

# Net-Zero America - arkansas state report

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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 -      |      | 10,539 | 12,307 |       |      |      |      |
| Cumulative 5-yr (million \$2018)           |      |        |        |       |      |      |      |
| Sales of cooking units - Electric          | 30.1 | 44.4   | 79.2   | 86.1  | 86.5 | 86.5 | 86.5 |
| Resistance (%)                             |      |        |        |       |      |      |      |
| Sales of cooking units - Gas (%)           | 69.9 | 55.6   | 20.8   | 13.9  | 13.5 | 13.5 | 13.5 |
| Sales of space heating units - Electric    | 2.92 | 27.3   | 77.1   | 91.1  | 92.3 | 92.3 | 92.3 |
| Heat Pump (%)                              |      |        |        |       |      |      |      |
| Sales of space heating units - Electric    | 2.74 | 4.44   | 4.73   | 6.05  | 6.35 | 6.37 | 6.39 |
| Resistance (%)                             |      |        |        |       |      |      |      |
| Sales of space heating units - Fossil (%)  | 0    | 0      | 0      | 0     | 0    | 0    | 0    |
| Sales of space heating units - Gas Furnace | 94.3 | 68.3   | 18.2   | 2.83  | 1.38 | 1.34 | 1.33 |
| (%)  |      |        |        |       |      |      |      |
| Sales of water heating units - Electric    | 0.08 | 10.7   | 56.3   | 66.5  | 66.9 | 66.9 | 66.9 |
| Heat Pump (%)                              |      |        |        |       |      |      |      |
| Sales of water heating units - Electric    | 2.31 | 8.07   | 26.9   | 31.1  | 31.3 | 31.3 | 31.3 |
| Resistance (%)                             |      |        |        |       |      |      |      |
| Sales of water heating units - Gas Furnace | 96.5 | 79.4   | 15     | 0.632 | 0    | 0    | 0    |
| (%)  |      |        |        |       |      |      |      |
| Sales of water heating units - Other (%)   | 1.07 | 1.78   | 1.78   | 1.78  | 1.79 | 1.79 | 1.8  |

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

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|------|------|------|------|------|------|------|
| Electricity distribution capital invested - |      | 2.42 | 2.48 | 3.87 | 4.09 | 4.01 | 4.2  |
| 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)     | 90   | 90.4 | 87   | 81.6 | 77.4 | 76.4 | 78.1 |
| Final energy use - Industry (PJ)       | 236  | 242  | 246  | 246  | 250  | 250  | 255  |
| Final energy use - Residential (PJ)    | 123  | 117  | 108  | 95.6 | 85.1 | 78.9 | 76.1 |
| Final energy use - Transportation (PJ) | 324  | 303  | 265  | 220  | 179  | 155  | 146  |

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

| Item                                       | 2020 | 2025 | 2030 | 2035  | 2040  | 2045  | 2050  |
|--|------|------|------|-------|-------|-------|-------|
| Residential HVAC investment in 2020s vs.   |      | 2.31 | 2.82 |       |       |       |       |
| REF - Cumulative 5-yr (billion \$2018)     |      |      |      |       |       |       |       |
| Sales of cooking units - Electric          | 52.7 | 62.8 | 93.6 | 99.7  | 100   | 100   | 100   |
| Resistance (%)                             |      |      |      |       |       |       |       |
| Sales of cooking units - Gas (%)           | 47.3 | 37.2 | 6.37 | 0.321 | 0     | 0     | 0     |
| Sales of space heating units - Electric    | 11.9 | 27.2 | 74.3 | 84.8  | 85.3  | 85.2  | 85.2  |
| Heat Pump (%)                              |      |      |      |       |       |       |       |
| Sales of space heating units - Electric    | 34.9 | 33.8 | 14.2 | 9.82  | 9.65  | 9.82  | 9.86  |
| Resistance (%)                             |      |      |      |       |       |       |       |
| Sales of space heating units - Fossil (%)  | 8.14 | 11.9 | 5.59 | 4.18  | 4.11  | 4.04  | 4.03  |
| Sales of space heating units - Gas (%)     | 45.1 | 27.1 | 5.9  | 1.18  | 0.978 | 0.957 | 0.954 |
| Sales of water heating units - Electric    | 0    | 11.3 | 59.7 | 70.6  | 71.1  | 71.1  | 71.1  |
| Heat Pump (%)                              |      |      |      |       |       |       |       |
| Sales of water heating units - Electric    | 44.5 | 51.9 | 32.1 | 27.6  | 27.4  | 27.4  | 27.4  |
| Resistance (%)                             |      |      |      |       |       |       |       |
| Sales of water heating units - Gas Furnace | 53.7 | 35.3 | 6.65 | 0.277 | 0     | 0     | 0     |
| (%)  |      |      |      |       |       |       |       |
| Sales of water heating units - Other (%)   | 1.86 | 1.52 | 1.52 | 1.49  | 1.49  | 1.5   | 1.5   |

