      |      | -76.6 |
| productivity (1000 tC02e/y)                |              |      |      |      |      |      | -10.0 |
|  |              |      |      |      |      |      | -3.48 |
| Carbon sink potential - Low - Accelerate   |              |      |      |      |      |      | -3.48 |
| regeneration (1000 tCO2e/y)                |              |      |      |      |      |      |       |
| Carbon sink potential - Low - All (not     |              |      |      |      |      |      | -263  |
| counting overlap) (1000 tCO2e/y)           |              |      |      |      |      |      |       |
| Carbon sink potential - Low - Avoid        |              |      |      |      |      |      | -34.3 |
| deforestation (1000 tCO2e/y)               |              |      |      |      |      |      |       |
| Carbon sink potential - Low - Extend       |              |      |      |      |      |      | -77.3 |
| rotation length (1000 tCO2e/y)             |              |      |      |      |      |      |       |
| Carbon sink potential - Low - Improve      |              |      |      |      |      |      | -13.9 |
| plantations (1000 tCO2e/y)                 |              |      |      |      |      |      | 10.7  |
| Carbon sink potential - Low - Increase     |              |      |      |      |      |      | -69.4 |
|  |              |      |      |      |      |      | -09.4 |
| retention of HWP (1000 tCO2e/y)            |              |      |      |      |      |      | 00.0  |
| Carbon sink potential - Low - Increase     |              |      |      |      |      |      | -29.2 |
| trees outside forests (1000 tCO2e/y)       |              |      |      |      |      |      |       |
| Carbon sink potential - Low - Reforest     |              |      |      |      |      |      | -2.7  |
| cropland (1000 tCO2e/y)                    |              |      |      |      |      |      |       |
| Carbon sink potential - Low - Reforest     |              |      |      |      |      |      | -6.51 |
| pasture (1000 tCO2e/y)                     |              |      |      |      |      |      |       |
| Carbon sink potential - Low - Restore      |              |      |      |      |      |      | -25.8 |
| productivity (1000 tCO2e/y)                |              |      |      |      |      |      |       |
| Carbon sink potential - Mid - Accelerate   |              |      |      |      |      |      | -5.21 |
| regeneration (1000 tCO2e/y)                |              |      |      |      |      |      | 0.21  |
|  |              |      |      |      |      |      | -581  |
| Carbon sink potential - Mid - All (not     |              |      |      |      |      |      | -581  |
| counting overlap) (1000 tCO2e/y)           |              |      |      |      |      |      |       |
| Carbon sink potential - Mid - Avoid        |              |      |      |      |      |      | -120  |
| deforestation (1000 tCO2e/y)               |              |      |      |      |      |      |       |
| Carbon sink potential - Mid - Extend       |              |      |      |      |      |      | -139  |
| rotation length (1000 tCO2e/y)             |              |      |      |      |      |      |       |
| Carbon sink potential - Mid - Improve      |              |      |      |      |      |      | -20.4 |
| plantations (1000 tCO2e/y)                 |              |      |      |      |      |      |       |
| Carbon sink potential - Mid - Increase     |              |      |      |      |      |      | -139  |
| retention of HWP (1000 tCO2e/y)            |              |      |      |      |      |      | 107   |
|  |              |      |      |      |      |      | -56.4 |
| Carbon sink potential - Mid - Increase     |              |      |      |      |      |      | -56.4 |
| trees outside forests (1000 tC02e/y)       |              |      |      |      |      |      |       |
| Carbon sink potential - Mid - Reforest     |              |      |      |      |      |      | -4.05 |
| cropland (1000 tCO2e/y)                    |              |      |      |      |      |      |       |
| Carbon sink potential - Mid - Reforest     |              |      |      |      |      |      | -46.2 |
| pasture (1000 tCO2e/y)                     |              |      |      |      |      |      |       |
| Carbon sink potential - Mid - Restore      |              |      |      |      |      |      | -51.2 |
| productivity (1000 tCO2e/y)                |              |      |      |      |      |      |       |
| p 32221111 (1200 10020/1)                  |              |      |      |      |      |      |       |

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

| Table 13: E+ scenario - PILLAR 6: Land sink                                      |      | <u> </u> |      | 0005 | 00/0 | 00/5 | 0050  |
|--|------|----------|------|------|------|------|-------|
| Item   | 2020 | 2025     | 2030 | 2035 | 2040 | 2045 | 2050  |
| Land impacted for carbon sink potential -  |      |          |      |      |      |      | 1.13  |
| High - Accelerate regeneration (1000   |      |          |      |      |      |      |       |
| hectares) Land impacted for carbon sink potential -                              |      |          |      |      |      |      | 27.8  |
| High - Avoid deforestation (over 30 years)                                       |      |          |      |      |      |      | 21.0  |
| (1000 hectares)  |      |          |      |      |      |      |       |
| ,  |      |          |      |      |      |      | 103   |
| Land impacted for carbon sink potential -<br>High - Extend rotation length (1000 |      |          |      |      |      |      | 103   |
| 5 ,  |      |          |      |      |      |      |       |
| hectares)  |      |          |      |      |      |      | 10.1  |
| Land impacted for carbon sink potential -  |      |          |      |      |      |      | 10.1  |
| High - Improve plantations (1000   |      |          |      |      |      |      |       |
| hectares)  |      |          |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |          |      |      |      |      | 0     |
| High - Increase retention of HWP (1000   |      |          |      |      |      |      |       |
| hectares)  |      |          |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |          |      |      |      |      | 7.93  |
| High - Increase trees outside forests  |      |          |      |      |      |      |       |
| (1000 hectares)  |      |          |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |          |      |      |      |      | 0.357 |
| High - Reforest cropland (1000 hectares)   |      |          |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |          |      |      |      |      | 2.44  |
| High - Reforest pasture (1000 hectares)  |      |          |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |          |      |      |      |      | 25.4  |
| High - Restore productivity (1000  |      |          |      |      |      |      |       |
| hectares)  |      |          |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |          |      |      |      |      | 178   |
| High - Total impacted (over 30 years)  |      |          |      |      |      |      |       |
| (1000 hectares)  |      |          |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |          |      |      |      |      | 0.567 |
| Low - Accelerate regeneration (1000  |      |          |      |      |      |      | 0.00. |
| hectares)  |      |          |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |          |      |      |      |      | 26.1  |
| Low - Avoid deforestation (over 30 years)  |      |          |      |      |      |      | 20.1  |
| (1000 hectares)  |      |          |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |          |      |      |      |      | 39.3  |
| Low - Extend rotation length (1000   |      |          |      |      |      |      | 37.3  |
| hectares)  |      |          |      |      |      |      |       |
| ,  |      |          |      |      |      |      | F 00  |
| Land impacted for carbon sink potential -  |      |          |      |      |      |      | 5.03  |
| Low - Improve plantations (1000  |      |          |      |      |      |      |       |
| hectares)  |      |          |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |          |      |      |      |      | 0     |
| Low - Increase retention of HWP (1000  |      |          |      |      |      |      |       |
| hectares)  |      |          |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |          |      |      |      |      | 4.17  |
| Low - Increase trees outside forests   |      |          |      |      |      |      |       |
| (1000 hectares)  |      |          |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |          |      |      |      |      | 0.179 |
| Low - Reforest cropland (1000 hectares)  |      |          |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |          |      |      |      |      | 0.423 |
| Low - Reforest pasture (1000 hectares)   |      |          |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |          |      |      |      |      | 15.4  |
| Low - Restore productivity (1000   |      |          |      |      |      |      |       |
| hectares)  |      |          |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |          |      |      |      |      | 91.2  |
| Low - Total impacted (over 30 years)   |      |          |      |      |      |      | ,     |
| (1000 hectares)  |      |          |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |          |      |      | +    |      | 0.851 |
| Mid - Accelerate regeneration (1000  |      |          |      |      |      |      | 0.031 |
| hectares)  |      |          |      |      |      |      |       |
| Herial Esj   |      |          |      |      |      |      |       |

| Tahla 12. Fx | econario -   | DILLAD 6. | Land sinks -   | Enrecte     | (continued) |
|--------------|--------------|-----------|----------------|-------------|-------------|
| Table 15. Et | SCEIIUI 10 - | PILLAK O. | LUIIU SIIIKS - | . คบา ยอเอา | COHUHUEUT   |

| Item                                       | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|--|------|------|------|------|------|------|-------|
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 27    |
| Mid - Avoid deforestation (over 30 years)  |      |      |      |      |      |      |       |
| (1000 hectares)                            |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 71    |
| Mid - Extend rotation length (1000         |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 7.57  |
| Mid - Improve plantations (1000 hectares)  |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 0     |
| Mid - Increase retention of HWP (1000      |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 6.05  |
| Mid - Increase trees outside forests (1000 |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 0.268 |
| Mid - Reforest cropland (1000 hectares)    |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 3.06  |
| Mid - Reforest pasture (1000 hectares)     |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 30.9  |
| Mid - Restore productivity (1000           |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 147   |
| Mid - Total impacted (over 30 years) (1000 |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |

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

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|---|------|------|------|------|------|------|-------|
| Natural gas consumption - Annual (tcf)      |      | 73.9 | 62.3 | 50   | 37.6 | 23.7 | 16.4  |
| Natural gas consumption - Cumulative (tcf)  |      |      |      |      |      |      | 1,505 |
| Natural gas production - Annual (tcf)       |      | 0    | 0    | 0    | 0    | 0    | 0     |
| Oil consumption - Annual (million bbls)     |      | 13.1 | 10.7 | 7.3  | 4.21 | 1.8  | 0     |
| Oil consumption - Cumulative (million bbls) |      |      |      |      |      |      | 229   |
| 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 -<br>Coal (million 2019\$)           |      | 129  | 0.09 | 0.089 | 0.082 | 0.057 | 0.005 |
| Monetary damages from air pollution -<br>Natural Gas (million 2019\$)    |      | 52.5 | 38.6 | 25.7  | 23.3  | 15.7  | 6.52  |
| Monetary damages from air pollution -<br>Transportation (million 2019\$) |      | 232  | 218  | 166   | 96.2  | 43.7  | 16.6  |
| Premature deaths from air pollution -<br>Coal (deaths)                   |      | 14.6 | 0.01 | 0.01  | 0.009 | 0.006 | 0.001 |
| Premature deaths from air pollution -<br>Natural Gas (deaths)            |      | 5.93 | 4.36 | 2.9   | 2.63  | 1.77  | 0.736 |
| Premature deaths from air pollution -<br>Transportation (deaths)         |      | 26.1 | 24.5 | 18.7  | 10.8  | 4.91  | 1.87  |

# Table 16: E+ scenario - IMPACTS - Jobs

| Item                                     | 2020 | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|--|------|-------|-------|-------|-------|-------|-------|
| By economic sector - Agriculture (jobs)  |      | 3.8   | 7.71  | 2.95  | 2.29  | 1.68  | 1.25  |
| By economic sector - Construction (jobs) |      | 1,159 | 1,095 | 1,419 | 1,414 | 4,193 | 7,337 |
| By economic sector - Manufacturing       |      | 1,426 | 2,601 | 2,635 | 2,094 | 2,841 | 2,826 |
| (jobs)                                   |      |       |       |       |       |       |       |
| By economic sector - Mining (jobs)       |      | 287   | 197   | 119   | 64.2  | 27.8  | 8.9   |

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

| Item         2020         2025         2030         2035         2040         2045           By economic sector - Other (jobs)         116         123         181         172         423           By economic sector - Pipeline (jobs)         81.8         67.9         52         36.7         21.4           By economic sector - Professional (jobs)         476         427         558         573         2,181           By economic sector - Trade (jobs)         359         317         376         364         1,221           By economic sector - Utilities (jobs)         1,300         1,156         1,571         1,840         5,242           By education level - All sectors - Associates degree or some college (jobs)         1,678         1,926         2,244         2,150         5,290           By education level - All sectors - Bachelors degree (jobs)         1,049         1,188         1,348         1,271         3,178           By education level - All sectors - Doctoral degree (jobs)         29.2         28.5         33.8         32.7         102           By education level - All sectors - High school diploma or less (jobs)         2,216         2,597         2,993         2,820         6,801           By education level - All sectors - Masters         238         25 | 2050<br>786<br>39.3<br>4,081<br>2,325<br>8,746<br>8,572<br>5,187 |
|--|--|
| By economic sector - Pipeline (jobs)         81.8         67.9         52         36.7         21.4           By economic sector - Professional (jobs)         476         427         558         573         2,181           By economic sector - Trade (jobs)         359         317         376         364         1,221           By economic sector - Utilities (jobs)         1,300         1,156         1,571         1,840         5,242           By education level - All sectors - Associates degree or some college (jobs)         1,678         1,926         2,244         2,150         5,290           By education level - All sectors - Bachelors degree (jobs)         1,049         1,188         1,348         1,271         3,178           By education level - All sectors - Doctoral degree (jobs)         29.2         28.5         33.8         32.7         102           By education level - All sectors - High school diploma or less (jobs)         2,216         2,597         2,993         2,820         6,801  | 39.3<br>4,081<br>2,325<br>8,746<br>8,572<br>5,187                |
| By economic sector - Professional (jobs)   476   427   558   573   2,181   | 4,081<br>2,325<br>8,746<br>8,572<br>5,187                        |
| By economic sector - Trade (jobs)         359         317         376         364         1,221           By economic sector - Utilities (jobs)         1,300         1,156         1,571         1,840         5,242           By education level - All sectors - Associates degree or some college (jobs)         1,678         1,926         2,244         2,150         5,290           By education level - All sectors - Bachelors degree (jobs)         1,049         1,188         1,348         1,271         3,178           By education level - All sectors - Doctoral degree (jobs)         29.2         28.5         33.8         32.7         102           By education level - All sectors - High school diploma or less (jobs)         2,216         2,597         2,993         2,820         6,801   | 2,325<br>8,746<br>8,572<br>5,187                                 |
| By economic sector - Utilities (jobs)         1,300         1,156         1,571         1,840         5,242           By education level - All sectors - Associates degree or some college (jobs)         1,678         1,926         2,244         2,150         5,290           By education level - All sectors - Bachelors degree (jobs)         1,049         1,188         1,348         1,271         3,178           By education level - All sectors - Doctoral degree (jobs)         29.2         28.5         33.8         32.7         102           By education level - All sectors - High school diploma or less (jobs)         2,216         2,597         2,993         2,820         6,801   | 8,746<br>8,572<br>5,187  |
| By education level - All sectors - Associates degree or some college (jobs)       1,678       1,926       2,244       2,150       5,290         By education level - All sectors - Bachelors degree (jobs)       1,049       1,188       1,348       1,271       3,178         By education level - All sectors - Doctoral degree (jobs)       29.2       28.5       33.8       32.7       102         By education level - All sectors - High school diploma or less (jobs)       2,216       2,597       2,993       2,820       6,801   | 5,187<br>183   |
| Associates degree or some college (jobs)  By education level - All sectors - Bachelors degree (jobs)  By education level - All sectors - Doctoral degree (jobs)  By education level - All sectors - High school diploma or less (jobs)   | 5,187  |
| By education level - All sectors - Bachelors degree (jobs)  By education level - All sectors - Doctoral degree (jobs)  By education level - All sectors - Doctoral degree (jobs)  By education level - All sectors - High school diploma or less (jobs)  1,049 1,188 1,348 1,271 3,178 29.2 28.5 33.8 32.7 102 4,800 6,801   | 183  |
| Bachelors degree (jobs)  By education level - All sectors - Doctoral degree (jobs)  By education level - All sectors - High school diploma or less (jobs)  By education level - All sectors - High school diploma or less (jobs)   | 183  |
| By education level - All sectors - Doctoral degree (jobs)  By education level - All sectors - High school diploma or less (jobs)  29.2 28.5 33.8 32.7 102 2,993 2,820 6,801  |  |
| degree (jobs)  By education level - All sectors - High cschool diploma or less (jobs)  2,216 2,597 2,993 2,820 6,801   |  |
| By education level - All sectors - High 2,216 2,597 2,993 2,820 6,801 school diploma or less (jobs)  | 10,887   |
| school diploma or less (jobs)  | .0,00.   |
|  |  |
| של באינים ווער באינים ווער באינים ווער באינים ווער באינים וווער באינים ווער באינים ווער באינים ווער באינים ווער  | 1,321  |
| or professional degree (jobs)  | , -  |
| By resource sector - Biomass (jobs)         16.3         21.3         8.39         6.88         6.13   | 5.33   |
| By resource sector - CO2 (jobs) 0 0 0 0  | 224  |
| By resource sector - Coal (jobs) 60.3 0 0 0  | 0  |
| By resource sector - Grid (jobs) 1,544 1,578 2,444 2,815 10,088  | 16,956   |
| By resource sector - Natural Gas (jobs)         1,224         934         898         1,048         701  | 713  |
| By resource sector - Nuclear (jobs) 0 0 0 0  | 0  |
| By resource sector - Oil (jobs)         583         435         275         147         58.8   | 0  |
| By resource sector - Solar (jobs)         1,777         2,924         3,212         2,308         2,259  | 2,349  |
| By resource sector - Wind (jobs)         4.99         99.5         77         236         3,040  | 5,904  |
| Median wages - Annual - All (\$2019 per 64,185 63,423 64,501 66,169 68,740 job)  | 70,482   |
| On-Site or In-Plant Training - Total jobs - 1 860 972 1,135 1,091 2,713  | 4,412  |
| to 4 years (jobs)  |  |
| On-Site or In-Plant Training - Total jobs - 4 338 340 414 417 1,130  | 1,912  |
| to 10 years (jobs)   |  |
| On-Site or In-Plant Training - Total jobs -         840         979         1,121         1,053         2,568  | 4,154  |
| None (jobs)  |  |
| On-Site or In-Plant Training - Total jobs -         45.4         50.2         59.7         58.7         150  | 246  |
| Over 10 years (jobs)   |  |
| On-Site or In-Plant Training - Total jobs -         3,126         3,652         4,184         3,941         9,592  | 15,426   |
| Up to 1 year (jobs)  | F 70F  |
| On-the-Job Training - All sectors - 1 to 4 1,107 1,241 1,453 1,403 3,514   | 5,735  |
| years (jobs)         329         328         404         411         1,127   | 1.01/  |
| On-the-Job Training - All sectors - 4 to 10 329 328 404 411 1,127 years (jobs)   | 1,916  |
| On-the-Job Training - All sectors - None 272 311 356 334 827   | 1,349  |
| (jobs)   | 1,347  |
| On-the-Job Training - All sectors - Over 10 53.6 66.8 74.5 67.3 150  | 233  |
| years (jobs)   | 200  |
| On-the-Job Training - All sectors - Up to 1 3,447 4,047 4,626 4,345 10,535   | 16,918   |
| year (jobs)  | 10,710   |
| Related work experience - All sectors - 1 1,867 2,125 2,453 2,336 5,797  | 9,419  |
| to 4 years (jobs)  | ,  |
| Related work experience - All sectors - 4 1,218 1,376 1,592 1,524 3,800  | 6,192  |
| to 10 years (jobs)   |  |
| Related work experience - All sectors - 754 856 994 952 2,345  | 3,805  |
| None (jobs)  |  |
| Related work experience - All sectors - 335 399 453 424 1,014  | 1,614  |
| Over 10 years (jobs)   |  |
| Related work experience - All sectors - Up         1,036         1,238         1,421         1,325         3,197   | 5,121  |
| to 1 year (jobs)   |  |
| Wage income - All (million \$2019)         334         380         446         434         1,110   | 1,843  |