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

| Item                                       | 2020  | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|--|-------|-------|-------|-------|-------|-------|-------|
| Light-duty vehicle capital costs -         |       | 542   | 1,384 | 2,253 | 3,409 | 3,714 | 3,539 |
| Cumulative 5-yr (million \$2018)           |       |       |       |       |       |       |       |
| Public EV charging plugs - DC Fast (1000   | 0.043 |       | 1.12  |       | 5.01  |       | 8.11  |
| units)                                     |       |       |       |       |       |       |       |
| Public EV charging plugs - L2 (1000 units) | 0.243 |       | 26.9  |       | 120   |       | 195   |
| 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 (%)    | 1.81  | 2.04  | 1.36  | 0.439 | 0.079 | 0.013 | 0     |
| Vehicle sales - Light-duty - EV (%)        | 3.04  | 12.5  | 42.3  | 80.1  | 96.1  | 99.3  | 100   |
| Vehicle sales - Light-duty - gasoline (%)  | 91.3  | 81    | 53.1  | 18.2  | 3.51  | 0.597 | 0     |
| Vehicle sales - Light-duty - hybrid (%)    | 3.57  | 3.93  | 2.92  | 1.11  | 0.266 | 0.056 | 0     |
| Vehicle sales - Light-duty - hydrogen FC   | 0.112 | 0.354 | 0.224 | 0.071 | 0.014 | 0.002 | 0     |
| (%)  |       |       |       |       |       |       |       |
| Vehicle sales - Light-duty - other (%)     | 0.113 | 0.11  | 0.074 | 0.026 | 0.005 | 0.001 | 0     |
| Vehicle sales - Medium-duty - diesel (%)   | 64.7  | 59.7  | 42.3  | 14.4  | 2.59  | 0.384 | 0     |
| Vehicle sales - Medium-duty - EV (%)       | 0.784 | 5.07  | 25.3  | 60.8  | 76.5  | 79.5  | 80    |
| Vehicle sales - Medium-duty - gasoline (%) | 33.7  | 33.3  | 25.5  | 9.32  | 1.77  | 0.277 | 0     |
| Vehicle sales - Medium-duty - hybrid (%)   | 0.363 | 0.402 | 0.341 | 0.14  | 0.03  | 0.005 | 0     |
| Vehicle sales - Medium-duty - hydrogen     | 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      | 0.022  | 0      | 0      | 0.032  |
| Capital invested - Biomass w/ccu power plant (billion \$2018)                  | 0    | 0     | 0      | 0      | 4.37   | 0      | 0.029  |
| Capital invested - Solar PV - Base (billion<br>\$2018)                         |      | 1.14  | 0.219  | 3.29   | 4.23   | 0.151  | 0      |
| Capital invested - Solar PV - Constrained (billion \$2018)                     |      | 0.354 | 1.18   | 3.58   | 3.11   | 0.641  | 0      |
| Capital invested - Wind - Base (billion<br>\$2018)                             |      | 3.48  | 8.29   | 10.5   | 12.8   | 10.5   | 21.2   |
| Capital invested - Wind - Constrained (billion \$2018)                         |      | 7.97  | 11.9   | 18.7   | 25.5   | 0.59   | 24.8   |
| 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      | 0      | 0      |
| Installed renewables - Rooftop PV (MW)   | 14.5 | 25.5  | 37.9   | 57.4   | 85.2   | 121    | 168    |
| Installed renewables - Solar - Base land use assumptions (MW)                  | 210  | 1,211 | 1,425  | 4,924  | 9,694  | 9,874  | 9,874  |
| Installed renewables - Solar -<br>Constrained land use assumptions (MW)        | 200  | 200   | 1,662  | 6,579  | 9,762  | 10,100 | 10,100 |
| Installed renewables - Wind - Base land use assumptions (MW)                   | 84.5 | 2,450 | 8,676  | 17,144 | 27,980 | 37,359 | 57,370 |
| Installed renewables - Wind - Constrained land use assumptions (MW)            | 541  | 5,494 | 14,552 | 29,653 | 56,618 | 57,141 | 79,791 |

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      | 21.7   | 21.7    | 21.7    | 53.4    |
| Biomass w/ccu power plant (GWh)          | 0     | 0      | 0      | 0      | 4,907   | 4,907   | 4,940   |
| OffshoreWind - Base land use             | 0     | 0      | 0      | 0      | 0       | 0       | 0       |
| assumptions (GWh)                        |       |        |        |        |         |         |         |
| OffshoreWind - Constrained land use      | 0     | 0      | 0      | 0      | 0       | 0       | 0       |
| assumptions (GWh)                        |       |        |        |        |         |         |         |
| Solar - Base land use assumptions (GWh)  | 409   | 2,043  | 2,391  | 8,094  | 15,883  | 16,176  | 16,176  |
| Solar - Constrained land use assumptions | 390   | 390    | 2,766  | 10,770 | 15,974  | 16,525  | 16,525  |
| (GWh)                                    |       |        |        |        |         |         |         |
| Wind - Base land use assumptions (GWh)   | 315   | 8,268  | 28,699 | 57,011 | 91,910  | 120,376 | 180,483 |
| Wind - Constrained land use assumptions  | 1,989 | 19,254 | 49,424 | 95,999 | 169,988 | 171,818 | 245,945 |
| (GWh)                                    |       |        |        |        |         |         |         |

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

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|--|------|----------|------|-------|-------|-------|-------|
| Item   | 2020 | 2025     | 2030 | 2035  | 2040  | 2045  | 2050  |
| Biomass purchases (million \$2018/year)      |      | 0        | 0    | 79.9  | 391   | 858   | 1,068 |
| Conversion capital investment -              |      | 0        | 0    | 1,551 | 6,476 | 8,924 | 4,059 |
| Cumulative 5-yr (million \$2018)             |      |          |      |       |       |       |       |
| Number of facilities - Allam power w ccu     | 0    | 0        | 0    | 1     | 1     | 1     | 2     |
| (quantity)                                   |      |          |      |       |       |       |       |
| Number of facilities - Beccs hydrogen        | 0    | 0        | 0    | 1     | 4     | 14    | 17    |
| (quantity)                                   |      |          |      |       |       |       |       |
| Number of facilities - Diesel (quantity)     | 0    | 0        | 0    | 0     | 0     | 0     | 0     |
| Number of facilities - Diesel ccu (quantity) | 0    | 0        | 0    | 1     | 1     | 1     | 2     |
| Number of facilities - Power (quantity)      | 0    | 0        | 0    | 0     | 0     | 0     | 0     |
| Number of facilities - Power ccu             | 0    | 0        | 0    | 0     | 4     | 4     | 5     |
| (quantity)                                   |      |          |      |       |       |       |       |
| Number of facilities - Pyrolysis (quantity)  | 0    | 0        | 0    | 0     | 0     | 0     | 0     |
| Number of facilities - Pyrolysis ccu         | 0    | 0        | 0    | 1     | 1     | 1     | 2     |
| (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 9: E+ scenario - PILLAR 4: CCUS - CO2 capture