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

| Item                                       | 2020  | 2025  | 2030  | 2035 | 2040 | 2045  | 2050 |
|--|-------|-------|-------|------|------|-------|------|
| Commercial HVAC investment in 2020s -      |       | 3,468 | 3,852 |      |      |       |      |
| Cumulative 5-yr (million \$2018)           |       |       |       |      |      |       |      |
| Sales of cooking units - Electric          | 32    | 36.2  | 40.9  | 53.4 | 71   | 81.7  | 85.5 |
| Resistance (%)                             |       |       |       |      |      |       |      |
| Sales of cooking units - Gas (%)           | 68    | 63.8  | 59.1  | 46.6 | 29   | 18.3  | 14.5 |
| Sales of space heating units - Electric    | 1.53  | 20.1  | 24.9  | 38.9 | 61.1 | 76.8  | 82.8 |
| Heat Pump (%)                              |       |       |       |      |      |       |      |
| Sales of space heating units - Electric    | 1.94  | 8.06  | 8.33  | 9.15 | 10.6 | 12    | 12.8 |
| Resistance (%)                             |       |       |       |      |      |       |      |
| Sales of space heating units - Fossil (%)  | 12.2  | 4.9   | 4.55  | 3.47 | 1.71 | 0.536 | 0.14 |
| Sales of space heating units - Gas Furnace | 84.3  | 66.9  | 62.2  | 48.4 | 26.6 | 10.7  | 4.3  |
| (%)  |       |       |       |      |      |       |      |
| Sales of water heating units - Electric    | 0.078 | 2.03  | 7.05  | 21.5 | 43.6 | 58.1  | 63.1 |
| Heat Pump (%)                              |       |       |       |      |      |       |      |
| Sales of water heating units - Electric    | 1.96  | 7.38  | 9.33  | 15.1 | 24   | 29.7  | 31.7 |
| Resistance (%)                             |       |       |       |      |      |       |      |
| Sales of water heating units - Gas Furnace | 93.3  | 86.1  | 79.2  | 59.5 | 29.1 | 9.29  | 2.42 |
| (%)  |       |       |       |      |      |       |      |
| Sales of water heating units - Other (%)   | 4.67  | 4.49  | 4.43  | 3.93 | 3.32 | 2.91  | 2.76 |

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

| Item  | 2020 | 2025  | 2030  | 2035  | 2040  | 2045 | 2050  |
|---|------|-------|-------|-------|-------|------|-------|
| Electricity distribution capital invested - |      | 0.457 | 0.458 | 0.597 | 0.614 | 0.89 | 0.939 |
| Cumulative 5-yr (billion \$2018)            |      |       |       |       |       |      |       |

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

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

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

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

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

| Item                                       | 2020  | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|--|-------|-------|-------|-------|-------|-------|-------|
| Light-duty vehicle capital costs -         |       | 0     | 31.3  | 65.7  | 222   | 699   | 1,018 |
| Cumulative 5-yr (million \$2018)           |       |       |       |       |       |       |       |
| Public EV charging plugs - DC Fast (1000   | 0.065 |       | 0.1   |       | 0.527 |       | 1.47  |
| units)                                     |       |       |       |       |       |       |       |
| Public EV charging plugs - L2 (1000 units) | 0.118 |       | 2.42  |       | 12.7  |       | 35.4  |
| Vehicle sales - Heavy-duty - diesel (%)    | 97.4  | 96    | 91.3  | 79.8  | 58.2  | 32.1  | 13.7  |
| Vehicle sales - Heavy-duty - EV (%)        | 0.498 | 1.45  | 4.11  | 10.8  | 23.6  | 39.5  | 51    |
| Vehicle sales - Heavy-duty - gasoline (%)  | 0.228 | 0.236 | 0.239 | 0.225 | 0.179 | 0.109 | 0.051 |
| Vehicle sales - Heavy-duty - hybrid (%)    | 0.083 | 0.094 | 0.104 | 0.107 | 0.092 | 0.06  | 0.03  |
| Vehicle sales - Heavy-duty - hydrogen FC   | 0.332 | 0.969 | 2.74  | 7.17  | 15.7  | 26.3  | 34    |
| (%)  |       |       |       |       |       |       |       |
| Vehicle sales - Heavy-duty - other (%)     | 1.5   | 1.28  | 1.46  | 1.95  | 2.25  | 1.96  | 1.14  |
| Vehicle sales - Light-duty - diesel (%)    | 1.45  | 1.88  | 2.04  | 1.61  | 1.02  | 0.523 | 0.225 |
| Vehicle sales - Light-duty - EV (%)        | 2.03  | 4.99  | 12.5  | 26.8  | 49.4  | 72.7  | 87.8  |
| Vehicle sales - Light-duty - gasoline (%)  | 91.3  | 86.9  | 78.6  | 65.4  | 45    | 24.1  | 10.7  |
| Vehicle sales - Light-duty - hybrid (%)    | 4.99  | 5.77  | 6.44  | 5.81  | 4.29  | 2.5   | 1.2   |
| Vehicle sales - Light-duty - hydrogen FC   | 0.112 | 0.377 | 0.319 | 0.241 | 0.169 | 0.094 | 0.044 |
| (%)  |       |       |       |       |       |       |       |
| Vehicle sales - Light-duty - other (%)     | 0.098 | 0.101 | 0.091 | 0.079 | 0.057 | 0.031 | 0.014 |
| Vehicle sales - Medium-duty - diesel (%)   | 64.8  | 62.2  | 57.7  | 49.4  | 35.6  | 19.6  | 8.37  |
| Vehicle sales - Medium-duty - EV (%)       | 0.664 | 1.94  | 5.49  | 14.3  | 31.4  | 52.6  | 68    |
| Vehicle sales - Medium-duty - gasoline (%) | 33.8  | 34.7  | 34.7  | 31.9  | 24.4  | 14.2  | 6.33  |
| Vehicle sales - Medium-duty - hybrid (%)   | 0.363 | 0.418 | 0.464 | 0.478 | 0.414 | 0.275 | 0.141 |
| Vehicle sales - Medium-duty - hydrogen     | 0.166 | 0.485 | 1.37  | 3.58  | 7.86  | 13.2  | 17    |
| FC (%)                                     |       |       |       |       |       |       |       |
| 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      |      |      |      |      |      |      | 0     |
| deployment - Corn-ethanol to energy     |      |      |      |      |      |      |       |
| grasses (1000 tCO2e/y)                  |      |      |      |      |      |      |       |
| Carbon sink potential - Aggressive      |      |      |      |      |      |      | -244  |
| deployment - Cropland measures (1000    |      |      |      |      |      |      |       |
| tCO2e/y)                                |      |      |      |      |      |      |       |
| Carbon sink potential - Aggressive      |      |      |      |      |      |      | -6.43 |
| deployment - Permanent conservation     |      |      |      |      |      |      |       |
| cover (1000 tCO2e/y)                    |      |      |      |      |      |      |       |
| Carbon sink potential - Aggressive      |      |      |      |      |      |      | -250  |
| deployment - Total (1000 tCO2e/y)       |      |      |      |      |      |      |       |
| Carbon sink potential - Moderate        |      |      |      |      |      |      | 0     |
| deployment - Corn-ethanol to energy     |      |      |      |      |      |      |       |
| grasses (1000 tCO2e/y)                  |      |      |      |      |      |      |       |
| Carbon sink potential - Moderate        |      |      |      |      |      |      | -126  |
| deployment - Cropland measures (1000    |      |      |      |      |      |      |       |
| tCO2e/y)                                |      |      |      |      |      |      |       |
| Carbon sink potential - Moderate        |      |      |      |      |      |      | -3.22 |
| deployment - Permanent conservation     |      |      |      |      |      |      |       |
| cover (1000 tCO2e/y)                    |      |      |      |      |      |      |       |
| Carbon sink potential - Moderate        |      |      |      |      |      |      | -129  |
| deployment - Total (1000 tCO2e/y)       |      |      |      |      |      |      |       |
| Land impacted for carbon sink -         |      |      |      |      |      |      | 0     |
| Aggressive deployment - Corn-ethanol to |      |      |      |      |      |      |       |
| energy grasses (1000 hectares)          |      |      |      |      |      |      |       |
| Land impacted for carbon sink -         |      |      |      |      |      |      | 171   |
| Aggressive deployment - Cropland        |      |      |      |      |      |      |       |
| measures (1000 hectares)                |      |      |      |      |      |      |       |
| Land impacted for carbon sink -         |      |      |      |      |      |      | 11.7  |
| Aggressive deployment - Permanent       |      |      |      |      |      |      |       |
| conservation cover (1000 hectares)      |      |      |      |      |      |      |       |

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

| Item                                     | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--|------|------|------|------|------|------|------|
| Land impacted for carbon sink -          |      |      |      |      |      |      | 183  |
| Aggressive deployment - Total (1000      |      |      |      |      |      |      |      |
| hectares)                                |      |      |      |      |      |      |      |
| Land impacted for carbon sink - Moderate |      |      |      |      |      |      | 0    |
| deployment - Corn-ethanol to energy      |      |      |      |      |      |      |      |
| grasses (1000 hectares)                  |      |      |      |      |      |      |      |
| Land impacted for carbon sink - Moderate |      |      |      |      |      |      | 88.6 |
| deployment - Cropland measures (1000     |      |      |      |      |      |      |      |
| hectares)                                |      |      |      |      |      |      |      |
| Land impacted for carbon sink - Moderate |      |      |      |      |      |      | 5.85 |
| deployment - Permanent conservation      |      |      |      |      |      |      |      |
| cover (1000 hectares)                    |      |      |      |      |      |      |      |
| Land impacted for carbon sink - Moderate |      |      |      |      |      |      | 94.5 |
| deployment - Total (1000 hectares)       |      |      |      |      |      |      |      |

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

| Item                                      | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|---|------|------|------|------|------|------|-------|
| Carbon sink potential - High - Accelerate |      |      |      |      |      |      | -6.94 |
| regeneration (1000 tCO2e/y)               |      |      |      |      |      |      |       |
| Carbon sink potential - High - All (not   |      |      |      |      |      |      | -901  |
| counting overlap) (1000 tCO2e/y)          |      |      |      |      |      |      |       |
| Carbon sink potential - High - Avoid      |      |      |      |      |      |      | -206  |
| deforestation (1000 tCO2e/y)              |      |      |      |      |      |      |       |
| Carbon sink potential - High - Extend     |      |      |      |      |      |      | -201  |
| rotation length (1000 tCO2e/y)            |      |      |      |      |      |      |       |
| Carbon sink potential - High - Improve    |      |      |      |      |      |      | -27.3 |
| plantations (1000 tCO2e/y)                |      |      |      |      |      |      |       |
| Carbon sink potential - High - Increase   |      |      |      |      |      |      | -208  |
| retention of HWP (1000 tCO2e/y)           |      |      |      |      |      |      |       |
| Carbon sink potential - High - Increase   |      |      |      |      |      |      | -83.5 |
| trees outside forests (1000 tCO2e/y)      |      |      |      |      |      |      |       |
| Carbon sink potential - High - Reforest   |      |      |      |      |      |      | -5.4  |
| cropland (1000 tCO2e/y)                   |      |      |      |      |      |      |       |
| Carbon sink potential - High - Reforest   |      |      |      |      |      |      | -85.9 |
| pasture (1000 tCO2e/y)                    |      |      |      |      |      |      |       |
| Carbon sink potential - High - Restore    |      |      |      |      |      |      | -76.6 |
| productivity (1000 tCO2e/y)               |      |      |      |      |      |      |       |
| Carbon sink potential - Low - Accelerate  |      |      |      |      |      |      | -3.48 |
| regeneration (1000 tCO2e/y)               |      |      |      |      |      |      |       |
| Carbon sink potential - Low - All (not    |      |      |      |      |      |      | -263  |
| counting overlap) (1000 tCO2e/y)          |      |      |      |      |      |      |       |
| Carbon sink potential - Low - Avoid       |      |      |      |      |      |      | -34.3 |
| deforestation (1000 tCO2e/y)              |      |      |      |      |      |      |       |
| Carbon sink potential - Low - Extend      |      |      |      |      |      |      | -77.3 |
| rotation length (1000 tCO2e/y)            |      |      |      |      |      |      |       |
| Carbon sink potential - Low - Improve     |      |      |      |      |      |      | -13.9 |
| plantations (1000 tCO2e/y)                |      |      |      |      |      |      |       |
| Carbon sink potential - Low - Increase    |      |      |      |      |      |      | -69.4 |
| retention of HWP (1000 tCO2e/y)           |      |      |      |      |      |      |       |
| Carbon sink potential - Low - Increase    |      |      |      |      |      |      | -29.2 |
| trees outside forests (1000 tC02e/y)      |      |      |      |      |      |      |       |
| Carbon sink potential - Low - Reforest    |      |      |      |      |      |      | -2.7  |
| cropland (1000 tCO2e/y)                   |      |      |      |      |      |      |       |
| Carbon sink potential - Low - Reforest    |      |      |      |      |      |      | -6.51 |
| pasture (1000 tC02e/y)                    |      |      |      |      |      |      |       |
| Carbon sink potential - Low - Restore     |      |      |      |      |      |      | -25.8 |
| productivity (1000 tCO2e/y)               |      |      |      |      |      |      |       |
| Carbon sink potential - Mid - Accelerate  |      |      |      |      |      |      | -5.21 |
| regeneration (1000 tCO2e/y)               |      |      |      |      |      |      |       |

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

| Item Contact part notantial Mid. All (not                               | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050<br>-581 |
|---|------|------|------|------|------|------|--------------|
| Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y) |      |      |      |      |      |      | -58          |
| Carbon sink potential - Mid - Avoid                                     |      |      |      |      |      |      | -120         |
| deforestation (1000 tCO2e/y)  |      |      |      |      |      |      | -120         |
| Carbon sink potential - Mid - Extend                                    |      |      |      |      |      |      | -139         |
| rotation length (1000 tC02e/y)  |      |      |      |      |      |      | -137         |
| Carbon sink potential - Mid - Improve                                   |      |      |      |      |      |      | -20.4        |
| plantations (1000 tCO2e/y)  |      |      |      |      |      |      | -20.4        |
| Carbon sink potential - Mid - Increase                                  |      |      |      |      |      |      | -139         |
| retention of HWP (1000 tC02e/y)   |      |      |      |      |      |      | -107         |
| Carbon sink potential - Mid - Increase                                  |      |      |      |      |      |      | -56.4        |
| trees outside forests (1000 tC02e/y)                                    |      |      |      |      |      |      | -50.4        |
| Carbon sink potential - Mid - Reforest                                  |      |      |      |      |      |      | -4.05        |
| cropland (1000 tCO2e/y)   |      |      |      |      |      |      | 4.00         |
| Carbon sink potential - Mid - Reforest                                  |      |      |      |      |      |      | -46.2        |
| pasture (1000 tC02e/y)  |      |      |      |      |      |      | -40.2        |
| Carbon sink potential - Mid - Restore                                   |      |      |      |      |      |      | -51.2        |
| productivity (1000 tC02e/y)   |      |      |      |      |      |      | 01.2         |
| Land impacted for carbon sink potential -                               |      |      |      |      |      |      | 1.13         |
| High - Accelerate regeneration (1000                                    |      |      |      |      |      |      | 1.10         |
| hectares)   |      |      |      |      |      |      |              |
| Land impacted for carbon sink potential -                               |      |      |      |      |      |      | 27.8         |
| High - Avoid deforestation (over 30 years)                              |      |      |      |      |      |      | 21.0         |
| (1000 hectares)   |      |      |      |      |      |      |              |
| Land impacted for carbon sink potential -                               |      |      |      |      |      |      | 103          |
| High - Extend rotation length (1000                                     |      |      |      |      |      |      | 100          |
| hectares)   |      |      |      |      |      |      |              |
| Land impacted for carbon sink potential -                               |      |      |      |      |      |      | 10.1         |
| High - Improve plantations (1000  |      |      |      |      |      |      | 10.          |
| hectares)   |      |      |      |      |      |      |              |
| Land impacted for carbon sink potential -                               |      |      |      |      |      |      | C            |
| High - Increase retention of HWP (1000                                  |      |      |      |      |      |      |              |
| hectares)   |      |      |      |      |      |      |              |
| Land impacted for carbon sink potential -                               |      |      |      |      |      |      | 7.93         |
| High - Increase trees outside forests                                   |      |      |      |      |      |      |              |
| (1000 hectares)   |      |      |      |      |      |      |              |
| Land impacted for carbon sink potential -                               |      |      |      |      |      |      | 0.357        |
| High - Reforest cropland (1000 hectares)                                |      |      |      |      |      |      |              |
| Land impacted for carbon sink potential -                               |      |      |      |      |      |      | 2.44         |
| High - Reforest pasture (1000 hectares)                                 |      |      |      |      |      |      |              |
| Land impacted for carbon sink potential -                               |      |      |      |      |      |      | 25.4         |
| High - Restore productivity (1000                                       |      |      |      |      |      |      |              |
| hectares)   |      |      |      |      |      |      |              |
| Land impacted for carbon sink potential -                               |      |      |      |      |      |      | 178          |
| High - Total impacted (over 30 years)                                   |      |      |      |      |      |      |              |
| (1000 hectares)   |      |      |      |      |      |      |              |
| Land impacted for carbon sink potential -                               |      |      |      |      |      |      | 0.567        |
| Low - Accelerate regeneration (1000                                     |      |      |      |      |      |      |              |
| hectares)   |      |      |      |      |      |      |              |
| Land impacted for carbon sink potential -                               |      |      |      |      |      |      | 26.1         |
| Low - Avoid deforestation (over 30 years)                               |      |      |      |      |      |      |              |
| (1000 hectares)   |      |      |      |      |      |      |              |
| Land impacted for carbon sink potential -                               |      |      |      |      |      |      | 39.3         |
| Low - Extend rotation length (1000                                      |      |      |      |      |      |      | 27.0         |
| hectares)   |      |      |      |      |      |      |              |
| Land impacted for carbon sink potential -                               |      |      |      |      |      |      | 5.03         |
| Low - Improve plantations (1000   |      |      |      |      |      |      | 5.50         |
| hectares)   |      |      |      |      |      |      |              |
| Land impacted for carbon sink potential -                               |      |      |      |      | +    |      | C            |
| Low - Increase retention of HWP (1000                                   |      |      |      |      |      |      |              |
| hectares)   |      |      |      |      |      |      |              |