| Item                               | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|------------------------------------|------|------|------|------|------|------|------|
| Annual - All (MMT)                 |      | 0    | 0    | 1.95 | 9.81 | 21.3 | 26.4 |
| Annual - BECCS (MMT)               |      | 0    | 0    | 1.95 | 9.81 | 21.3 | 26.4 |
| 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    | 1.95 | 11.8 | 33   | 59.5 |
| Cumulative - BECCS (MMT)           |      | 0    | 0    | 1.95 | 11.8 | 33   | 59.5 |
| 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    | 39.8 | 140  | 420  | 894   | 1,699 |
| Cumulative investment - All (million<br>\$2018)   |      | 0    | 244  | 540  | 812  | 1,335 | 2,026 |
| Cumulative investment - Spur (million<br>\$2018)  |      | 0    | 0    | 50.8 | 323  | 846   | 1,537 |
| Cumulative investment - Trunk (million<br>\$2018) |      | 0    | 244  | 489  | 489  | 489   | 489   |
| Spur (km)   |      | 0    | 0    | 60.8 | 341  | 815   | 1,619 |
| Trunk (km)  |      | 0    | 39.8 | 79.6 | 79.6 | 79.6  | 79.6  |

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

|   | •    |      |      |      |      |      |       |
|---|------|------|------|------|------|------|-------|
| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
| CO2 storage (MMT)   |      | 0    | 2.19 | 8.81 | 16.3 | 25.8 | 35.4  |
| Injection wells (wells)   |      | 0    | 2    | 10   | 18   | 30   | 38    |
| Resource characterization, appraisal, permitting costs (million \$2020) |      | 14.2 | 255  | 404  | 404  | 404  | 404   |
| Wells and facilities construction costs (million \$2020)                |      | 0    | 78.2 | 305  | 543  | 909  | 1,128 |

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

| Item                                     | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050    |
|--|------|------|------|------|------|------|---------|
| Carbon sink potential - Aggressive       |      |      |      |      |      |      | -243    |
| deployment - Corn-ethanol to energy      |      |      |      |      |      |      |         |
| grasses (1000 tC02e/y)                   |      |      |      |      |      |      |         |
| Carbon sink potential - Aggressive       |      |      |      |      |      |      | -10,076 |
| deployment - Cropland measures (1000     |      |      |      |      |      |      |         |
| tCO2e/y)                                 |      |      |      |      |      |      | ( / 0   |
| Carbon sink potential - Aggressive       |      |      |      |      |      |      | -64.8   |
| deployment - Permanent conservation      |      |      |      |      |      |      |         |
| cover (1000 tC02e/y)                     |      |      |      |      |      |      | 10.000  |
| Carbon sink potential - Aggressive       |      |      |      |      |      |      | -10,383 |
| deployment - Total (1000 tCO2e/y)        |      |      |      |      |      |      | 0/0     |
| Carbon sink potential - Moderate         |      |      |      |      |      |      | -243    |
| deployment - Corn-ethanol to energy      |      |      |      |      |      |      |         |
| grasses (1000 tC02e/y)                   |      |      |      |      |      |      | F 10.0  |
| Carbon sink potential - Moderate         |      |      |      |      |      |      | -5,130  |
| deployment - Cropland measures (1000     |      |      |      |      |      |      |         |
| tCO2e/y)                                 |      |      |      |      |      |      |         |
| Carbon sink potential - Moderate         |      |      |      |      |      |      | -32.4   |
| deployment - Permanent conservation      |      |      |      |      |      |      |         |
| cover (1000 tC02e/y)                     |      |      |      |      |      |      |         |
| Carbon sink potential - Moderate         |      |      |      |      |      |      | -5,405  |
| deployment - Total (1000 tCO2e/y)        |      |      |      |      |      |      | 0//     |
| Land impacted for carbon sink -          |      |      |      |      |      |      | 96.4    |
| Aggressive deployment - Corn-ethanol to  |      |      |      |      |      |      |         |
| energy grasses (1000 hectares)           |      |      |      |      |      |      | 0.055   |
| Land impacted for carbon sink -          |      |      |      |      |      |      | 2,955   |
| Aggressive deployment - Cropland         |      |      |      |      |      |      |         |
| measures (1000 hectares)                 |      |      |      |      |      |      | 440     |
| Land impacted for carbon sink -          |      |      |      |      |      |      | 118     |
| Aggressive deployment - Permanent        |      |      |      |      |      |      |         |
| conservation cover (1000 hectares)       |      |      |      |      |      |      |         |
| Land impacted for carbon sink -          |      |      |      |      |      |      | 3,170   |
| Aggressive deployment - Total (1000      |      |      |      |      |      |      |         |
| hectares)                                |      |      |      |      |      |      | 07.7    |
| Land impacted for carbon sink - Moderate |      |      |      |      |      |      | 96.4    |
| deployment - Corn-ethanol to energy      |      |      |      |      |      |      |         |
| grasses (1000 hectares)                  |      |      |      |      |      |      | 4.505   |
| Land impacted for carbon sink - Moderate |      |      |      |      |      |      | 1,507   |
| deployment - Cropland measures (1000     |      |      |      |      |      |      |         |
| hectares)                                |      |      |      |      |      |      |         |
| Land impacted for carbon sink - Moderate |      |      |      |      |      |      | 58.9    |
| deployment - Permanent conservation      |      |      |      |      |      |      |         |
| cover (1000 hectares)                    |      |      |      |      |      |      | 1 / / 2 |
| Land impacted for carbon sink - Moderate |      |      |      |      |      |      | 1,662   |
| deployment - Total (1000 hectares)       |      |      |      |      |      |      |         |

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

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050    |
|--|------|------|------|------|------|------|---------|
| Carbon sink potential - High - Accelerate                        |      |      |      |      |      |      | -356    |
| regeneration (1000 tC02e/y)                                      |      |      |      |      |      |      |         |
| Carbon sink potential - High - All (not                          |      |      |      |      |      |      | -46,154 |
| counting overlap) (1000 tCO2e/y)                                 |      |      |      |      |      |      |         |
| Carbon sink potential - High - Avoid                             |      |      |      |      |      |      | -1,334  |
| deforestation (1000 tC02e/y)                                     |      |      |      |      |      |      |         |
| Carbon sink potential - High - Extend                            |      |      |      |      |      |      | -9,227  |
| rotation length (1000 tCO2e/y)                                   |      |      |      |      |      |      | 0.077   |
| Carbon sink potential - High - Improve                           |      |      |      |      |      |      | -3,044  |
| plantations (1000 tC02e/y)                                       |      |      |      |      |      |      | 10.005  |
| Carbon sink potential - High - Increase                          |      |      |      |      |      |      | -13,825 |
| retention of HWP (1000 tC02e/y)                                  |      |      |      |      |      |      | 1100    |
| Carbon sink potential - High - Increase                          |      |      |      |      |      |      | -1,120  |
| trees outside forests (1000 tC02e/y)                             |      |      |      |      |      |      | 1.077   |
| Carbon sink potential - High - Reforest                          |      |      |      |      |      |      | -1,077  |
| cropland (1000 tCO2e/y)  Carbon sink potential - High - Reforest |      |      |      |      |      |      | -11,526 |
| ,  |      |      |      |      |      |      | -11,526 |
| pasture (1000 tCO2e/y)  Carbon sink potential - High - Restore   |      |      |      |      |      |      | -4,644  |
| productivity (1000 tC02e/y)                                      |      |      |      |      |      |      | -4,044  |
| Carbon sink potential - Low - Accelerate                         |      |      |      |      |      |      | -178    |
| regeneration (1000 tC02e/y)                                      |      |      |      |      |      |      | -110    |
| Carbon sink potential - Low - All (not                           |      |      |      |      |      |      | -13,471 |
| counting overlap) (1000 tC02e/y)                                 |      |      |      |      |      |      | -13,471 |
| Carbon sink potential - Low - Avoid                              |      |      |      |      |      |      | -222    |
| deforestation (1000 tC02e/y)                                     |      |      |      |      |      |      | -222    |
| Carbon sink potential - Low - Extend                             |      |      |      |      |      |      | -3,544  |
| rotation length (1000 tCO2e/y)                                   |      |      |      |      |      |      | -5,544  |
| Carbon sink potential - Low - Improve                            |      |      |      |      |      |      | -1,549  |
| plantations (1000 tCO2e/y)                                       |      |      |      |      |      |      | -1,047  |
| Carbon sink potential - Low - Increase                           |      |      |      |      |      |      | -4,608  |
| retention of HWP (1000 tC02e/y)                                  |      |      |      |      |      |      | -4,000  |
| Carbon sink potential - Low - Increase                           |      |      |      |      |      |      | -392    |
| trees outside forests (1000 tCO2e/y)                             |      |      |      |      |      |      | 072     |
| Carbon sink potential - Low - Reforest                           |      |      |      |      |      |      | -538    |
| cropland (1000 tCO2e/y)  |      |      |      |      |      |      | 000     |
| Carbon sink potential - Low - Reforest                           |      |      |      |      |      |      | -873    |
| pasture (1000 tCO2e/y)   |      |      |      |      |      |      | 0.0     |
| Carbon sink potential - Low - Restore                            |      |      |      |      |      |      | -1,565  |
| productivity (1000 tCO2e/y)                                      |      |      |      |      |      |      | ,       |
| Carbon sink potential - Mid - Accelerate                         |      |      |      |      |      |      | -267    |
| regeneration (1000 tCO2e/y)                                      |      |      |      |      |      |      |         |
| Carbon sink potential - Mid - All (not                           |      |      |      |      |      |      | -29,786 |
| counting overlap) (1000 tC02e/y)                                 |      |      |      |      |      |      | •       |
| Carbon sink potential - Mid - Avoid                              |      |      |      |      |      |      | -778    |
| deforestation (1000 tCO2e/y)                                     |      |      |      |      |      |      |         |
| Carbon sink potential - Mid - Extend                             |      |      |      |      |      |      | -6,386  |
| rotation length (1000 tCO2e/y)                                   |      |      |      |      |      |      |         |
| Carbon sink potential - Mid - Improve                            |      |      |      |      |      |      | -2,270  |
| plantations (1000 tCO2e/y)                                       |      |      |      |      |      |      |         |
| Carbon sink potential - Mid - Increase                           |      |      |      |      |      |      | -9,217  |
| retention of HWP (1000 tCO2e/y)                                  |      |      |      |      |      |      |         |
| Carbon sink potential - Mid - Increase                           |      |      |      |      |      |      | -756    |
| trees outside forests (1000 tCO2e/y)                             |      |      |      |      |      |      |         |
| Carbon sink potential - Mid - Reforest                           |      |      |      |      |      |      | -807    |
| cropland (1000 tCO2e/y)  |      |      |      |      |      |      |         |
| Carbon sink potential - Mid - Reforest                           |      |      |      |      |      |      | -6,200  |
| pasture (1000 tCO2e/y)   |      |      |      |      |      |      |         |
| Carbon sink potential - Mid - Restore                            |      |      |      |      |      |      | -3,105  |
| productivity (1000 tCO2e/y)                                      |      |      |      |      |      |      |         |