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

| Item                                       | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|--|------|------|------|------|------|------|-------|
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 4.17  |
| Low - Increase trees outside forests       |      |      |      |      |      |      |       |
| (1000 hectares)                            |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 0.179 |
| Low - Reforest cropland (1000 hectares)    |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 0.423 |
| Low - Reforest pasture (1000 hectares)     |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 15.4  |
| Low - Restore productivity (1000           |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 91.2  |
| Low - Total impacted (over 30 years)       |      |      |      |      |      |      |       |
| (1000 hectares)                            |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 0.851 |
| Mid - Accelerate regeneration (1000        |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 27    |
| Mid - Avoid deforestation (over 30 years)  |      |      |      |      |      |      |       |
| (1000 hectares)                            |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 71    |
| Mid - Extend rotation length (1000         |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 7.57  |
| Mid - Improve plantations (1000 hectares)  |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 0     |
| Mid - Increase retention of HWP (1000      |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 6.05  |
| Mid - Increase trees outside forests (1000 |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 0.268 |
| Mid - Reforest cropland (1000 hectares)    |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 3.06  |
| Mid - Reforest pasture (1000 hectares)     |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 30.9  |
| Mid - Restore productivity (1000           |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 147   |
| Mid - Total impacted (over 30 years) (1000 |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |

Table 24: E- scenario - IMPACTS - Health

| Item   | 2020 | 2025 | 2030 | 2035  | 2040  | 2045  | 2050  |
|--|------|------|------|-------|-------|-------|-------|
| Monetary damages from air pollution -<br>Coal (million 2019\$)           |      | 129  | 0.09 | 0.089 | 0.082 | 0.057 | 0.005 |
| Monetary damages from air pollution -<br>Natural Gas (million 2019\$)    |      | 47.6 | 30.8 | 13.4  | 5.77  | 1.89  | 1.29  |
| Monetary damages from air pollution -<br>Transportation (million 2019\$) |      | 237  | 240  | 234   | 212   | 169   | 116   |
| Premature deaths from air pollution -<br>Coal (deaths)                   |      | 14.6 | 0.01 | 0.01  | 0.009 | 0.006 | 0.001 |
| Premature deaths from air pollution -<br>Natural Gas (deaths)            |      | 5.37 | 3.48 | 1.51  | 0.651 | 0.213 | 0.146 |
| Premature deaths from air pollution -<br>Transportation (deaths)         |      | 26.6 | 27   | 26.4  | 23.8  | 19    | 13.1  |

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

| Item  | 2020  | 2025  | 2030  | 2035  | 2040 | 2045 | 2050 |
|---|-------|-------|-------|-------|------|------|------|
| Commercial HVAC investment in 2020s -<br>Cumulative 5-yr (million \$2018) |       | 3,472 | 3,883 |       |      |      |      |
| Sales of cooking units - Electric Resistance (%)                          | 32    | 46    | 79.9  | 86.5  | 86.9 | 86.9 | 86.9 |
| Sales of cooking units - Gas (%)  | 68    | 54    | 20.1  | 13.5  | 13.1 | 13.1 | 13.1 |
| Sales of space heating units - Electric<br>Heat Pump (%)                  | 1.53  | 28.2  | 70.6  | 83.7  | 85   | 85.1 | 85.1 |
| Sales of space heating units - Electric<br>Resistance (%)                 | 1.94  | 8.4   | 10.6  | 12.7  | 13.1 | 13.1 | 13.1 |
| Sales of space heating units - Fossil (%)                                 | 12.2  | 4.23  | 0.808 | 0.035 | 0    | 0    | 0    |
| Sales of space heating units - Gas Furnace (%)                            | 84.3  | 59.2  | 18.1  | 3.53  | 1.88 | 1.85 | 1.84 |
| Sales of water heating units - Electric<br>Heat Pump (%)                  | 0.078 | 10.5  | 54.6  | 64.4  | 64.9 | 64.9 | 64.9 |
| Sales of water heating units - Electric<br>Resistance (%)                 | 1.96  | 10.8  | 28.3  | 32.2  | 32.4 | 32.4 | 32.4 |
| Sales of water heating units - Gas Furnace (%)                            | 93.3  | 74.5  | 14.1  | 0.593 | 0    | 0    | 0    |
| Sales of water heating units - Other (%)                                  | 4.67  | 4.25  | 3.03  | 2.72  | 2.72 | 2.72 | 2.71 |

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

| Item  | 2020 | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|---|------|-------|-------|-------|-------|-------|-------|
| Electricity distribution capital invested - |      | 0.526 | 0.536 | 0.919 | 0.973 | 0.907 | 0.947 |
| Cumulative 5-yr (billion \$2018)            |      |       |       |       |       |       |       |

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

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

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

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

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

| Item                                       | 2020  | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|--|-------|-------|-------|-------|-------|-------|-------|
| Light-duty vehicle capital costs -         |       | 193   | 496   | 803   | 1,217 | 1,325 | 1,263 |
| Cumulative 5-yr (million \$2018)           |       |       |       |       |       |       |       |
| Public EV charging plugs - DC Fast (1000   | 0.065 |       | 0.324 |       | 1.42  |       | 2.3   |
| units)                                     |       |       |       |       |       |       |       |
| Public EV charging plugs - L2 (1000 units) | 0.118 |       | 7.8   |       | 34.2  |       | 55.3  |
| Vehicle sales - Heavy-duty - diesel (%)    | 97.2  | 92.1  | 67    | 23.3  | 4.22  | 0.628 | 0     |
| Vehicle sales - Heavy-duty - EV (%)        | 0.588 | 3.81  | 19    | 45.6  | 57.4  | 59.6  | 60    |
| Vehicle sales - Heavy-duty - gasoline (%)  | 0.227 | 0.227 | 0.176 | 0.066 | 0.013 | 0.002 | 0     |
| Vehicle sales - Heavy-duty - hybrid (%)    | 0.082 | 0.09  | 0.077 | 0.031 | 0.007 | 0.001 | 0     |
| Vehicle sales - Heavy-duty - hydrogen FC   | 0.392 | 2.54  | 12.7  | 30.4  | 38.2  | 39.7  | 40    |
| (%)  |       |       |       |       |       |       |       |
| Vehicle sales - Heavy-duty - other (%)     | 1.5   | 1.23  | 1.07  | 0.568 | 0.163 | 0.038 | 0     |
| Vehicle sales - Light-duty - diesel (%)    | 1.43  | 1.71  | 1.21  | 0.386 | 0.073 | 0.013 | 0     |
| Vehicle sales - Light-duty - EV (%)        | 4.31  | 16.4  | 48.3  | 82.5  | 96.4  | 99.3  | 100   |
| Vehicle sales - Light-duty - gasoline (%)  | 89.2  | 76.6  | 46.9  | 15.8  | 3.2   | 0.587 | 0     |
| Vehicle sales - Light-duty - hybrid (%)    | 4.8   | 4.82  | 3.34  | 1.23  | 0.301 | 0.066 | 0     |
| Vehicle sales - Light-duty - hydrogen FC   | 0.11  | 0.333 | 0.194 | 0.06  | 0.012 | 0.002 | 0     |
| (%)  |       |       |       |       |       |       |       |
| Vehicle sales - Light-duty - other (%)     | 0.096 | 0.092 | 0.059 | 0.021 | 0.004 | 0.001 | 0     |
| Vehicle sales - Medium-duty - diesel (%)   | 64.7  | 59.7  | 42.3  | 14.4  | 2.59  | 0.384 | 0     |
| Vehicle sales - Medium-duty - EV (%)       | 0.784 | 5.07  | 25.3  | 60.8  | 76.5  | 79.5  | 80    |
| Vehicle sales - Medium-duty - gasoline (%) | 33.7  | 33.3  | 25.5  | 9.32  | 1.77  | 0.277 | 0     |
| Vehicle sales - Medium-duty - hybrid (%)   | 0.363 | 0.402 | 0.341 | 0.14  | 0.03  | 0.005 | 0     |
| Vehicle sales - Medium-duty - hydrogen     | 0.196 | 1.27  | 6.33  | 15.2  | 19.1  | 19.9  | 20    |
| FC (%)                                     |       |       |       |       |       |       |       |
| Vehicle sales - Medium-duty - other (%)    | 0.253 | 0.255 | 0.205 | 0.083 | 0.019 | 0.004 | 0     |

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

| Item  | 2020 | 2025 | 2030  | 2035  | 2040  | 2045  | 2050   |
|---|------|------|-------|-------|-------|-------|--------|
| Capital invested - Offshore Wind - Base     |      | 0    | 0     | 0     | 3.88  | 7.84  | 1.02   |
| (billion \$2018)                            |      |      |       |       |       |       |        |
| Capital invested - Solar PV - Base (billion |      | 0    | 0.242 | 0     | 0     | 0     | 2.91   |
| \$2018)                                     |      |      |       |       |       |       |        |
| Capital invested - Wind - Base (billion     |      | 0    | 0     | 0     | 0     | 0     | 0.246  |
| \$2018)                                     |      |      |       |       |       |       |        |
| Installed renewables - OffshoreWind -       | 0    | 0    | 0     | 0     | 2,235 | 7,552 | 8,319  |
| Base land use assumptions (MW)              |      |      |       |       |       |       |        |
| Installed renewables - OffshoreWind -       | 0    | 0    | 0     | 0     | 4,479 | 4,479 | 16,647 |
| Constrained land use assumptions (MW)       |      |      |       |       |       |       |        |
| Installed renewables - Solar - Base land    | 39.8 | 39.8 | 276   | 276   | 276   | 276   | 3,955  |
| use assumptions (MW)                        |      |      |       |       |       |       |        |
| Installed renewables - Solar -              | 79.6 | 327  | 1,722 | 1,722 | 1,722 | 1,722 | 8,675  |
| Constrained land use assumptions (MW)       |      |      |       |       |       |       |        |
| Installed renewables - Wind - Base land     | 2    | 2    | 2     | 2     | 2     | 2     | 131    |
| use assumptions (MW)                        |      |      |       |       |       |       |        |
| Installed renewables - Wind - Constrained   | 4    | 4    | 4     | 4     | 4     | 4     | 4      |
| land use assumptions (MW)                   |      |      |       |       |       |       |        |

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

| Item                                     | 2020 | 2025 | 2030  | 2035  | 2040   | 2045   | 2050   |
|--|------|------|-------|-------|--------|--------|--------|
| OffshoreWind - Base land use             | 0    | 0    | 0     | 0     | 9,506  | 33,967 | 37,615 |
| assumptions (GWh)                        |      |      |       |       |        |        |        |
| OffshoreWind - Constrained land use      | 0    | 0    | 0     | 0     | 19,052 | 19,052 | 75,270 |
| assumptions (GWh)                        |      |      |       |       |        |        |        |
| Solar - Base land use assumptions (GWh)  | 75.2 | 75.2 | 454   | 454   | 454    | 454    | 6,352  |
| Solar - Constrained land use assumptions | 150  | 548  | 2,786 | 2,786 | 2,786  | 2,786  | 13,929 |
| (GWh)                                    |      |      |       |       |        |        |        |
| Wind - Base land use assumptions (GWh)   | 8.07 | 8.07 | 8.07  | 8.07  | 8.07   | 8.07   | 403    |

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

| Item                                    | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|------|------|------|------|------|------|------|
| Wind - Constrained land use assumptions | 16.1 | 16.1 | 16.1 | 16.1 | 16.1 | 16.1 | 16.1 |
| (GWh)                                   |      |      |      |      |      |      |      |

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

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|--|------|------|------|------|------|------|-------|
| Carbon sink potential - Aggressive                 |      |      |      |      |      |      | 0     |
| deployment - Corn-ethanol to energy                |      |      |      |      |      |      |       |
| grasses (1000 tCO2e/y)                             |      |      |      |      |      |      |       |
| Carbon sink potential - Aggressive                 |      |      |      |      |      |      | -244  |
| deployment - Cropland measures (1000               |      |      |      |      |      |      |       |
| tCO2e/y)   |      |      |      |      |      |      |       |
| Carbon sink potential - Aggressive                 |      |      |      |      |      |      | -6.43 |
| deployment - Permanent conservation                |      |      |      |      |      |      |       |
| cover (1000 tCO2e/y)                               |      |      |      |      |      |      |       |
| Carbon sink potential - Aggressive                 |      |      |      |      |      |      | -250  |
| deployment - Total (1000 tCO2e/y)                  |      |      |      |      |      |      |       |
| Carbon sink potential - Moderate                   |      |      |      |      |      |      | 0     |
| deployment - Corn-ethanol to energy                |      |      |      |      |      |      |       |
| grasses (1000 tC02e/y)                             |      |      |      |      |      |      |       |
| Carbon sink potential - Moderate                   |      |      |      |      |      |      | -126  |
| deployment - Cropland measures (1000               |      |      |      |      |      |      |       |
| tCO2e/y)   |      |      |      |      |      |      |       |
| Carbon sink potential - Moderate                   |      |      |      |      |      |      | -3.22 |
| deployment - Permanent conservation                |      |      |      |      |      |      | 0.22  |
| cover (1000 tC02e/y)                               |      |      |      |      |      |      |       |
| Carbon sink potential - Moderate                   |      |      |      |      |      |      | -129  |
| deployment - Total (1000 tC02e/y)                  |      |      |      |      |      |      | 127   |
| Land impacted for carbon sink -                    |      |      |      |      |      |      | 0     |
| Aggressive deployment - Corn-ethanol to            |      |      |      |      |      |      | O     |
| energy grasses (1000 hectares)                     |      |      |      |      |      |      |       |
| Land impacted for carbon sink -                    |      |      |      |      |      |      | 171   |
| Aggressive deployment - Cropland                   |      |      |      |      |      |      | 111   |
| measures (1000 hectares)                           |      |      |      |      |      |      |       |
| Land impacted for carbon sink -                    |      |      |      |      |      |      | 11.7  |
| Aggressive deployment - Permanent                  |      |      |      |      |      |      | 11.1  |
| conservation cover (1000 hectares)                 |      |      |      |      |      |      |       |
| Land impacted for carbon sink -                    |      |      |      |      |      |      | 183   |
| ·  |      |      |      |      |      |      | 103   |
| Aggressive deployment - Total (1000                |      |      |      |      |      |      |       |
| hectares) Land impacted for carbon sink - Moderate |      |      |      |      |      |      | 0     |
|  |      |      |      |      |      |      | U     |
| deployment - Corn-ethanol to energy                |      |      |      |      |      |      |       |
| grasses (1000 hectares)                            |      |      |      |      |      |      | 00.7  |
| Land impacted for carbon sink - Moderate           |      |      |      |      |      |      | 88.6  |
| deployment - Cropland measures (1000               |      |      |      |      |      |      |       |
| hectares)  |      |      |      |      |      |      |       |
| Land impacted for carbon sink - Moderate           |      |      |      |      |      |      | 5.85  |
| deployment - Permanent conservation                |      |      |      |      |      |      |       |
| cover (1000 hectares)                              |      |      |      |      |      |      |       |
| Land impacted for carbon sink - Moderate           |      |      |      |      |      |      | 94.5  |
| deployment - Total (1000 hectares)                 |      |      |      |      |      |      |       |

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

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|--|------|------|------|------|------|------|-------|
| Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)    |      |      |      |      |      |      | -6.94 |
| Carbon sink potential - High - All (not counting overlap) (1000 tC02e/y) |      |      |      |      |      |      | -901  |
| Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)        |      |      |      |      |      |      | -206  |

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

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 205  |
|--|------|------|------|------|------|------|------|
| Carbon sink potential - High - Extend rotation length (1000 tCO2e/y) |      |      |      |      |      |      | -20  |
| • , , , , , , , , , , , , , , , , , , ,                              |      |      |      |      |      |      | 07   |
| Carbon sink potential - High - Improve                               |      |      |      |      |      |      | -27. |
| plantations (1000 tC02e/y)   |      |      |      |      |      |      | 00   |
| Carbon sink potential - High - Increase                              |      |      |      |      |      |      | -20  |
| retention of HWP (1000 tCO2e/y)                                      |      |      |      |      |      |      |      |
| Carbon sink potential - High - Increase                              |      |      |      |      |      |      | -83. |
| trees outside forests (1000 tCO2e/y)                                 |      |      |      |      |      |      |      |
| Carbon sink potential - High - Reforest                              |      |      |      |      |      |      | -5.  |
| cropland (1000 tCO2e/y)  |      |      |      |      |      |      |      |
| Carbon sink potential - High - Reforest                              |      |      |      |      |      |      | -85. |
| pasture (1000 tCO2e/y)   |      |      |      |      |      |      |      |
| Carbon sink potential - High - Restore                               |      |      |      |      |      |      | -76. |
| productivity (1000 tCO2e/y)  |      |      |      |      |      |      |      |
| Carbon sink potential - Low - Accelerate                             |      |      |      |      |      |      | -3.4 |
| regeneration (1000 tCO2e/y)  |      |      |      |      |      |      |      |
| Carbon sink potential - Low - All (not                               |      |      |      |      |      |      | -26  |
| counting overlap) (1000 tCO2e/y)                                     |      |      |      |      |      |      |      |
| Carbon sink potential - Low - Avoid                                  |      |      |      |      |      |      | -34  |
| deforestation (1000 tCO2e/y)   |      |      |      |      |      |      | 0-1  |
| Carbon sink potential - Low - Extend                                 |      |      |      |      |      |      | -77  |
| rotation length (1000 tC02e/y)                                       |      |      |      |      |      |      | -11  |
|  |      |      |      |      |      |      | -13  |
| Carbon sink potential - Low - Improve                                |      |      |      |      |      |      | -13  |
| plantations (1000 tCO2e/y)   |      |      |      |      |      |      |      |
| Carbon sink potential - Low - Increase                               |      |      |      |      |      |      | -69  |
| retention of HWP (1000 tC02e/y)                                      |      |      |      |      |      |      |      |
| Carbon sink potential - Low - Increase                               |      |      |      |      |      |      | -29  |
| trees outside forests (1000 tCO2e/y)                                 |      |      |      |      |      |      |      |
| Carbon sink potential - Low - Reforest                               |      |      |      |      |      |      | -2   |
| cropland (1000 tCO2e/y)  |      |      |      |      |      |      |      |
| Carbon sink potential - Low - Reforest                               |      |      |      |      |      |      | -6.  |
| pasture (1000 tCO2e/y)   |      |      |      |      |      |      |      |
| Carbon sink potential - Low - Restore                                |      |      |      |      |      |      | -25. |
| productivity (1000 tCO2e/y)  |      |      |      |      |      |      |      |
| Carbon sink potential - Mid - Accelerate                             |      |      |      |      |      |      | -5.2 |
| regeneration (1000 tCO2e/y)  |      |      |      |      |      |      |      |
| Carbon sink potential - Mid - All (not                               |      |      |      |      |      |      | -58  |
| counting overlap) (1000 tCO2e/y)                                     |      |      |      |      |      |      |      |
| Carbon sink potential - Mid - Avoid                                  |      |      |      |      |      |      | -12  |
| deforestation (1000 tC02e/y)   |      |      |      |      |      |      | 12   |
| Carbon sink potential - Mid - Extend                                 |      |      |      |      |      |      | -13  |
| rotation length (1000 tC02e/y)                                       |      |      |      |      |      |      | -10  |
|  |      |      |      |      |      |      | 00   |
| Carbon sink potential - Mid - Improve                                |      |      |      |      |      |      | -20  |
| plantations (1000 tCO2e/y)   |      |      |      |      |      |      |      |
| Carbon sink potential - Mid - Increase                               |      |      |      |      |      |      | -13  |
| retention of HWP (1000 tCO2e/y)                                      |      |      |      |      |      |      |      |
| Carbon sink potential - Mid - Increase                               |      |      |      |      |      |      | -56  |
| trees outside forests (1000 tCO2e/y)                                 |      |      |      |      |      |      |      |
| Carbon sink potential - Mid - Reforest                               |      |      |      |      |      |      | -4.0 |
| cropland (1000 tCO2e/y)  |      |      |      |      |      |      |      |
| Carbon sink potential - Mid - Reforest                               |      |      |      |      |      |      | -46  |
| pasture (1000 tC02e/y)   |      |      |      |      |      |      |      |
| Carbon sink potential - Mid - Restore                                |      |      |      |      |      |      | -51  |
| productivity (1000 tCO2e/y)  |      |      |      |      |      |      | ٠.   |
| and impacted for carbon sink potential -                             |      |      |      |      |      |      | 1.   |
| High - Accelerate regeneration (1000                                 |      |      |      |      |      |      | 1.   |
| nectares)  |      |      |      |      |      |      |      |
| -  |      |      |      |      |      |      | 27.  |
| and impacted for carbon sink potential -                             |      |      |      |      |      |      | 27   |
| High - Avoid deforestation (over 30 years) (1000 hectares)           |      |      |      |      |      |      |      |