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

| Table 13: E+ scenario - PILLAR 6: Land sini |      | ·    |      |      |      |      |       |
|---|------|------|------|------|------|------|-------|
| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
| Land impacted for carbon sink potential -   |      |      |      |      |      |      | 58.3  |
| High - Accelerate regeneration (1000        |      |      |      |      |      |      |       |
| hectares)                                   |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -   |      |      |      |      |      |      | 181   |
| High - Avoid deforestation (over 30 years)  |      |      |      |      |      |      |       |
| (1000 hectares)                             |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -   |      |      |      |      |      |      | 4,705 |
| High - Extend rotation length (1000         |      |      |      |      |      |      |       |
| hectares)                                   |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -   |      |      |      |      |      |      | 1,121 |
| 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 -   |      |      |      |      |      |      | 106   |
| High - Increase trees outside forests       |      |      |      |      |      |      |       |
| (1000 hectares)                             |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -   |      |      |      |      |      |      | 71.2  |
| High - Reforest cropland (1000 hectares)    |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -   |      |      |      |      |      |      | 327   |
| High - Reforest pasture (1000 hectares)     |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -   |      |      |      |      |      |      | 1,539 |
| High - Restore productivity (1000           |      |      |      |      |      |      |       |
| hectares)                                   |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -   |      |      |      |      |      |      | 8,110 |
| High - Total impacted (over 30 years)       |      |      |      |      |      |      |       |
| (1000 hectares)                             |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -   |      |      |      |      |      |      | 29.1  |
| Low - Accelerate regeneration (1000         |      |      |      |      |      |      |       |
| hectares)                                   |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -   |      |      |      |      |      |      | 170   |
| Low - Avoid deforestation (over 30 years)   |      |      |      |      |      |      |       |
| (1000 hectares)                             |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -   |      |      |      |      |      |      | 1,803 |
| Low - Extend rotation length (1000          |      |      |      |      |      |      |       |
| hectares)                                   |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -   |      |      |      |      |      |      | 561   |
| 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 -   |      |      |      |      |      |      | 56    |
| Low - Increase trees outside forests        |      |      |      |      |      |      |       |
| (1000 hectares)                             |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -   |      |      |      |      |      |      | 35.6  |
| Low - Reforest cropland (1000 hectares)     |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -   |      |      |      |      |      |      | 56.8  |
| Low - Reforest pasture (1000 hectares)      |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -   |      |      |      |      |      |      | 931   |
| Low - Restore productivity (1000            |      |      |      |      |      |      |       |
| hectares)                                   |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -   |      |      |      |      |      |      | 3,642 |
| Low - Total impacted (over 30 years)        |      |      |      |      |      |      | •     |
| (1000 hectares)                             |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -   |      |      |      |      |      |      | 43.7  |
| Mid - Accelerate regeneration (1000         |      |      |      |      |      |      |       |
| Mid - Accelerate regeneration riboo         |      | ,    | 1    | ,    |      |      |       |

| Table 13: E+ | econario - | DTIIAP 6. | I and sinks - | Enrocte | (continued) |
|--------------|------------|-----------|---------------|---------|-------------|
| Table 15. E+ | SCEHUITO - | PILLAR D. | LUHU SHIKS -  | FULESTS | COMUNICEUR  |

| Item                                       | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|--|------|------|------|------|------|------|-------|
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 175   |
| Mid - Avoid deforestation (over 30 years)  |      |      |      |      |      |      |       |
| (1000 hectares)                            |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 3,254 |
| Mid - Extend rotation length (1000         |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 844   |
| 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 -  |      |      |      |      |      |      | 81.2  |
| Mid - Increase trees outside forests (1000 |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 53.4  |
| Mid - Reforest cropland (1000 hectares)    |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 410   |
| Mid - Reforest pasture (1000 hectares)     |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 1,876 |
| Mid - Restore productivity (1000           |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 6,737 |
| 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)      |      | 279  | 235  | 189  | 142  | 89.4 | 62    |
| Natural gas consumption - Cumulative (tcf)  |      |      |      |      |      |      | 5,687 |
| Natural gas production - Annual (tcf)       |      | 720  | 681  | 593  | 501  | 397  | 309   |
| Oil consumption - Annual (million bbls)     |      | 54.3 | 46.3 | 34.6 | 23.5 | 14.8 | 7.61  |
| Oil consumption - Cumulative (million bbls) |      |      |      |      |      |      | 1,065 |
| Oil production - Annual (million bbls)      |      | 6.5  | 6.52 | 6.52 | 5.16 | 4.2  | 2.79  |

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

| Item   | 2020 | 2025 | 2030  | 2035  | 2040  | 2045  | 2050  |
|--|------|------|-------|-------|-------|-------|-------|
| Monetary damages from air pollution -<br>Coal (million 2019\$)           |      | 319  | 0.217 | 0.206 | 0.16  | 0.104 | 0.004 |
| Monetary damages from air pollution -<br>Natural Gas (million 2019\$)    |      | 113  | 64.1  | 34    | 28.5  | 12.5  | 6.16  |
| Monetary damages from air pollution -<br>Transportation (million 2019\$) |      | 404  | 374   | 283   | 163   | 74.8  | 30.8  |
| Premature deaths from air pollution -<br>Coal (deaths)                   |      | 36   | 0.024 | 0.023 | 0.018 | 0.012 | 0     |
| Premature deaths from air pollution -<br>Natural Gas (deaths)            |      | 12.8 | 7.24  | 3.84  | 3.21  | 1.41  | 0.695 |
| Premature deaths from air pollution -<br>Transportation (deaths)         |      | 45.5 | 42.1  | 31.8  | 18.3  | 8.42  | 3.46  |