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

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050<br>103 |
|---|------|------|------|------|------|------|-------------|
| Land impacted for carbon sink potential -<br>High - Extend rotation length (1000<br>hectares)                     |      |      |      |      |      |      | 103         |
| Land impacted for carbon sink potential -<br>High - Improve plantations (1000                                     |      |      |      |      |      |      | 10.1        |
| hectares) Land impacted for carbon sink potential - High - Increase retention of HWP (1000                        |      |      |      |      |      |      | 0           |
| hectares) Land impacted for carbon sink potential - High - Increase trees outside forests                         |      |      |      |      |      |      | 7.93        |
| (1000 hectares)  Land impacted for carbon sink potential -  |      |      |      |      |      |      | 0.357       |
| High - Reforest cropland (1000 hectares)  Land impacted for carbon sink potential -                               |      |      |      |      |      |      | 2.44        |
| High - Reforest pasture (1000 hectares) Land impacted for carbon sink potential -                                 |      |      |      |      |      |      | 25.4        |
| High - Restore productivity (1000 hectares)   |      |      |      |      |      |      |             |
| Land impacted for carbon sink potential -<br>High - Total impacted (over 30 years)<br>(1000 hectares)             |      |      |      |      |      |      | 178         |
| Land impacted for carbon sink potential -<br>Low - Accelerate regeneration (1000<br>hectares)                     |      |      |      |      |      |      | 0.567       |
| Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)               |      |      |      |      |      |      | 26.1        |
| Land impacted for carbon sink potential -<br>Low - Extend rotation length (1000                                   |      |      |      |      |      |      | 39.3        |
| hectares) Land impacted for carbon sink potential - Low - Improve plantations (1000                               |      |      |      |      |      |      | 5.03        |
| hectares) Land impacted for carbon sink potential - Low - Increase retention of HWP (1000                         |      |      |      |      |      |      | O           |
| hectares) Land impacted for carbon sink potential - Low - Increase trees outside forests                          |      |      |      |      |      |      | 4.17        |
| (1000 hectares)  Land impacted for carbon sink potential -  |      |      |      |      |      |      | 0.179       |
| Low - Reforest cropland (1000 hectares) Land impacted for carbon sink potential -                                 |      |      |      |      |      |      | 0.423       |
| Low - Reforest pasture (1000 hectares) Land impacted for carbon sink potential - Low - Restore productivity (1000 |      |      |      |      |      |      | 15.4        |
| hectares) Land impacted for carbon sink potential - Low - Total impacted (over 30 years)                          |      |      |      |      |      |      | 91.2        |
| (1000 hectares) Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000                     |      |      |      |      |      |      | 0.85        |
| hectares) Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years)                     |      |      |      |      |      |      | 27          |
| (1000 hectares)  Land impacted for carbon sink potential - Mid - Extend rotation length (1000                     |      |      |      |      |      |      | 71          |
| hectares)  Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)                    |      |      |      |      |      |      | 7.57        |

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 -  |      |      |      |      |      |      | 0     |
| Mid - Increase retention of HWP (1000      |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 6.05  |
| Mid - Increase trees outside forests (1000 |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 0.268 |
| Mid - Reforest cropland (1000 hectares)    |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 3.06  |
| Mid - Reforest pasture (1000 hectares)     |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 30.9  |
| Mid - Restore productivity (1000           |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 147   |
| Mid - Total impacted (over 30 years) (1000 |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |

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

| Item                                  | 2020 | 2025 | 2030 | 2035  | 2040  | 2045  | 2050  |
|---------------------------------------|------|------|------|-------|-------|-------|-------|
| Monetary damages from air pollution - |      | 129  | 0.09 | 0.089 | 0.082 | 0.057 | 0.005 |
| Coal (million 2019\$)                 |      |      |      |       |       |       |       |
| Monetary damages from air pollution - |      | 43.7 | 32.3 | 19.8  | 13.5  | 4.78  | 0.946 |
| Natural Gas (million 2019\$)          |      |      |      |       |       |       |       |
| Monetary damages from air pollution - |      | 232  | 218  | 166   | 96.2  | 43.7  | 16.6  |
| Transportation (million 2019\$)       |      |      |      |       |       |       |       |
| Premature deaths from air pollution - |      | 14.6 | 0.01 | 0.01  | 0.009 | 0.006 | 0.001 |
| Coal (deaths)                         |      |      |      |       |       |       |       |
| Premature deaths from air pollution - |      | 4.93 | 3.65 | 2.23  | 1.52  | 0.539 | 0.107 |
| Natural Gas (deaths)                  |      |      |      |       |       |       |       |
| Premature deaths from air pollution - |      | 26.1 | 24.5 | 18.7  | 10.8  | 4.91  | 1.87  |
| Transportation (deaths)               |      |      |      |       |       |       |       |

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

| Item                                       | 2020  | 2025  | 2030  | 2035  | 2040 | 2045 | 2050 |
|--|-------|-------|-------|-------|------|------|------|
| Commercial HVAC investment in 2020s -      |       | 3,472 | 3,883 |       |      |      |      |
| Cumulative 5-yr (million \$2018)           |       |       |       |       |      |      |      |
| Sales of cooking units - Electric          | 32    | 46    | 79.9  | 86.5  | 86.9 | 86.9 | 86.9 |
| Resistance (%)                             |       |       |       |       |      |      |      |
| Sales of cooking units - Gas (%)           | 68    | 54    | 20.1  | 13.5  | 13.1 | 13.1 | 13.1 |
| Sales of space heating units - Electric    | 1.53  | 28.2  | 70.6  | 83.7  | 85   | 85.1 | 85.1 |
| Heat Pump (%)                              |       |       |       |       |      |      |      |
| Sales of space heating units - Electric    | 1.94  | 8.4   | 10.6  | 12.7  | 13.1 | 13.1 | 13.1 |
| Resistance (%)                             |       |       |       |       |      |      |      |
| Sales of space heating units - Fossil (%)  | 12.2  | 4.23  | 0.808 | 0.035 | 0    | 0    | 0    |
| Sales of space heating units - Gas Furnace | 84.3  | 59.2  | 18.1  | 3.53  | 1.88 | 1.85 | 1.84 |
| (%)  |       |       |       |       |      |      |      |
| Sales of water heating units - Electric    | 0.078 | 10.5  | 54.6  | 64.4  | 64.9 | 64.9 | 64.9 |
| Heat Pump (%)                              |       |       |       |       |      |      |      |
| Sales of water heating units - Electric    | 1.96  | 10.8  | 28.3  | 32.2  | 32.4 | 32.4 | 32.4 |
| Resistance (%)                             |       |       |       |       |      |      |      |
| Sales of water heating units - Gas Furnace | 93.3  | 74.5  | 14.1  | 0.593 | 0    | 0    | 0    |
| (%)  |       |       |       |       |      |      |      |
| Sales of water heating units - Other (%)   | 4.67  | 4.25  | 3.03  | 2.72  | 2.72 | 2.72 | 2.71 |

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

| Item  | 2020 | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|---|------|-------|-------|-------|-------|-------|-------|
| Electricity distribution capital invested - |      | 0.526 | 0.536 | 0.919 | 0.973 | 0.907 | 0.947 |
| Cumulative 5-yr (billion \$2018)            |      |       |       |       |       |       |       |

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

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

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

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

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

| Item                                       | 2020  | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|--|-------|-------|-------|-------|-------|-------|-------|
| Light-duty vehicle capital costs -         |       | 193   | 496   | 803   | 1,217 | 1,325 | 1,263 |
| Cumulative 5-yr (million \$2018)           |       |       |       |       |       |       |       |
| Public EV charging plugs - DC Fast (1000   | 0.065 |       | 0.324 |       | 1.42  |       | 2.3   |
| units)                                     |       |       |       |       |       |       |       |
| Public EV charging plugs - L2 (1000 units) | 0.118 |       | 7.8   |       | 34.2  |       | 55.3  |
| Vehicle sales - Heavy-duty - diesel (%)    | 97.2  | 92.1  | 67    | 23.3  | 4.22  | 0.628 | 0     |
| Vehicle sales - Heavy-duty - EV (%)        | 0.588 | 3.81  | 19    | 45.6  | 57.4  | 59.6  | 60    |
| Vehicle sales - Heavy-duty - gasoline (%)  | 0.227 | 0.227 | 0.176 | 0.066 | 0.013 | 0.002 | 0     |
| Vehicle sales - Heavy-duty - hybrid (%)    | 0.082 | 0.09  | 0.077 | 0.031 | 0.007 | 0.001 | 0     |
| Vehicle sales - Heavy-duty - hydrogen FC   | 0.392 | 2.54  | 12.7  | 30.4  | 38.2  | 39.7  | 40    |
| (%)  |       |       |       |       |       |       |       |
| Vehicle sales - Heavy-duty - other (%)     | 1.5   | 1.23  | 1.07  | 0.568 | 0.163 | 0.038 | 0     |
| Vehicle sales - Light-duty - diesel (%)    | 1.43  | 1.71  | 1.21  | 0.386 | 0.073 | 0.013 | 0     |
| Vehicle sales - Light-duty - EV (%)        | 4.31  | 16.4  | 48.3  | 82.5  | 96.4  | 99.3  | 100   |
| Vehicle sales - Light-duty - gasoline (%)  | 89.2  | 76.6  | 46.9  | 15.8  | 3.2   | 0.587 | 0     |
| Vehicle sales - Light-duty - hybrid (%)    | 4.8   | 4.82  | 3.34  | 1.23  | 0.301 | 0.066 | 0     |
| Vehicle sales - Light-duty - hydrogen FC   | 0.11  | 0.333 | 0.194 | 0.06  | 0.012 | 0.002 | 0     |
| (%)  |       |       |       |       |       |       |       |
| Vehicle sales - Light-duty - other (%)     | 0.096 | 0.092 | 0.059 | 0.021 | 0.004 | 0.001 | 0     |
| Vehicle sales - Medium-duty - diesel (%)   | 64.7  | 59.7  | 42.3  | 14.4  | 2.59  | 0.384 | 0     |
| Vehicle sales - Medium-duty - EV (%)       | 0.784 | 5.07  | 25.3  | 60.8  | 76.5  | 79.5  | 80    |
| Vehicle sales - Medium-duty - gasoline (%) | 33.7  | 33.3  | 25.5  | 9.32  | 1.77  | 0.277 | 0     |
| Vehicle sales - Medium-duty - hybrid (%)   | 0.363 | 0.402 | 0.341 | 0.14  | 0.03  | 0.005 | 0     |

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

| Item   | 2020  | 2025  | 2030  | 2035  | 2040  | 2045  | 2050 |
|--|-------|-------|-------|-------|-------|-------|------|
| Vehicle sales - Medium-duty - hydrogen<br>FC (%) | 0.196 | 1.27  | 6.33  | 15.2  | 19.1  | 19.9  | 20   |
| Vehicle sales - Medium-duty - other (%)          | 0.253 | 0.255 | 0.205 | 0.083 | 0.019 | 0.004 | 0    |

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

| Item   | 2020 | 2025 | 2030  | 2035  | 2040 | 2045  | 2050  |
|--|------|------|-------|-------|------|-------|-------|
| Capital invested - Offshore Wind -<br>Constrained (billion \$2018)             |      | 0    | 0     | 0     | 0    | 0.356 | 0.106 |
| Capital invested - Solar PV - Base (billion \$2018)                            |      | 0    | 0     | 0     | 0    | 0     | 0     |
| Capital invested - Solar PV - Constrained (billion \$2018)                     |      | 0    | 0.127 | 0.275 | 0    | 0.217 | 0     |
| Capital invested - Wind - Base (billion<br>\$2018)                             |      | 0    | 0     | 0     | 0    | 0     | 0     |
| Capital invested - Wind - Constrained (billion \$2018)                         |      | 0    | 0     | 0     | 0    | 0     | 0     |
| Installed renewables - OffshoreWind -<br>Base land use assumptions (MW)        | 0    | 0    | 0     | 0     | 0    | 0     | 0     |
| Installed renewables - OffshoreWind -<br>Constrained land use assumptions (MW) | 0    | 0    | 0     | 0     | 0    | 241   | 321   |
| Installed renewables - Solar - Base land use assumptions (MW)                  | 39.8 | 39.8 | 39.8  | 39.8  | 39.8 | 39.8  | 39.8  |
| Installed renewables - Solar -<br>Constrained land use assumptions (MW)        | 39.8 | 39.8 | 164   | 456   | 456  | 715   | 715   |
| Installed renewables - Wind - Base land use assumptions (MW)                   | 2    | 2    | 2     | 2     | 2    | 2     | 2     |
| Installed renewables - Wind - Constrained land use assumptions (MW)            | 2    | 2    | 2     | 2     | 2    | 2     | 2     |

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

| Item                                     | 2020 | 2025 | 2030 | 2035 | 2040 | 2045  | 2050  |
|--|------|------|------|------|------|-------|-------|
| OffshoreWind - Base land use             | 0    | 0    | 0    | 0    | 0    | 0     | 0     |
| assumptions (GWh)                        |      |      |      |      |      |       |       |
| OffshoreWind - Constrained land use      | 0    | 0    | 0    | 0    | 0    | 1,008 | 1,348 |
| assumptions (GWh)                        |      |      |      |      |      |       |       |
| Solar - Base land use assumptions (GWh)  | 75.2 | 75.2 | 75.2 | 75.2 | 75.2 | 75.2  | 75.2  |
| Solar - Constrained land use assumptions | 75.2 | 75.2 | 274  | 743  | 743  | 1,157 | 1,157 |
| (GWh)                                    |      |      |      |      |      |       |       |
| Wind - Base land use assumptions (GWh)   | 8.07 | 8.07 | 8.07 | 8.07 | 8.07 | 8.07  | 8.07  |
| Wind - Constrained land use assumptions  | 8.07 | 8.07 | 8.07 | 8.07 | 8.07 | 8.07  | 8.07  |
| (GWh)                                    |      |      |      |      |      |       |       |

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

| 0     |
|-------|
|       |
|       |
|       |
| -244  |
|       |
|       |
| -6.43 |
|       |
|       |
| -250  |
|       |
| 0     |
|       |
|       |
| -     |

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

| Item                                     | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|--|------|------|------|------|------|------|-------|
| Carbon sink potential - Moderate         |      |      |      |      |      |      | -126  |
| deployment - Cropland measures (1000     |      |      |      |      |      |      |       |
| tCO2e/y)                                 |      |      |      |      |      |      |       |
| Carbon sink potential - Moderate         |      |      |      |      |      |      | -3.22 |
| deployment - Permanent conservation      |      |      |      |      |      |      |       |
| cover (1000 tC02e/y)                     |      |      |      |      |      |      |       |
| Carbon sink potential - Moderate         |      |      |      |      |      |      | -129  |
| deployment - Total (1000 tCO2e/y)        |      |      |      |      |      |      |       |
| Land impacted for carbon sink -          |      |      |      |      |      |      | 0     |
| Aggressive deployment - Corn-ethanol to  |      |      |      |      |      |      |       |
| energy grasses (1000 hectares)           |      |      |      |      |      |      |       |
| Land impacted for carbon sink -          |      |      |      |      |      |      | 171   |
| Aggressive deployment - Cropland         |      |      |      |      |      |      |       |
| measures (1000 hectares)                 |      |      |      |      |      |      |       |
| Land impacted for carbon sink -          |      |      |      |      |      |      | 11.7  |
| Aggressive deployment - Permanent        |      |      |      |      |      |      |       |
| conservation cover (1000 hectares)       |      |      |      |      |      |      |       |
| Land impacted for carbon sink -          |      |      |      |      |      |      | 183   |
| Aggressive deployment - Total (1000      |      |      |      |      |      |      |       |
| hectares)                                |      |      |      |      |      |      |       |
| Land impacted for carbon sink - Moderate |      |      |      |      |      |      | 0     |
| deployment - Corn-ethanol to energy      |      |      |      |      |      |      |       |
| grasses (1000 hectares)                  |      |      |      |      |      |      |       |
| Land impacted for carbon sink - Moderate |      |      |      |      |      |      | 88.6  |
| deployment - Cropland measures (1000     |      |      |      |      |      |      |       |
| hectares)                                |      |      |      |      |      |      |       |
| Land impacted for carbon sink - Moderate |      |      |      |      |      |      | 5.85  |
| deployment - Permanent conservation      |      |      |      |      |      |      |       |
| cover (1000 hectares)                    |      |      |      |      |      |      |       |
| Land impacted for carbon sink - Moderate |      |      |      |      |      |      | 94.5  |
| deployment - Total (1000 hectares)       |      |      |      |      |      |      |       |

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

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|---|------|------|------|------|------|------|-------|
| Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y) |      |      |      |      |      |      | -6.94 |
| Carbon sink potential - High - All (not                               |      |      |      |      |      |      | -901  |
| counting overlap) (1000 tCO2e/y)                                      |      |      |      |      |      |      |       |
| Carbon sink potential - High - Avoid                                  |      |      |      |      |      |      | -206  |
| deforestation (1000 tCO2e/y)  |      |      |      |      |      |      |       |
| Carbon sink potential - High - Extend                                 |      |      |      |      |      |      | -201  |
| rotation length (1000 tCO2e/y)  |      |      |      |      |      |      |       |
| Carbon sink potential - High - Improve                                |      |      |      |      |      |      | -27.3 |
| plantations (1000 tCO2e/y)  |      |      |      |      |      |      |       |
| Carbon sink potential - High - Increase                               |      |      |      |      |      |      | -208  |
| retention of HWP (1000 tCO2e/y)                                       |      |      |      |      |      |      |       |
| Carbon sink potential - High - Increase                               |      |      |      |      |      |      | -83.5 |
| trees outside forests (1000 tCO2e/y)                                  |      |      |      |      |      |      |       |
| Carbon sink potential - High - Reforest                               |      |      |      |      |      |      | -5.4  |
| cropland (1000 tCO2e/y)   |      |      |      |      |      |      |       |
| Carbon sink potential - High - Reforest                               |      |      |      |      |      |      | -85.9 |
| pasture (1000 tCO2e/y)  |      |      |      |      |      |      |       |
| Carbon sink potential - High - Restore                                |      |      |      |      |      |      | -76.6 |
| productivity (1000 tCO2e/y)   |      |      |      |      |      |      |       |
| Carbon sink potential - Low - Accelerate                              |      |      |      |      |      |      | -3.48 |
| regeneration (1000 tCO2e/y)   |      |      |      |      |      |      |       |
| Carbon sink potential - Low - All (not                                |      |      |      |      |      |      | -263  |
| counting overlap) (1000 tCO2e/y)                                      |      |      |      |      |      |      |       |
| Carbon sink potential - Low - Avoid                                   |      |      |      |      |      |      | -34.3 |
| deforestation (1000 tCO2e/y)  |      |      |      |      |      |      |       |

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

| Item Comban sink natantial Law Extend  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|--|------|------|------|------|------|------|-------|
| Carbon sink potential - Low - Extend   |      |      |      |      |      |      | -77.  |
| rotation length (1000 tCO2e/y)   |      |      |      |      |      |      | 10    |
| Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)   |      |      |      |      |      |      | -13.  |
| Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)                                     |      |      |      |      |      |      | -69.  |
| Carbon sink potential - Low - Increase trees outside forests (1000 tC02e/y)                                |      |      |      |      |      |      | -29.  |
| Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)   |      |      |      |      |      |      | -2.   |
| Carbon sink potential - Low - Reforest   |      |      |      |      |      |      | -6.5  |
| pasture (1000 tC02e/y) Carbon sink potential - Low - Restore   |      |      |      |      |      |      | -25.8 |
| productivity (1000 tCO2e/y) Carbon sink potential - Mid - Accelerate                                       |      |      |      |      |      |      | -5.2  |
| regeneration (1000 tCO2e/y) Carbon sink potential - Mid - All (not   |      |      |      |      |      |      | -58   |
| counting overlap) (1000 tCO2e/y) Carbon sink potential - Mid - Avoid                                       |      |      |      |      |      |      | -120  |
| deforestation (1000 tCO2e/y) Carbon sink potential - Mid - Extend  |      |      |      |      |      |      | -13'  |
| rotation length (1000 tCO2e/y) Carbon sink potential - Mid - Improve                                       |      |      |      |      |      |      | -20.4 |
| plantations (1000 tCO2e/y) Carbon sink potential - Mid - Increase  |      |      |      |      |      |      | -13   |
| retention of HWP (1000 tC02e/y)  Carbon sink potential - Mid - Increase                                    |      |      |      |      |      |      | -56.  |
| trees outside forests (1000 tCO2e/y)   |      |      |      |      |      |      |       |
| Carbon sink potential - Mid - Reforest<br>cropland (1000 tCO2e/y)  |      |      |      |      |      |      | -4.0  |
| Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)  |      |      |      |      |      |      | -46.  |
| Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)  |      |      |      |      |      |      | -51.  |
| Land impacted for carbon sink potential -<br>High - Accelerate regeneration (1000<br>hectares)             |      |      |      |      |      |      | 1.1   |
| Land impacted for carbon sink potential -<br>High - Avoid deforestation (over 30 years)<br>(1000 hectares) |      |      |      |      |      |      | 27.   |
| Land impacted for carbon sink potential -<br>High - Extend rotation length (1000<br>hectares)              |      |      |      |      |      |      | 10    |
| Land impacted for carbon sink potential -<br>High - Improve plantations (1000<br>hectares)                 |      |      |      |      |      |      | 10    |
| Land impacted for carbon sink potential -<br>High - Increase retention of HWP (1000<br>hectares)           |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -<br>High - Increase trees outside forests<br>(1000 hectares)      |      |      |      |      |      |      | 7.9   |
| Land impacted for carbon sink potential -<br>High - Reforest cropland (1000 hectares)                      |      |      |      |      |      |      | 0.35  |
| Land impacted for carbon sink potential -<br>High - Reforest pasture (1000 hectares)                       |      |      |      |      |      |      | 2.4   |
| Land impacted for carbon sink potential -<br>High - Restore productivity (1000<br>hectares)                |      |      |      |      |      |      | 25.   |

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

| Item                                       | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 205  |
|--|------|------|------|------|------|------|------|
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 17   |
| High - Total impacted (over 30 years)      |      |      |      |      |      |      |      |
| (1000 hectares)                            |      |      |      |      |      |      |      |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 0.56 |
| Low - Accelerate regeneration (1000        |      |      |      |      |      |      |      |
| hectares)                                  |      |      |      |      |      |      |      |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 26   |
| Low - Avoid deforestation (over 30 years)  |      |      |      |      |      |      |      |
| (1000 hectares)                            |      |      |      |      |      |      |      |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 39.  |
| Low - Extend rotation length (1000         |      |      |      |      |      |      |      |
| hectares)                                  |      |      |      |      |      |      |      |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 5.0  |
| Low - Improve plantations (1000            |      |      |      |      |      |      |      |
| hectares)                                  |      |      |      |      |      |      |      |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      |      |
| Low - Increase retention of HWP (1000      |      |      |      |      |      |      |      |
| hectares)                                  |      |      |      |      |      |      |      |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 4.   |
| Low - Increase trees outside forests       |      |      |      |      |      |      |      |
| (1000 hectares)                            |      |      |      |      |      |      |      |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 0.17 |
| Low - Reforest cropland (1000 hectares)    |      |      |      |      |      |      |      |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 0.42 |
| Low - Reforest pasture (1000 hectares)     |      |      |      |      |      |      |      |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 15.  |
| Low - Restore productivity (1000           |      |      |      |      |      |      |      |
| hectares)                                  |      |      |      |      |      |      |      |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 91   |
| Low - Total impacted (over 30 years)       |      |      |      |      |      |      |      |
| (1000 hectares)                            |      |      |      |      |      |      |      |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 0.8  |
| Mid - Accelerate regeneration (1000        |      |      |      |      |      |      |      |
| hectares)                                  |      |      |      |      |      |      |      |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 2    |
| Mid - Avoid deforestation (over 30 years)  |      |      |      |      |      |      |      |
| (1000 hectares)                            |      |      |      |      |      |      |      |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      |      |
| Mid - Extend rotation length (1000         |      |      |      |      |      |      |      |
| hectares)                                  |      |      |      |      |      |      |      |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 7.5  |
| Mid - Improve plantations (1000 hectares)  |      |      |      |      |      |      |      |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      |      |
| Mid - Increase retention of HWP (1000      |      |      |      |      |      |      |      |
| hectares)                                  |      |      |      |      |      |      |      |
| Land impacted for carbon sink potential -  |      |      |      | T    |      | T    | 6.0  |
| Mid - Increase trees outside forests (1000 |      |      |      |      |      |      |      |
| hectares)                                  |      |      |      |      |      |      |      |
| Land impacted for carbon sink potential -  |      | T    | Ţ    | T    |      |      | 0.26 |
| Mid - Reforest cropland (1000 hectares)    |      |      |      |      |      |      |      |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 3.0  |
| Mid - Reforest pasture (1000 hectares)     |      |      |      |      |      |      |      |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 30   |
| Mid - Restore productivity (1000           |      |      |      |      |      |      |      |
| hectares)                                  |      |      |      |      |      |      |      |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 14   |
| Mid - Total impacted (over 30 years) (1000 |      |      |      |      |      |      |      |
| hectares)                                  |      |      |      |      |      |      |      |

| Table /./ | r.pr  | acanania   | IMPACTS -   | Hoalth |
|-----------|-------|------------|-------------|--------|
| Table 44. | F+KF- | srpnnrin - | IIVIPALIS - | HPNITN |

| Item                                  | 2020 | 2025 | 2030 | 2035  | 2040  | 2045  | 2050  |
|---------------------------------------|------|------|------|-------|-------|-------|-------|
| Monetary damages from air pollution - |      | 129  | 0.09 | 0.089 | 0.082 | 0.057 | 0.005 |
| Coal (million 2019\$)                 |      |      |      |       |       |       |       |
| Monetary damages from air pollution - |      | 51.3 | 41.8 | 48.2  | 36.9  | 14.7  | 4.27  |
| Natural Gas (million 2019\$)          |      |      |      |       |       |       |       |
| Monetary damages from air pollution - |      | 232  | 218  | 166   | 96.2  | 43.7  | 16.6  |
| Transportation (million 2019\$)       |      |      |      |       |       |       |       |
| Premature deaths from air pollution - |      | 14.6 | 0.01 | 0.01  | 0.009 | 0.006 | 0.001 |
| Coal (deaths)                         |      |      |      |       |       |       |       |
| Premature deaths from air pollution - |      | 5.79 | 4.72 | 5.44  | 4.16  | 1.66  | 0.482 |
| Natural Gas (deaths)                  |      |      |      |       |       |       |       |
| Premature deaths from air pollution - |      | 26.1 | 24.5 | 18.7  | 10.8  | 4.91  | 1.87  |
| Transportation (deaths)               |      |      |      |       |       |       |       |

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

| Item                                       | 2020  | 2025  | 2030  | 2035 | 2040 | 2045  | 2050 |
|--|-------|-------|-------|------|------|-------|------|
| Commercial HVAC investment in 2020s -      |       | 3,468 | 3,852 |      |      |       |      |
| Cumulative 5-yr (million \$2018)           |       |       |       |      |      |       |      |
| Sales of cooking units - Electric          | 32    | 36.2  | 40.9  | 53.4 | 71   | 81.7  | 85.5 |
| Resistance (%)                             |       |       |       |      |      |       |      |
| Sales of cooking units - Gas (%)           | 68    | 63.8  | 59.1  | 46.6 | 29   | 18.3  | 14.5 |
| Sales of space heating units - Electric    | 1.53  | 20.1  | 24.9  | 38.9 | 61.1 | 76.8  | 82.8 |
| Heat Pump (%)                              |       |       |       |      |      |       |      |
| Sales of space heating units - Electric    | 1.94  | 8.06  | 8.33  | 9.15 | 10.6 | 12    | 12.8 |
| Resistance (%)                             |       |       |       |      |      |       |      |
| Sales of space heating units - Fossil (%)  | 12.2  | 4.9   | 4.55  | 3.47 | 1.71 | 0.536 | 0.14 |
| Sales of space heating units - Gas Furnace | 84.3  | 66.9  | 62.2  | 48.4 | 26.6 | 10.7  | 4.3  |
| (%)  |       |       |       |      |      |       |      |
| Sales of water heating units - Electric    | 0.078 | 2.03  | 7.05  | 21.5 | 43.6 | 58.1  | 63.1 |
| Heat Pump (%)                              |       |       |       |      |      |       |      |
| Sales of water heating units - Electric    | 1.96  | 7.38  | 9.33  | 15.1 | 24   | 29.7  | 31.7 |
| Resistance (%)                             |       |       |       |      |      |       |      |
| Sales of water heating units - Gas Furnace | 93.3  | 86.1  | 79.2  | 59.5 | 29.1 | 9.29  | 2.42 |
| (%)  |       |       |       |      |      |       |      |
| Sales of water heating units - Other (%)   | 4.67  | 4.49  | 4.43  | 3.93 | 3.32 | 2.91  | 2.76 |

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

| Item  | 2020 | 2025  | 2030  | 2035  | 2040  | 2045 | 2050  |
|---|------|-------|-------|-------|-------|------|-------|
| Electricity distribution capital invested - |      | 0.457 | 0.458 | 0.597 | 0.614 | 0.89 | 0.939 |
| Cumulative 5-yr (billion \$2018)            |      |       |       |       |       |      |       |

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

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

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

| Item                                     | 2020 | 2025  | 2030  | 2035 | 2040 | 2045 | 2050 |
|--|------|-------|-------|------|------|------|------|
| Residential HVAC investment in 2020s vs. |      | 0.769 | 0.798 |      |      |      |      |
| REF - Cumulative 5-yr (billion \$2018)   |      |       |       |      |      |      |      |
| Sales of cooking units - Electric        | 49.9 | 51.2  | 55.8  | 67.9 | 84.7 | 95.1 | 98.7 |
| Resistance (%)                           |      |       |       |      |      |      |      |
| Sales of cooking units - Gas (%)         | 50.1 | 48.8  | 44.2  | 32.1 | 15.3 | 4.94 | 1.33 |
| Sales of space heating units - Electric  | 14.3 | 22.9  | 28.3  | 44   | 68   | 83.7 | 89.1 |
| Heat Pump (%)                            |      |       |       |      |      |      |      |

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

| Item                                       | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--|------|------|------|------|------|------|------|
| Sales of space heating units - Electric    | 9.9  | 12   | 11.2 | 9.09 | 5.93 | 3.95 | 3.26 |
| Resistance (%)                             |      |      |      |      |      |      |      |
| Sales of space heating units - Fossil (%)  | 20.5 | 29.9 | 27.8 | 21.5 | 11.8 | 5.49 | 3.29 |
| Sales of space heating units - Gas (%)     | 55.3 | 35.2 | 32.6 | 25.4 | 14.2 | 6.89 | 4.33 |
| Sales of water heating units - Electric    | 0    | 1.62 | 6.23 | 19.5 | 39.9 | 53.2 | 57.8 |
| Heat Pump (%)                              |      |      |      |      |      |      |      |
| Sales of water heating units - Electric    | 30.2 | 47   | 46.3 | 44.4 | 41.6 | 39.8 | 39.1 |
| Resistance (%)                             |      |      |      |      |      |      |      |
| Sales of water heating units - Gas Furnace | 65.2 | 47.8 | 44   | 33.1 | 16.2 | 5.18 | 1.35 |
| (%)  |      |      |      |      |      |      |      |
| Sales of water heating units - Other (%)   | 4.6  | 3.59 | 3.44 | 3    | 2.33 | 1.9  | 1.75 |

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

| Item   | 2020  | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|--|-------|-------|-------|-------|-------|-------|-------|
| Light-duty vehicle capital costs -               |       | 0     | 31.3  | 65.7  | 222   | 699   | 1,018 |
| Cumulative 5-yr (million \$2018)                 |       |       |       |       |       |       | ,     |
| Public EV charging plugs - DC Fast (1000 units)  | 0.065 |       | 0.1   |       | 0.527 |       | 1.47  |
| Public EV charging plugs - L2 (1000 units)       | 0.118 |       | 2.42  |       | 12.7  |       | 35.4  |
| Vehicle sales - Heavy-duty - diesel (%)          | 97.4  | 96    | 91.3  | 79.8  | 58.2  | 32.1  | 13.7  |
| Vehicle sales - Heavy-duty - EV (%)              | 0.498 | 1.45  | 4.11  | 10.8  | 23.6  | 39.5  | 51    |
| Vehicle sales - Heavy-duty - gasoline (%)        | 0.228 | 0.236 | 0.239 | 0.225 | 0.179 | 0.109 | 0.051 |
| Vehicle sales - Heavy-duty - hybrid (%)          | 0.083 | 0.094 | 0.104 | 0.107 | 0.092 | 0.06  | 0.03  |
| Vehicle sales - Heavy-duty - hydrogen FC<br>(%)  | 0.332 | 0.969 | 2.74  | 7.17  | 15.7  | 26.3  | 34    |
| Vehicle sales - Heavy-duty - other (%)           | 1.5   | 1.28  | 1.46  | 1.95  | 2.25  | 1.96  | 1.14  |
| Vehicle sales - Light-duty - diesel (%)          | 1.45  | 1.88  | 2.04  | 1.61  | 1.02  | 0.523 | 0.225 |
| Vehicle sales - Light-duty - EV (%)              | 2.03  | 4.99  | 12.5  | 26.8  | 49.4  | 72.7  | 87.8  |
| Vehicle sales - Light-duty - gasoline (%)        | 91.3  | 86.9  | 78.6  | 65.4  | 45    | 24.1  | 10.7  |
| Vehicle sales - Light-duty - hybrid (%)          | 4.99  | 5.77  | 6.44  | 5.81  | 4.29  | 2.5   | 1.2   |
| Vehicle sales - Light-duty - hydrogen FC (%)     | 0.112 | 0.377 | 0.319 | 0.241 | 0.169 | 0.094 | 0.044 |
| Vehicle sales - Light-duty - other (%)           | 0.098 | 0.101 | 0.091 | 0.079 | 0.057 | 0.031 | 0.014 |
| Vehicle sales - Medium-duty - diesel (%)         | 64.8  | 62.2  | 57.7  | 49.4  | 35.6  | 19.6  | 8.37  |
| Vehicle sales - Medium-duty - EV (%)             | 0.664 | 1.94  | 5.49  | 14.3  | 31.4  | 52.6  | 68    |
| Vehicle sales - Medium-duty - gasoline (%)       | 33.8  | 34.7  | 34.7  | 31.9  | 24.4  | 14.2  | 6.33  |
| Vehicle sales - Medium-duty - hybrid (%)         | 0.363 | 0.418 | 0.464 | 0.478 | 0.414 | 0.275 | 0.141 |
| Vehicle sales - Medium-duty - hydrogen<br>FC (%) | 0.166 | 0.485 | 1.37  | 3.58  | 7.86  | 13.2  | 17    |
| Vehicle sales - Medium-duty - other (%)          | 0.253 | 0.266 | 0.279 | 0.286 | 0.258 | 0.184 | 0.102 |

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

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

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

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

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

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--|------|------|------|------|------|------|------|
| Biomass purchases (million \$2018/year)      |      | 0    | 0    | 0    | 0    | 0    | 69.2 |
| Conversion capital investment -              |      | 0    | 0    | 0    | 0    | 0    | 772  |
| Cumulative 5-yr (million \$2018)             |      |      |      |      |      |      |      |
| Number of facilities - Allam power w ccu     | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| (quantity)                                   |      |      |      |      |      |      |      |
| Number of facilities - Beccs hydrogen        | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| (quantity)                                   |      |      |      |      |      |      |      |
| Number of facilities - Diesel (quantity)     | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| Number of facilities - Diesel ccu (quantity) | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| Number of facilities - Power (quantity)      | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| Number of facilities - Power ccu             | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| (quantity)                                   |      |      |      |      |      |      |      |
| Number of facilities - Pyrolysis (quantity)  | 0    | 0    | 0    | 0    | 0    | 0    | 1    |
| Number of facilities - Pyrolysis ccu         | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| (quantity)                                   |      |      |      |      |      |      |      |
| Number of facilities - Sng (quantity)        | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| Number of facilities - Sng ccu (quantity)    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |

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

| Item                               | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|------------------------------------|------|------|------|------|------|------|------|
| Annual - All (MMT)                 |      | 0    | 0    | 0    | 0    | 0    | 0    |
| Annual - BECCS (MMT)               |      | 0    | 0    | 0    | 0    | 0    | 0    |
| Annual - Cement and lime (MMT)     |      | 0    | 0    | 0    | 0    | 0    | 0    |
| Annual - NGCC (MMT)                |      | 0    | 0    | 0    | 0    | 0    | 0    |
| Cumulative - All (MMT)             |      | 0    | 0    | 0    | 0    | 0    | 0    |
| Cumulative - BECCS (MMT)           |      | 0    | 0    | 0    | 0    | 0    | 0    |
| Cumulative - Cement and lime (MMT) |      | 0    | 0    | 0    | 0    | 0    | 0    |
| 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    | 0    | 0    | 0    | 0    |
| Cumulative investment - All (million<br>\$2018)   |      | 0    | 0    | 0    | 0    | 0    | 0    |
| Cumulative investment - Spur (million<br>\$2018)  |      | 0    | 0    | 0    | 0    | 0    | 0    |
| Cumulative investment - Trunk (million<br>\$2018) |      | 0    | 0    | 0    | 0    | 0    | 0    |
| Spur (km)   |      | 0    | 0    | 0    | 0    | 0    | 0    |
| Trunk (km)  |      | 0    | 0    | 0    | 0    | 0    | 0    |

# 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 |      |      |      |      |      |      | -25.9 |
| grasses (1000 tCO2e/y)   |      |      |      |      |      |      |       |

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

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|---|------|------|------|------|------|------|-------|
| Carbon sink potential - Aggressive  |      |      |      |      |      |      | -225  |
| deployment - Cropland measures (1000  |      |      |      |      |      |      |       |
| tCO2e/y) Carbon sink potential - Aggressive                                   |      |      |      |      |      |      | 0     |
| deployment - Cropland to woody energy   |      |      |      |      |      |      | U     |
| crops (1000 tCO2e/y)  |      |      |      |      |      |      |       |
| Carbon sink potential - Aggressive  |      |      |      |      |      |      | 0     |
| deployment - Pasture to energy crops  |      |      |      |      |      |      | ·     |
| (1000 tC02e/y)  |      |      |      |      |      |      |       |
| Carbon sink potential - Aggressive  |      |      |      |      |      |      | -5.61 |
| deployment - Permanent conservation   |      |      |      |      |      |      |       |
| cover (1000 tCO2e/y)  |      |      |      |      |      |      |       |
| Carbon sink potential - Aggressive  |      |      |      |      |      |      | -257  |
| deployment - Total (1000 tC02e/y)   |      |      |      |      |      |      | 25.0  |
| Carbon sink potential - Moderate  |      |      |      |      |      |      | -25.9 |
| deployment - Corn-ethanol to energy<br>grasses (1000 tCO2e/y)                 |      |      |      |      |      |      |       |
| Carbon sink potential - Moderate  |      |      |      |      |      |      | -116  |
| deployment - Cropland measures (1000  |      |      |      |      |      |      | 110   |
| tCO2e/y)  |      |      |      |      |      |      |       |
| Carbon sink potential - Moderate  |      |      |      |      |      |      | 0     |
| deployment - Cropland to woody energy   |      |      |      |      |      |      |       |
| crops (1000 tCO2e/y)  |      |      |      |      |      |      |       |
| Carbon sink potential - Moderate  |      |      |      |      |      |      | 0     |
| deployment - Pasture to energy crops  |      |      |      |      |      |      |       |
| (1000 tC02e/y)  |      |      |      |      |      |      |       |
| Carbon sink potential - Moderate  |      |      |      |      |      |      | -2.8  |
| deployment - Permanent conservation cover (1000 tCO2e/y)                      |      |      |      |      |      |      |       |
| Carbon sink potential - Moderate  |      |      |      |      |      |      | -145  |
| deployment - Total (1000 tC02e/y)   |      |      |      |      |      |      | -140  |
| Land impacted for carbon sink -   |      |      |      |      |      |      | 13.8  |
| Aggressive deployment - Corn-ethanol to                                       |      |      |      |      |      |      |       |
| energy grasses (1000 hectares)  |      |      |      |      |      |      |       |
| Land impacted for carbon sink -   |      |      |      |      |      |      | 390   |
| Aggressive deployment - Cropland  |      |      |      |      |      |      |       |
| measures (1000 hectares)  |      |      |      |      |      |      |       |
| Land impacted for carbon sink -   |      |      |      |      |      |      | 3.07  |
| Aggressive deployment - Cropland to   |      |      |      |      |      |      |       |
| woody energy crops (1000 hectares)  |      |      |      |      |      |      | 0.14  |
| Land impacted for carbon sink - Aggressive deployment - Pasture to            |      |      |      |      |      |      | 0.14  |
| energy crops (1000 hectares)  |      |      |      |      |      |      |       |
| Land impacted for carbon sink -   |      |      |      |      |      |      | 10.2  |
| Aggressive deployment - Permanent   |      |      |      |      |      |      |       |
| conservation cover (1000 hectares)  |      |      |      |      |      |      |       |
| Land impacted for carbon sink -   |      |      |      |      |      |      | 417   |
| Aggressive deployment - Total (1000   |      |      |      |      |      |      |       |
| hectares)   |      |      |      |      |      |      |       |
| Land impacted for carbon sink - Moderate                                      |      |      |      |      |      |      | 13.8  |
| deployment - Corn-ethanol to energy   |      |      |      |      |      |      |       |
| grasses (1000 hectares)   |      |      |      |      |      |      | 81.5  |
| Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 |      |      |      |      |      |      | 81.5  |
| hectares)   |      |      |      |      |      |      |       |
| Land impacted for carbon sink - Moderate                                      |      |      |      |      |      |      | 3.07  |
| deployment - Cropland to woody energy   |      |      |      |      |      |      | 0.01  |
| crops (1000 hectares)   |      |      |      |      |      |      |       |
| Land impacted for carbon sink - Moderate                                      |      |      |      |      |      |      | 0.14  |
| deployment - Pasture to energy crops  |      |      |      |      |      |      |       |
| (1000 hectares)   |      |      |      |      |      |      |       |

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

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--|------|------|------|------|------|------|------|
| Land impacted for carbon sink - Moderate deployment - Permanent conservation |      |      |      |      |      |      | 5.1  |
| cover (1000 hectares)  Land impacted for carbon sink - Moderate              |      |      |      |      |      |      | 104  |
| deployment - Total (1000 hectares)   |      |      |      |      |      |      |      |

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

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|--|------|------|------|------|------|------|-------|
|  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | -6.94 |
| Carbon sink potential - High - Accelerate                            |      |      |      |      |      |      | -6.94 |
| regeneration (1000 tC02e/y)  |      |      |      |      |      |      | -901  |
| Carbon sink potential - High - All (not                              |      |      |      |      |      |      | -901  |
| counting overlap) (1000 tC02e/y)                                     |      |      |      |      |      |      | 007   |
| Carbon sink potential - High - Avoid                                 |      |      |      |      |      |      | -206  |
| deforestation (1000 tC02e/y)   |      |      |      |      |      |      | 0.01  |
| Carbon sink potential - High - Extend rotation length (1000 tC02e/y) |      |      |      |      |      |      | -201  |
| Carbon sink potential - High - Improve                               |      |      |      |      |      |      | -27.3 |
| plantations (1000 tCO2e/y)   |      |      |      |      |      |      |       |
| Carbon sink potential - High - Increase                              |      |      |      |      |      |      | -208  |
| retention of HWP (1000 tCO2e/y)                                      |      |      |      |      |      |      |       |
| Carbon sink potential - High - Increase                              |      |      |      |      |      |      | -83.5 |
| trees outside forests (1000 tCO2e/y)                                 |      |      |      |      |      |      |       |
| Carbon sink potential - High - Reforest                              |      |      |      |      |      |      | -5.4  |
| cropland (1000 tCO2e/y)  |      |      |      |      |      |      |       |
| Carbon sink potential - High - Reforest                              |      |      |      |      |      |      | -85.9 |
| pasture (1000 tCO2e/y)   |      |      |      |      |      |      | 00.7  |
| Carbon sink potential - High - Restore                               |      |      |      |      |      |      | -76.6 |
| productivity (1000 tCO2e/y)  |      |      |      |      |      |      | 10.0  |
| Carbon sink potential - Low - Accelerate                             |      |      |      |      |      |      | -3.48 |
| regeneration (1000 tC02e/y)  |      |      |      |      |      |      | 0.40  |
| Carbon sink potential - Low - All (not                               |      |      |      |      |      |      | -263  |
| counting overlap) (1000 tC02e/y)                                     |      |      |      |      |      |      | 200   |
| Carbon sink potential - Low - Avoid                                  |      |      |      |      |      |      | -34.3 |
| deforestation (1000 tC02e/y)   |      |      |      |      |      |      | -34.3 |
| Carbon sink potential - Low - Extend                                 |      |      |      |      |      |      | -77.3 |
| rotation length (1000 tCO2e/y)                                       |      |      |      |      |      |      | -11.5 |
| Carbon sink potential - Low - Improve                                |      |      |      |      |      |      | -13.9 |
| plantations (1000 tCO2e/y)   |      |      |      |      |      |      | -13.7 |
| Carbon sink potential - Low - Increase                               |      |      |      |      |      |      | -69.4 |
| retention of HWP (1000 tCO2e/y)                                      |      |      |      |      |      |      | -09.4 |
| Carbon sink potential - Low - Increase                               |      |      |      |      |      |      | -29.2 |
| ·  |      |      |      |      |      |      | -29.2 |
| trees outside forests (1000 tC02e/y)                                 |      |      |      |      |      |      | -2.7  |
| Carbon sink potential - Low - Reforest                               |      |      |      |      |      |      | -2.7  |
| cropland (1000 tC02e/y)  |      |      |      |      |      |      | / 51  |
| Carbon sink potential - Low - Reforest                               |      |      |      |      |      |      | -6.51 |
| pasture (1000 tC02e/y)   |      |      |      |      |      |      | 05.0  |
| Carbon sink potential - Low - Restore                                |      |      |      |      |      |      | -25.8 |
| productivity (1000 tC02e/y)  |      |      |      |      |      |      | F 01  |
| Carbon sink potential - Mid - Accelerate                             |      |      |      |      |      |      | -5.21 |
| regeneration (1000 tC02e/y)  |      |      |      |      |      |      |       |
| Carbon sink potential - Mid - All (not                               |      |      |      |      |      |      | -581  |
| counting overlap) (1000 tC02e/y)                                     |      |      |      |      |      |      |       |
| Carbon sink potential - Mid - Avoid                                  |      |      |      |      |      |      | -120  |
| deforestation (1000 tC02e/y)   |      |      |      |      |      |      |       |
| Carbon sink potential - Mid - Extend                                 |      |      |      |      |      |      | -139  |
| rotation length (1000 tCO2e/y)                                       |      |      |      |      |      |      |       |
| Carbon sink potential - Mid - Improve                                |      |      |      |      |      |      | -20.4 |
| plantations (1000 tCO2e/y)   |      |      |      |      |      |      |       |
| Carbon sink potential - Mid - Increase                               | T    | Π    |      |      |      |      | -139  |
| retention of HWP (1000 tCO2e/y)                                      |      |      |      |      |      |      |       |

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

| Item Cappen sink notantial Mid Increase  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050<br>-56.4 |
|--|------|------|------|------|------|------|---------------|
| Carbon sink potential - Mid - Increase   |      |      |      |      |      |      | -56.4         |
| trees outside forests (1000 tC02e/y)  Carbon sink potential - Mid - Reforest           |      |      |      |      |      |      | -4.05         |
| cropland (1000 tCO2e/y)  |      |      |      |      |      |      | -4.05         |
| Carbon sink potential - Mid - Reforest   |      |      |      |      |      |      | -46.2         |
| pasture (1000 tC02e/y)   |      |      |      |      |      |      | -40.2         |
| Carbon sink potential - Mid - Restore  |      |      |      |      |      |      | -51.2         |
| productivity (1000 tC02e/y)  |      |      |      |      |      |      | -31.2         |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 1.13          |
| High - Accelerate regeneration (1000   |      |      |      |      |      |      | 1.10          |
| hectares)  |      |      |      |      |      |      |               |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 27.8          |
| High - Avoid deforestation (over 30 years)   |      |      |      |      |      |      | 21.0          |
| (1000 hectares)  |      |      |      |      |      |      |               |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 103           |
| High - Extend rotation length (1000  |      |      |      |      |      |      |               |
| hectares)  |      |      |      |      |      |      |               |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 10.1          |
| High - Improve plantations (1000   |      |      |      |      |      |      |               |
| hectares)  |      |      |      |      |      |      |               |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 0             |
| High - Increase retention of HWP (1000   |      |      |      |      |      |      |               |
| hectares)  |      |      |      |      |      |      |               |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 7.93          |
| High - Increase trees outside forests  |      |      |      |      |      |      |               |
| (1000 hectares)  |      |      |      |      |      |      |               |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 0.357         |
| High - Reforest cropland (1000 hectares)   |      |      |      |      |      |      |               |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 2.44          |
| High - Reforest pasture (1000 hectares)  |      |      |      |      |      |      |               |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 25.4          |
| High - Restore productivity (1000  |      |      |      |      |      |      |               |
| hectares)  |      |      |      |      |      |      |               |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 178           |
| High - Total impacted (over 30 years)  |      |      |      |      |      |      |               |
| (1000 hectares)  |      |      |      |      |      |      | 0.5/3         |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 0.567         |
| Low - Accelerate regeneration (1000  |      |      |      |      |      |      |               |
| hectares)  |      |      |      |      |      |      | 0/1           |
| Land impacted for carbon sink potential -<br>Low - Avoid deforestation (over 30 years) |      |      |      |      |      |      | 26.1          |
| (1000 hectares)  |      |      |      |      |      |      |               |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 39.3          |
| Low - Extend rotation length (1000   |      |      |      |      |      |      | 39.3          |
| hectares)  |      |      |      |      |      |      |               |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 5.03          |
| Low - Improve plantations (1000  |      |      |      |      |      |      | 3.00          |
| hectares)  |      |      |      |      |      |      |               |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 0             |
| Low - Increase retention of HWP (1000  |      |      |      |      |      |      | Ū             |
| hectares)  |      |      |      |      |      |      |               |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 4.17          |
| Low - Increase trees outside forests   |      |      |      |      |      |      |               |
| (1000 hectares)  |      |      |      |      |      |      |               |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 0.179         |
| Low - Reforest cropland (1000 hectares)  |      |      |      |      |      |      |               |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 0.423         |
| Low - Reforest pasture (1000 hectares)   |      |      |      |      |      |      |               |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 15.4          |
| Low - Restore productivity (1000   |      |      |      |      |      |      |               |
| hectares)  |      |      |      |      |      |      |               |

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

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

| Item   | 2020 | 2025 | 2030 | 2035  | 2040  | 2045  | 2050  |
|--|------|------|------|-------|-------|-------|-------|
| Monetary damages from air pollution -<br>Coal (million 2019\$)           |      | 129  | 0.09 | 0.089 | 0.082 | 0.057 | 0.005 |
| Monetary damages from air pollution -<br>Natural Gas (million 2019\$)    |      | 46.6 | 28.3 | 15.9  | 11.4  | 6.65  | 1.97  |
| Monetary damages from air pollution -<br>Transportation (million 2019\$) |      | 237  | 240  | 234   | 212   | 169   | 116   |
| Premature deaths from air pollution -<br>Coal (deaths)                   |      | 14.6 | 0.01 | 0.01  | 0.009 | 0.006 | 0.001 |
| Premature deaths from air pollution -<br>Natural Gas (deaths)            |      | 5.26 | 3.19 | 1.79  | 1.29  | 0.751 | 0.223 |
| Premature deaths from air pollution -<br>Transportation (deaths)         |      | 26.6 | 27   | 26.4  | 23.8  | 19    | 13.1  |

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

| Item                                      | 2020 | 2025  | 2030  | 2035 | 2040  | 2045  | 2050 |
|---|------|-------|-------|------|-------|-------|------|
| Commercial HVAC investment in 2020s -     |      | 3,421 | 3,558 |      |       |       |      |
| Cumulative 5-yr (million \$2018)          |      |       |       |      |       |       |      |
| Sales of cooking units - Electric         | 32   | 34.3  | 34.3  | 34.3 | 34.4  | 34.3  | 34.3 |
| Resistance (%)                            |      |       |       |      |       |       |      |
| Sales of cooking units - Gas (%)          | 68   | 65.7  | 65.7  | 65.7 | 65.6  | 65.7  | 65.7 |
| Sales of space heating units - Electric   | 1.53 | 24.1  | 48.5  | 68.4 | 71.7  | 72.1  | 72.1 |
| Heat Pump (%)                             |      |       |       |      |       |       |      |
| Sales of space heating units - Electric   | 1.94 | 8.79  | 12.8  | 20.1 | 25.2  | 25.9  | 26   |
| Resistance (%)                            |      |       |       |      |       |       |      |
| Sales of space heating units - Fossil (%) | 12.2 | 4.76  | 3.52  | 1.51 | 0.221 | 0.018 | 0    |

| Table CO. DCC accompaig | DILLAD 1. Efficiency /Floorwiff continue             | 0                        |
|-------------------------|--|--------------------------|
| Table 59: REE Scenorio  | - PTLLAR 1 <sup>,</sup> Efficiency/Flectrification - | Commerciai I continuea i |

| Item                                       | 2020  | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|--|-------|-------|-------|-------|-------|-------|-------|
| Sales of space heating units - Gas Furnace | 84.3  | 62.4  | 35.2  | 9.91  | 2.84  | 1.91  | 1.84  |
| (%)  |       |       |       |       |       |       |       |
| Sales of water heating units - Electric    | 0.078 | 0.268 | 0.265 | 0.267 | 0.268 | 0.267 | 0.268 |
| Heat Pump (%)                              |       |       |       |       |       |       |       |
| Sales of water heating units - Electric    | 1.96  | 6.67  | 6.62  | 6.62  | 6.65  | 6.63  | 6.65  |
| Resistance (%)                             |       |       |       |       |       |       |       |
| Sales of water heating units - Gas Furnace | 93.3  | 88.5  | 88.5  | 88.6  | 88.5  | 88.5  | 88.5  |
| (%)  |       |       |       |       |       |       |       |
| Sales of water heating units - Other (%)   | 4.67  | 4.54  | 4.63  | 4.53  | 4.56  | 4.58  | 4.53  |

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

| Item  | 2020 | 2025  | 2030  | 2035  | 2040 | 2045 | 2050  |
|---|------|-------|-------|-------|------|------|-------|
| Electricity distribution capital invested -<br>Cumulative 5-yr (billion \$2018) |      | 0.488 | 0.492 | 0.647 | 0.67 | 0.83 | 0.869 |

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

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

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

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

# Table 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 (%)   | 1.44  | 1.87  | 2.16  | 2.02  | 1.81  | 1.69  | 1.6   |
| Vehicle sales - Light-duty - EV (%)       | 3.95  | 6.1   | 6.91  | 8.53  | 10.3  | 11.9  | 13.1  |
| Vehicle sales - Light-duty - gasoline (%) | 89.6  | 85.9  | 83.6  | 81.6  | 79.5  | 77.5  | 76    |
| Vehicle sales - Light-duty - hybrid (%)   | 4.82  | 5.65  | 6.89  | 7.44  | 7.98  | 8.51  | 8.88  |

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

| Item                                       | 2020  | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|--|-------|-------|-------|-------|-------|-------|-------|
| Vehicle sales - Light-duty - hydrogen FC   | 0.11  | 0.373 | 0.339 | 0.3   | 0.296 | 0.295 | 0.306 |
| (%)  |       |       |       |       |       |       |       |
| Vehicle sales - Light-duty - other (%)     | 0.097 | 0.101 | 0.097 | 0.097 | 0.097 | 0.095 | 0.098 |
| Vehicle sales - Medium-duty - diesel (%)   | 65.2  | 63.5  | 61.6  | 59.6  | 58    | 56.5  | 55.2  |
| Vehicle sales - Medium-duty - EV (%)       | 0.027 | 0.105 | 0.329 | 0.671 | 0.895 | 0.973 | 0.993 |
| Vehicle sales - Medium-duty - gasoline (%) | 34    | 35.5  | 37    | 38.5  | 39.7  | 40.8  | 41.7  |
| Vehicle sales - Medium-duty - hybrid (%)   | 0.365 | 0.427 | 0.496 | 0.577 | 0.674 | 0.793 | 0.929 |
| Vehicle sales - Medium-duty - hydrogen     | 0.175 | 0.208 | 0.242 | 0.285 | 0.339 | 0.409 | 0.487 |
| FC (%)                                     |       |       |       |       |       |       |       |
| 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

| Carbon sink potential - High - Accelerate regeneration (1000 t022e/y)   Carbon sink potential - High - All (not counting overlap) (1000 t022e/y)   Carbon sink potential - High - All (not counting overlap) (1000 t022e/y)   Carbon sink potential - High - Extend rotation length (1000 t022e/y)   Carbon sink potential - High - Extend rotation length (1000 t022e/y)   Carbon sink potential - High - Increase retention of HWP (1000 t022e/y)   Carbon sink potential - High - Increase retention of HWP (1000 t022e/y)   Carbon sink potential - High - Increase retention of HWP (1000 t022e/y)   Carbon sink potential - High - Increase retention of HWP (1000 t022e/y)   Carbon sink potential - High - Reforest cropland (1000 t022e/y)   Carbon sink potential - High - Reforest cropland (1000 t022e/y)   Carbon sink potential - High - Reforest pasture (1000 t022e/y)   Carbon sink potential - High - Reforest pasture (1000 t022e/y)   Carbon sink potential - Low - Accelerate regeneration (1000 t022e/y)   Carbon sink potential - Low - Accelerate regeneration (1000 t022e/y)   Carbon sink potential - Low - Accelerate regeneration (1000 t022e/y)   Carbon sink potential - Low - All (not counting overlap) (1000 t022e/y)   Carbon sink potential - Low - Wall deforestation (1000 t022e/y)   Carbon sink potential - Low - Wall deforestation (1000 t022e/y)   Carbon sink potential - Low - Reforest palantations (1000 t022e/y)   Carbon sink potential - Low - Reforest palantations (1000 t022e/y)   Carbon sink potential - Low - Reforest palantations (1000 t022e/y)   Carbon sink potential - Low - Reforest palantations (1000 t022e/y)   Carbon sink potential - Low - Reforest palantations (1000 t022e/y)   Carbon sink potential - Low - Reforest pasture (1000 t022e/y)   Carbon sink potential - Low - Reforest pasture (1000 t022e/y)   Carbon sink potential - Low - Reforest pasture (1000 t022e/y)   Carbon sink potential - Low - Reforest pasture (1000 t022e/y)   Carbon sink potential - Mid - Accelerate regeneration (1000 t022e/y)   Carbon sink potential - Mid - A | Item                                  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|--|---------------------------------------|------|------|------|------|------|------|-------|
| Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/v)   Carbon sink potential - High - Avoid deforestation (1000 tCO2e/v)   Carbon sink potential - High - Extend   |                                       |      |      |      |      |      |      | -6.94 |
| Carbon sink potential - High - Avoid deforestation (1000 tcO2e/v)   Carbon sink potential - High - Extend rotation length (1000 tcO2e/v)   Carbon sink potential - High - Extend rotation length (1000 tcO2e/v)   Carbon sink potential - High - Improve plantations (1000 tcO2e/v)   Carbon sink potential - High - Improve plantations (1000 tcO2e/v)   Carbon sink potential - High - Improve plantations (1000 tcO2e/v)   Carbon sink potential - High - Improve plantations (1000 tcO2e/v)   Carbon sink potential - High - Improve plantations (1000 tcO2e/v)   Carbon sink potential - High - Reforest plantations (1000 tcO2e/v)   Carbon sink potential - High - Reforest plantations (1000 tcO2e/v)   Carbon sink potential - High - Reforest plantations (1000 tcO2e/v)   Carbon sink potential - High - Restore productivity (1000 tcO2e/v)   Carbon sink potential - Low - Accelerate regeneration (1000 tcO2e/v)   Carbon sink potential - Low - Accelerate regeneration (1000 tcO2e/v)   Carbon sink potential - Low - Ali (Inot counting overlap) (1000 tcO2e/v)   Carbon sink potential - Low - Ali (Inot counting overlap) (1000 tcO2e/v)   Carbon sink potential - Low - Extend rotation length (1000 tcO2e/v)   Carbon sink potential - Low - Extend rotation length (1000 tcO2e/v)   Carbon sink potential - Low - Extend rotation length (1000 tcO2e/v)   Carbon sink potential - Low - Increase retention of HWP (1000 tcO2e/v)   Carbon sink potential - Low - Reforest plantations (1000 tcO2e/v)   Carbon sink potential - Low - Reforest plantations (1000 tcO2e/v)   Carbon sink potential - Low - Reforest productivity (1000 tcO2e/v)   Carbon sink potential - Low - Restore productivity (1000 tcO2e/v)   Carbon sink potential - Low - Restore productivity (1000 tcO2e/v)   Carbon sink potential - Low - Restore productivity (1000 tcO2e/v)   Carbon sink potential - Low - Restore productivity (1000 tcO2e/v)   Carbon sink potential - Low - Restore productivity (1000 tcO2e/v)   Carbon sink potential - Mid - Accelerate regeneration (1000 tcO2e/v)   Carbon sink potential - Mid |                                       |      |      |      |      |      |      | 001   |
| Carbon sink potential - High - Avoid deforestation (1000 tC02e/v)   Carbon sink potential - High - Extend   -201   |                                       |      |      |      |      |      |      | -901  |
| deforestation (1000 CO2e/y)   Carbon sink potential - High - Extend rotation length (1000 CO2e/y)   -27.3  |                                       |      |      |      |      |      |      | -206  |
| Carbon sink potential - High - Improve   1-27.3  |                                       |      |      |      |      |      |      |       |
| Carbon sink potential - High - Improve plantations (1000 tC02e/v)   Carbon sink potential - High - Increase retention of HWP (1000 tC02e/v)   Carbon sink potential - High - Increase trees outside forests (1000 tC02e/v)   Carbon sink potential - High - Reforest cropland (1000 tC02e/v)   Carbon sink potential - High - Reforest cropland (1000 tC02e/v)   Carbon sink potential - High - Reforest productivity (1000 tC02e/v)   Carbon sink potential - High - Restore productivity (1000 tC02e/v)   Carbon sink potential - Low - Accelerate regeneration (1000 tC02e/v)   Carbon sink potential - Low - Accelerate regeneration (1000 tC02e/v)   Carbon sink potential - Low - All (not counting overlap) (1000 tC02e/v)   Carbon sink potential - Low - All (not counting overlap) (1000 tC02e/v)   Carbon sink potential - Low - Avoid deforestation (1000 tC02e/v)   Carbon sink potential - Low - Extend rotation length (1000 tC02e/v)   Carbon sink potential - Low - Extend rotation length (1000 tC02e/v)   Carbon sink potential - Low - Increase retention of HWP (1000 tC02e/v)   Carbon sink potential - Low - Increase retention of HWP (1000 tC02e/v)   Carbon sink potential - Low - Increase retention of HWP (1000 tC02e/v)   Carbon sink potential - Low - Reforest cropland (1000 tC02e/v)   Carbon sink potential - Low - Reforest pasture (1000 tC02e/v)   Carbon sink potential - Low - Reforest pasture (1000 tC02e/v)   Carbon sink potential - Low - Reforest pasture (1000 tC02e/v)   Carbon sink potential - Low - Reforest pasture (1000 tC02e/v)   Carbon sink potential - Low - Restore productivity (1000 tC02e/v)   Carbon sink potential - Low - Restore productivity (1000 tC02e/v)   Carbon sink potential - High - Restore productivity (1000 tC02e/v)   Carbon sink potential - High - Restore productivity (1000 tC02e/v)   Carbon sink potential - High - Restore productivity (1000 tC02e/v)   Carbon sink potential - High - Restore productivity (1000 tC02e/v)   Carbon sink potential - High - Restore productivity (1000 tC02e/v)   Carbon sink potential - High - Res |                                       |      |      |      |      |      |      | -201  |
| Description   Carbon sink potential - High - Increase retention of HWP (1000 tC02e/y)   Carbon sink potential - High - Increase retention of HWP (1000 tC02e/y)   Carbon sink potential - High - Increase trees outside forests (1000 tC02e/y)   Carbon sink potential - High - Reforest cropland (1000 tC02e/y)   Carbon sink potential - High - Reforest pasture (1000 tC02e/y)   Carbon sink potential - High - Reforest productivity (1000 tC02e/y)   Carbon sink potential - High - Restore productivity (1000 tC02e/y)   Carbon sink potential - Low - Accelerate regeneration (1000 tC02e/y)   Carbon sink potential - Low - All (not counting overlap) (1000 tC02e/y)   Carbon sink potential - Low - All (not counting overlap) (1000 tC02e/y)   Carbon sink potential - Low - Avoid deforestation (1000 tC02e/y)   Carbon sink potential - Low - Extend rotation length (1000 tC02e/y)   Carbon sink potential - Low - Improve plantations (1000 tC02e/y)   Carbon sink potential - Low - Increase retention of HWP (1000 tC02e/y)   Carbon sink potential - Low - Increase retention of HWP (1000 tC02e/y)   Carbon sink potential - Low - Increase retens outside forests (1000 tC02e/y)   Carbon sink potential - Low - Reforest pasture (1000 tC02e/y)   Carbon sink potential - Low - Reforest pasture (1000 tC02e/y)   Carbon sink potential - Low - Reforest pasture (1000 tC02e/y)   Carbon sink potential - Low - Reforest pasture (1000 tC02e/y)   Carbon sink potential - Low - Reforest pasture (1000 tC02e/y)   Carbon sink potential - Low - Reforest pasture (1000 tC02e/y)   Carbon sink potential - Low - Restore productivity (1000 tC02e/y)   Carbon sink potential - Low - Restore productivity (1000 tC02e/y)   Carbon sink potential - Low - Restore productivity (1000 tC02e/y)   Carbon sink potential - Low - Restore productivity (1000 tC02e/y)   Carbon sink potential - Mid - All (100 tc02e/y)   Carbon sink potential - Mid - All (100 tc02e/y)   Carbon sink potential - Mid - All (100 tc02e/y)   Carbon sink potential - Mid - All (100 tc02e/y)   Carbon sink potential - Mid - |                                       |      |      |      |      |      |      |       |
| Carbon sink potential - High - Increase retention of HWP (1000 tC02e/y)  |                                       |      |      |      |      |      |      | -27.3 |
| Retention of HWP (1000 tC02e/v)   Carbon sink potential - High - Increase trees outside forests (1000 tC02e/v)   Carbon sink potential - High - Reforest cropland (1000 tC02e/v)   Carbon sink potential - High - Reforest pasture (1000 tC02e/v)   Carbon sink potential - High - Reforest pasture (1000 tC02e/v)   Carbon sink potential - High - Restore productivity (1000 tC02e/v)   Carbon sink potential - Low - Accelerate regeneration (1000 tC02e/v)   Carbon sink potential - Low - All (not counting overlap) (1000 tC02e/v)   Carbon sink potential - Low - All (not counting overlap) (1000 tC02e/v)   Carbon sink potential - Low - Extend rotation length (1000 tC02e/v)   Carbon sink potential - Low - Extend rotation length (1000 tC02e/v)   Carbon sink potential - Low - Improve plantations (1000 tC02e/v)   Carbon sink potential - Low - Improve plantations (1000 tC02e/v)   Carbon sink potential - Low - Increase retention of HWP (1000 tC02e/v)   Carbon sink potential - Low - Increase retention of HWP (1000 tC02e/v)   Carbon sink potential - Low - Reforest cropland (1000 tC02e/v)   Carbon sink potential - Low - Reforest pool to the counting overlap) (1000 tC02e/v)   Carbon sink potential - Low - Reforest pool to to to to to the counting overlap) (1000 tC02e/v)   Carbon sink potential - Low - Reforest pool to the counting overlap) (1000 tC02e/v)   Carbon sink potential - Low - Reforest pool to the counting overlap) (1000 tC02e/v)   Carbon sink potential - Low - Restore productivity (1000 tC02e/v)   Carbon sink potential - Low - Restore productivity (1000 tC02e/v)   Carbon sink potential - Low - Restore productivity (1000 tC02e/v)   Carbon sink potential - Mid - Avoid   -581 counting overlap) (1000 tC02e/v)   Carbon sink potential - Mid - Avoid   -120   Carbon si |                                       |      |      |      |      |      |      | 200   |
| Carbon sink potential - High - Increase trees outside forests (1000 tC02e/y)   Carbon sink potential - High - Reforest cropland (1000 tC02e/y)   Carbon sink potential - High - Reforest soutside forests (1000 tC02e/y)   Carbon sink potential - High - Reforest spasture (1000 tC02e/y)   Carbon sink potential - High - Restore productivity (1000 tC02e/y)   Carbon sink potential - Low - Accelerate regeneration (1000 tC02e/y)   Carbon sink potential - Low - All (not counting overlap) (1000 tC02e/y)   Carbon sink potential - Low - Avoid deforestation (1000 tC02e/y)   Carbon sink potential - Low - Extend rotation length (1000 tC02e/y)   Carbon sink potential - Low - Extend rotation length (1000 tC02e/y)   Carbon sink potential - Low - Improve plantations (1000 tC02e/y)   Carbon sink potential - Low - Increase retention of HWP (1000 tC02e/y)   Carbon sink potential - Low - Increase retention of HWP (1000 tC02e/y)   Carbon sink potential - Low - Reforest cropland (1000 tC02e/y)   Carbon sink potential - Low - Reforest rotation length (1000 tC02e/y)   Carbon sink potential - Low - Reforest rotation sink potential - Low - Restore rotation sink potential - Mid - Accelerate regeneration (1000 tC02e/y)   Carbon sink potential - Mid - Accelerate regeneration (1000 tC02e/y)   Carbon sink potential - Mid - Avoid   -120   Carbon sink potential - Mid - Avoid  |                                       |      |      |      |      |      |      | -200  |
| Trees outside forests (1000 tCO2e/y)   Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)   Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)   Carbon sink potential - High - Restore productivity (1000 tCO2e/y)   Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)   Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)   Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)   Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)   Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)   Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)   Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)   Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)   Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)   Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)   Carbon sink potential - Low - Reforest poductivity (1000 tCO2e/y)   Carbon sink potential - Low - Reforest poductivity (1000 tCO2e/y)   Carbon sink potential - Low - Reforest productivity (1000 tCO2e/y)   Carbon sink potential - Low - Reforest productivity (1000 tCO2e/y)   Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)   Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)   Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)   Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)   Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)   Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)   Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)   Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)   Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)   Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)   Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)   Carbon sink potential - Mid - All (not counting  |                                       |      |      |      |      |      |      | -83.5 |
| Carbon sink potential - High - Reforest productivity (1000 tCO2e/y)   Carbon sink potential - High - Restore productivity (1000 tCO2e/y)   Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)   Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)   Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)   Carbon sink potential - Low - Avoid   -34.3   |                                       |      |      |      |      |      |      |       |
| Carbon sink potential - High - Reforest pasture (1000 tC02e/y)  Carbon sink potential - High - Restore productivity (1000 tC02e/y)  Carbon sink potential - Low - Accelerate regeneration (1000 tC02e/y)  Carbon sink potential - Low - Aul (1not counting overlap) (1000 tC02e/y)  Carbon sink potential - Low - Avoid deforestation (1000 tC02e/y)  Carbon sink potential - Low - Extend rotation length (1000 tC02e/y)  Carbon sink potential - Low - Extend rotation length (1000 tC02e/y)  Carbon sink potential - Low - Improve plantations (1000 tC02e/y)  Carbon sink potential - Low - Improve plantations (1000 tC02e/y)  Carbon sink potential - Low - Increase retention of HWP (1000 tC02e/y)  Carbon sink potential - Low - Increase trees outside forests (1000 tC02e/y)  Carbon sink potential - Low - Reforest consink potential - Low - Reforest pasture (1000 tC02e/y)  Carbon sink potential - Low - Reforest post ink potential - Low - Reforest post ink potential - Low - Reforest post ink potential - Low - Reforest productivity (1000 tC02e/y)  Carbon sink potential - Low - Reforest productivity (1000 tC02e/y)  Carbon sink potential - Low - Restore productivity (1000 tC02e/y)  Carbon sink potential - Mid - Aucclerate5.21  regeneration (1000 tC02e/y)  Carbon sink potential - Mid - Alcoclerate5.21  Carbon sink potential - Mid - Alcoclerate5.21  Carbon sink potential - Mid - Alcoclerate5.21  Carbon sink potential - Mid - Alvoid120  |                                       |      |      |      |      |      |      | -5.4  |
| Pasture (1000 tCO2e/y)   Carbon sink potential - High - Restore productivity (1000 tCO2e/y)   Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)   Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)   Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)   Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)   Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)   Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)   Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)   Carbon sink potential - Low - Increase recessoristic forests (1000 tCO2e/y)   Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)   Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)   Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)   Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)   Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)   Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)   Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)   Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)   Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)   Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)   Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)   Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)   Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)   Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)   Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)   Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)   Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)   Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)   Carbon sink potential - Mid - Avoid   -120  |                                       |      |      |      |      |      |      |       |
| Carbon sink potential - High - Restore productivity (1000 tC02e/y)  Carbon sink potential - Low - Accelerate regeneration (1000 tC02e/y)  Carbon sink potential - Low - All (not counting overlap) (1000 tC02e/y)  Carbon sink potential - Low - Awoid deforestation (1000 tC02e/y)  Carbon sink potential - Low - Extend rotation length (1000 tC02e/y)  Carbon sink potential - Low - Extend rotation length (1000 tC02e/y)  Carbon sink potential - Low - Improve plantations (1000 tC02e/y)  Carbon sink potential - Low - Increase retention of HWP (1000 tC02e/y)  Carbon sink potential - Low - Increase retention of HWP (1000 tC02e/y)  Carbon sink potential - Low - Reforest cropland (1000 tC02e/y)  Carbon sink potential - Low - Reforest cropland (1000 tC02e/y)  Carbon sink potential - Low - Reforest posture (1000 tC02e/y)  Carbon sink potential - Low - Reforest rospinal potential - Low - Restore productivity (1000 tC02e/y)  Carbon sink potential - Low - Restore productivity (1000 tC02e/y)  Carbon sink potential - Mid - Accelerate regeneration (1000 tC02e/y)  Carbon sink potential - Mid - Accelerate regeneration (1000 tC02e/y)  Carbon sink potential - Mid - Accelerate regeneration (1000 tC02e/y)  Carbon sink potential - Mid - All (not counting overlap) (1000 tC02e/y)  Carbon sink potential - Mid - All (not counting overlap) (1000 tC02e/y)  Carbon sink potential - Mid - Avoid  |                                       |      |      |      |      |      |      | -85.9 |
| Description   Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)   Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)   Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)   Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)   Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)   Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)   Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)   Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)   Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)   Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)   Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)   Carbon sink potential - Low - Reforest productivity (1000 tCO2e/y)   Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)   Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)   Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)   Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)   Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)   Carbon sink potential - Mid - Avoid   -581   Carbon sink potential - Mid - Avoid   -120   -120   -120   -120   -120   -120  |                                       |      |      |      |      |      |      | 74.4  |
| Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)  Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)  Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)  Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)  Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)  Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)  Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)  Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)  Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)  Carbon sink potential - Low - Reforest productivity (1000 tCO2e/y)  Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)  Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)  Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)  Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)  Carbon sink potential - Mid - Avoid   | '                                     |      |      |      |      |      |      | -10.0 |
| regeneration (1000 tCO2e/y)   Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)   Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)   Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)   Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)   Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)   Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)   Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)   Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)   Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)   Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)   Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)   Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)   Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)   Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)   Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)   Carbon sink potential - Mid - Avoid   -120  |                                       |      |      |      |      |      |      | -3.48 |
| counting overlap) (1000 tC02e/y) Carbon sink potential - Low - Avoid deforestation (1000 tC02e/y) Carbon sink potential - Low - Extend rotation length (1000 tC02e/y) Carbon sink potential - Low - Improve plantations (1000 tC02e/y) Carbon sink potential - Low - Increase retention of HWP (1000 tC02e/y) Carbon sink potential - Low - Increase retention of HWP (1000 tC02e/y) Carbon sink potential - Low - Increase trees outside forests (1000 tC02e/y) Carbon sink potential - Low - Reforest cropland (1000 tC02e/y) Carbon sink potential - Low - Reforest pasture (1000 tC02e/y) Carbon sink potential - Low - Restore productivity (1000 tC02e/y) Carbon sink potential - Low - Restore productivity (1000 tC02e/y) Carbon sink potential - Mid - Accelerate regeneration (1000 tC02e/y) Carbon sink potential - Mid - Accelerate regeneration (1000 tC02e/y) Carbon sink potential - Mid - All (not counting overlap) (1000 tC02e/y) Carbon sink potential - Mid - All (not counting overlap) (1000 tC02e/y) Carbon sink potential - Mid - Avoid  |                                       |      |      |      |      |      |      |       |
| Carbon sink potential - Low - Avoid deforestation (1000 tC02e/y)  Carbon sink potential - Low - Extend rotation length (1000 tC02e/y)  Carbon sink potential - Low - Improve plantations (1000 tC02e/y)  Carbon sink potential - Low - Increase retention of HWP (1000 tC02e/y)  Carbon sink potential - Low - Increase trees outside forests (1000 tC02e/y)  Carbon sink potential - Low - Reforest cropland (1000 tC02e/y)  Carbon sink potential - Low - Reforest pasture (1000 tC02e/y)  Carbon sink potential - Low - Reforest pasture (1000 tC02e/y)  Carbon sink potential - Low - Restore productivity (1000 tC02e/y)  Carbon sink potential - Mid - Accelerate regeneration (1000 tC02e/y)  Carbon sink potential - Mid - All (not counting overlap) (1000 tC02e/y)  Carbon sink potential - Mid - All (not counting overlap) (1000 tC02e/y)  Carbon sink potential - Mid - All (not counting overlap) (1000 tC02e/y)  Carbon sink potential - Mid - Avoid - 120  |                                       |      |      |      |      |      |      | -263  |
| deforestation (1000 tC02e/y)  Carbon sink potential - Low - Extend rotation length (1000 tC02e/y)  Carbon sink potential - Low - Improve plantations (1000 tC02e/y)  Carbon sink potential - Low - Increase retention of HWP (1000 tC02e/y)  Carbon sink potential - Low - Increase retention of HWP (1000 tC02e/y)  Carbon sink potential - Low - Increase trees outside forests (1000 tC02e/y)  Carbon sink potential - Low - Reforest cropland (1000 tC02e/y)  Carbon sink potential - Low - Reforest pasture (1000 tC02e/y)  Carbon sink potential - Low - Restore productivity (1000 tC02e/y)  Carbon sink potential - Mid - Accelerate regeneration (1000 tC02e/y)  Carbon sink potential - Mid - Accelerate regeneration (1000 tC02e/y)  Carbon sink potential - Mid - All (not counting overlap) (1000 tC02e/y)  Carbon sink potential - Mid - Avoid - 120   |                                       |      |      |      |      |      |      |       |
| Carbon sink potential - Low - Extend rotation length (1000 tC02e/y)  Carbon sink potential - Low - Improve plantations (1000 tC02e/y)  Carbon sink potential - Low - Increase retention of HWP (1000 tC02e/y)  Carbon sink potential - Low - Increase trees outside forests (1000 tC02e/y)  Carbon sink potential - Low - Reforest cropland (1000 tC02e/y)  Carbon sink potential - Low - Reforest pasture (1000 tC02e/y)  Carbon sink potential - Low - Restore productivity (1000 tC02e/y)  Carbon sink potential - Low - Restore productivity (1000 tC02e/y)  Carbon sink potential - Mid - Accelerate regeneration (1000 tC02e/y)  Carbon sink potential - Mid - Accelerate regeneration (1000 tC02e/y)  Carbon sink potential - Mid - All (not counting overlap) (1000 tC02e/y)  Carbon sink potential - Mid - All (not counting overlap) (1000 tC02e/y)  Carbon sink potential - Mid - Avoid   | ·                                     |      |      |      |      |      |      | -34.3 |
| rotation length (1000 tC02e/y)  Carbon sink potential - Low - Improve plantations (1000 tC02e/y)  Carbon sink potential - Low - Increase retention of HWP (1000 tC02e/y)  Carbon sink potential - Low - Increase trees outside forests (1000 tC02e/y)  Carbon sink potential - Low - Reforest cropland (1000 tC02e/y)  Carbon sink potential - Low - Reforest pasture (1000 tC02e/y)  Carbon sink potential - Low - Restore productivity (1000 tC02e/y)  Carbon sink potential - Mid - Accelerate regeneration (1000 tC02e/y)  Carbon sink potential - Mid - All (not counting overlap) (1000 tC02e/y)  Carbon sink potential - Mid - All (not counting overlap) (1000 tC02e/y)  Carbon sink potential - Mid - All (not counting overlap) (1000 tC02e/y)  Carbon sink potential - Mid - Avoid  |                                       |      |      |      |      |      |      | 77 2  |
| Carbon sink potential - Low - Improve plantations (1000 tC02e/y)  Carbon sink potential - Low - Increase retention of HWP (1000 tC02e/y)  Carbon sink potential - Low - Increase trees outside forests (1000 tC02e/y)  Carbon sink potential - Low - Reforest cropland (1000 tC02e/y)  Carbon sink potential - Low - Reforest pasture (1000 tC02e/y)  Carbon sink potential - Low - Restore productivity (1000 tC02e/y)  Carbon sink potential - Mid - Accelerate regeneration (1000 tC02e/y)  Carbon sink potential - Mid - All (not counting overlap) (1000 tC02e/y)  Carbon sink potential - Mid - All (not counting overlap) (1000 tC02e/y)  Carbon sink potential - Mid - Avoid   |                                       |      |      |      |      |      |      | -11.5 |
| plantations (1000 tC02e/y)  Carbon sink potential - Low - Increase retention of HWP (1000 tC02e/y)  Carbon sink potential - Low - Increase trees outside forests (1000 tC02e/y)  Carbon sink potential - Low - Reforest cropland (1000 tC02e/y)  Carbon sink potential - Low - Reforest pasture (1000 tC02e/y)  Carbon sink potential - Low - Restore productivity (1000 tC02e/y)  Carbon sink potential - Mid - Accelerate regeneration (1000 tC02e/y)  Carbon sink potential - Mid - All (not counting overlap) (1000 tC02e/y)  Carbon sink potential - Mid - All (not counting overlap) (1000 tC02e/y)  Carbon sink potential - Mid - Avoid   |                                       |      |      |      |      |      |      | -13.9 |
| retention of HWP (1000 tCO2e/y)  Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)  Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)  Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)  Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)  Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)  Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)  Carbon sink potential - Mid - Avoid   | ·                                     |      |      |      |      |      |      |       |
| Carbon sink potential - Low - Increase trees outside forests (1000 tC02e/y)  Carbon sink potential - Low - Reforest cropland (1000 tC02e/y)  Carbon sink potential - Low - Reforest pasture (1000 tC02e/y)  Carbon sink potential - Low - Restore productivity (1000 tC02e/y)  Carbon sink potential - Mid - Accelerate regeneration (1000 tC02e/y)  Carbon sink potential - Mid - All (not counting overlap) (1000 tC02e/y)  Carbon sink potential - Mid - Avoid  |                                       |      |      |      |      |      |      | -69.4 |
| trees outside forests (1000 tCO2e/y)  Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)  Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)  Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)  Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)  Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)  Carbon sink potential - Mid - Avoid   |                                       |      |      |      |      |      |      |       |
| Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)  Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)  Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)  Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)  Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)  Carbon sink potential - Mid - Avoid   |                                       |      |      |      |      |      |      | -29.2 |
| cropland (1000 tCO2e/y)  Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)  Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)  Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)  Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)  Carbon sink potential - Mid - Avoid  |                                       |      |      |      |      |      |      | 0.7   |
| Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)  Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)  Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)  Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)  Carbon sink potential - Mid - Avoid   |                                       |      |      |      |      |      |      | -2.1  |
| pasture (1000 tCO2e/y)  Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)  Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)  Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)  Carbon sink potential - Mid - Avoid  |                                       |      |      |      |      |      |      | -6.51 |
| productivity (1000 tC02e/y)  Carbon sink potential - Mid - Accelerate regeneration (1000 tC02e/y)  Carbon sink potential - Mid - All (not counting overlap) (1000 tC02e/y)  Carbon sink potential - Mid - Avoid  -120  |                                       |      |      |      |      |      |      |       |
| Carbon sink potential - Mid - Accelerate regeneration (1000 tC02e/y) Carbon sink potential - Mid - All (not counting overlap) (1000 tC02e/y) Carbon sink potential - Mid - Avoid  -120   | Carbon sink potential - Low - Restore |      |      |      |      |      |      | -25.8 |
| regeneration (1000 tCO2e/y)  Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)  Carbon sink potential - Mid - Avoid  | productivity (1000 tCO2e/y)           |      |      |      |      |      |      |       |
| Carbon sink potential - Mid - All (not counting overlap) (1000 tC02e/y) Carbon sink potential - Mid - Avoid -120   |                                       |      | T    |      |      |      |      | -5.21 |
| counting overlap) (1000 tC02e/y) Carbon sink potential - Mid - Avoid   |                                       |      |      |      |      |      |      | F01   |
| Carbon sink potential - Mid - Avoid -120   |                                       |      |      |      |      |      |      | -581  |
|  |                                       |      |      |      |      |      |      | -120  |
|  | deforestation (1000 tC02e/y)          |      |      |      |      |      |      | 120   |

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

| Item Conhon sink notantial, Mid. Extend               | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|---|------|------|------|------|------|------|-------|
| Carbon sink potential - Mid - Extend                  |      |      |      |      |      |      | -139  |
| rotation length (1000 tC02e/y)                        |      |      |      |      |      |      | 00.7  |
| Carbon sink potential - Mid - Improve                 |      |      |      |      |      |      | -20.4 |
| plantations (1000 tCO2e/y)                            |      |      |      |      |      |      | 400   |
| Carbon sink potential - Mid - Increase                |      |      |      |      |      |      | -139  |
| retention of HWP (1000 tCO2e/y)                       |      |      |      |      |      |      |       |
| Carbon sink potential - Mid - Increase                |      |      |      |      |      |      | -56.4 |
| trees outside forests (1000 tCO2e/y)                  |      |      |      |      |      |      |       |
| Carbon sink potential - Mid - Reforest                |      |      |      |      |      |      | -4.05 |
| cropland (1000 tCO2e/y)                               |      |      |      |      |      |      |       |
| Carbon sink potential - Mid - Reforest                |      |      |      |      |      |      | -46.2 |
| pasture (1000 tCO2e/y)                                |      |      |      |      |      |      |       |
| Carbon sink potential - Mid - Restore                 |      |      |      |      |      |      | -51.2 |
| productivity (1000 tCO2e/y)                           |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -             |      |      |      |      |      |      | 1.13  |
| High - Accelerate regeneration (1000                  |      |      |      |      |      |      |       |
| hectares)   |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -             |      |      |      |      |      |      | 27.8  |
| High - Avoid deforestation (over 30 years)            |      |      |      |      |      |      |       |
| (1000 hectares)                                       |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -             |      |      |      |      |      |      | 103   |
| High - Extend rotation length (1000                   |      |      |      |      |      |      |       |
| hectares)   |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -             |      |      |      |      |      |      | 10.   |
| High - Improve plantations (1000                      |      |      |      |      |      |      |       |
| hectares)   |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -             |      |      |      |      |      |      | (     |
| High - Increase retention of HWP (1000                |      |      |      |      |      |      |       |
| hectares)   |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -             |      |      |      |      |      |      | 7.93  |
| High - Increase trees outside forests                 |      |      |      |      |      |      | 1170  |
| (1000 hectares)                                       |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -             |      |      |      |      |      |      | 0.35  |
| High - Reforest cropland (1000 hectares)              |      |      |      |      |      |      | 0.00  |
| Land impacted for carbon sink potential -             |      |      |      |      |      |      | 2.44  |
| High - Reforest pasture (1000 hectares)               |      |      |      |      |      |      | 2.4-  |
| Land impacted for carbon sink potential -             |      |      |      |      |      |      | 25.4  |
| High - Restore productivity (1000                     |      |      |      |      |      |      | 20.5  |
| hectares)   |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -             |      |      |      |      |      |      | 178   |
|   |      |      |      |      |      |      | 110   |
| High - Total impacted (over 30 years) (1000 hectares) |      |      |      |      |      |      |       |
| •   |      |      |      |      |      |      | 0.57  |
| Land impacted for carbon sink potential -             |      |      |      |      |      |      | 0.56  |
| Low - Accelerate regeneration (1000                   |      |      |      |      |      |      |       |
| hectares)   |      |      |      |      |      |      | 0/    |
| Land impacted for carbon sink potential -             |      |      |      |      |      |      | 26.   |
| Low - Avoid deforestation (over 30 years)             |      |      |      |      |      |      |       |
| (1000 hectares)                                       |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -             |      |      |      |      |      |      | 39.3  |
| Low - Extend rotation length (1000                    |      |      |      |      |      |      |       |
| hectares)   |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -             |      |      |      |      |      |      | 5.03  |
| Low - Improve plantations (1000                       |      |      |      |      |      |      |       |
| hectares)   |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -             |      |      |      |      |      |      | (     |
| Low - Increase retention of HWP (1000                 |      |      |      |      |      |      |       |
| hectares)   |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -             |      |      |      |      |      |      | 4.1   |
| Low - Increase trees outside forests                  |      |      |      |      |      |      |       |
| (1000 hectares)                                       |      |      |      |      |      |      |       |

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

| Item                                       | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|--|------|------|------|------|------|------|-------|
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 0.179 |
| Low - Reforest cropland (1000 hectares)    |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 0.423 |
| Low - Reforest pasture (1000 hectares)     |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 15.4  |
| Low - Restore productivity (1000           |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 91.2  |
| Low - Total impacted (over 30 years)       |      |      |      |      |      |      |       |
| (1000 hectares)                            |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 0.851 |
| Mid - Accelerate regeneration (1000        |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 27    |
| Mid - Avoid deforestation (over 30 years)  |      |      |      |      |      |      |       |
| (1000 hectares)                            |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 71    |
| Mid - Extend rotation length (1000         |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 7.57  |
| Mid - Improve plantations (1000 hectares)  |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 0     |
| Mid - Increase retention of HWP (1000      |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 6.05  |
| Mid - Increase trees outside forests (1000 |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 0.268 |
| Mid - Reforest cropland (1000 hectares)    |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 3.06  |
| Mid - Reforest pasture (1000 hectares)     |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 30.9  |
| Mid - Restore productivity (1000           |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 147   |
| Mid - Total impacted (over 30 years) (1000 |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |

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

| Item  | 2020   | 2025 | 2030   | 2035 | 2040 | 2045 | 2050   |
|---|--------|------|--------|------|------|------|--------|
| Business-as-usual carbon sink - Natural uptake (Mt CO2e/y)                | -0.69  |      | -0.314 |      |      |      | -0.281 |
| Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y) | -0.057 |      | -0.102 |      |      |      | -0.106 |
| Business-as-usual carbon sink - Total (Mt<br>CO2e/y)                      | -0.747 |      | -0.416 |      |      |      | -0.387 |

# Table 66: REF scenario - IMPACTS - Health

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--|------|------|------|------|------|------|------|
| Monetary damages from air pollution -<br>Coal (million 2019\$)           |      | 344  | 215  | 201  | 196  | 193  | 177  |
| Monetary damages from air pollution -<br>Natural Gas (million 2019\$)    |      | 36.8 | 41   | 53.9 | 55.9 | 55.9 | 52.3 |
| Monetary damages from air pollution -<br>Transportation (million 2019\$) |      | 236  | 243  | 249  | 257  | 265  | 272  |
| Premature deaths from air pollution -<br>Coal (deaths)                   |      | 38.9 | 24.3 | 22.8 | 22.2 | 21.8 | 19.9 |
| Premature deaths from air pollution -<br>Natural Gas (deaths)            |      | 4.15 | 4.63 | 6.08 | 6.31 | 6.31 | 5.9  |

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

| Item                                  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---------------------------------------|------|------|------|------|------|------|------|
| Premature deaths from air pollution - |      | 26.6 | 27.3 | 28.1 | 28.9 | 29.8 | 30.6 |
| Transportation (deaths)               |      |      |      |      |      |      |      |