# Table 16: E+ scenario - IMPACTS - Jobs

| Item                                     | 2020 | 2025  | 2030  | 2035   | 2040   | 2045   | 2050   |
|--|------|-------|-------|--------|--------|--------|--------|
| By economic sector - Agriculture (jobs)  |      | 122   | 247   | 259    | 772    | 1,312  | 1,336  |
| By economic sector - Construction (jobs) |      | 4,896 | 6,363 | 11,223 | 15,191 | 14,823 | 20,176 |
| By economic sector - Manufacturing       |      | 5,351 | 6,235 | 8,016  | 8,218  | 7,279  | 9,324  |
| (jobs)                                   |      |       |       |        |        |        |        |
| By economic sector - Mining (jobs)       |      | 4,370 | 3,274 | 2,308  | 1,469  | 913    | 501    |

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

| Table 16: E+ Scendro - IMPACTS - Jobs (co     | -    |        |          |        |        |         |         |
|---|------|--------|----------|--------|--------|---------|---------|
| Item  | 2020 | 2025   | 2030     | 2035   | 2040   | 2045    | 2050    |
| By economic sector - Other (jobs)             |      | 378    | 481      | 1,264  | 1,956  | 1,707   | 2,330   |
| By economic sector - Pipeline (jobs)          |      | 462    | 422      | 348    | 245    | 210     | 294     |
| By economic sector - Professional (jobs)      |      | 3,306  | 4,324    | 7,167  | 10,566 | 12,169  | 16,526  |
| By economic sector - Trade (jobs)             |      | 2,329  | 2,667    | 4,131  | 5,742  | 6,200   | 8,554   |
| By economic sector - Utilities (jobs)         |      | 5,433  | 5,851    | 9,006  | 12,339 | 13,051  | 18,471  |
| By education level - All sectors -            |      | 8,235  | 9,338    | 13,898 | 17,964 | 18,160  | 24,604  |
| Associates degree or some college (jobs)      |      |        |          |        |        |         |         |
| By education level - All sectors -            |      | 5,967  | 6,481    | 9,160  | 11,755 | 12,197  | 16,367  |
| Bachelors degree (jobs)                       |      |        |          |        |        |         |         |
| By education level - All sectors - Doctoral   |      | 206    | 233      | 346    | 474    | 521     | 698     |
| degree (jobs)                                 |      |        | 10.000   | 10.010 |        |         |         |
| By education level - All sectors - High       |      | 10,795 | 12,232   | 18,040 | 23,297 | 23,593  | 31,540  |
| school diploma or less (jobs)                 |      | 1110   | 1.500    |        | 2.222  | 2.121   |         |
| By education level - All sectors - Masters    |      | 1,442  | 1,582    | 2,278  | 3,008  | 3,194   | 4,302   |
| or professional degree (jobs)                 |      |        |          |        | 2 222  | . = 2 . |         |
| By resource sector - Biomass (jobs)           |      | 523    | 682      | 737    | 2,323  | 4,786   | 5,704   |
| By resource sector - CO2 (jobs)               |      | 5.51   | 379      | 463    | 249    | 721     | 1,891   |
| By resource sector - Coal (jobs)              |      | 901    | 80.8     | 0      | 0      | 0       | 0       |
| By resource sector - Grid (jobs)              |      | 5,282  | 7,780    | 14,354 | 20,576 | 22,284  | 32,952  |
| By resource sector - Natural Gas (jobs)       |      | 9,323  | 7,514    | 5,850  | 5,167  | 3,424   | 1,726   |
| By resource sector - Nuclear (jobs)           |      | 549    | 0.005    | 0.01   | 0.011  | 0.023   | 0.035   |
| By resource sector - Oil (jobs)               |      | 3,609  | 2,977    | 2,297  | 1,546  | 1,027   | 571     |
| By resource sector - Solar (jobs)             |      | 2,982  | 2,521    | 6,677  | 8,730  | 4,946   | 5,816   |
| By resource sector - Wind (jobs)              |      | 3,471  | 7,932    | 13,343 | 17,906 | 20,476  | 28,852  |
| Median wages - Annual - All (\$2019 per       |      | 53,507 | 53,547   | 53,429 | 54,135 | 55,332  | 56,196  |
| job)  |      |        |          |        |        |         |         |
| On-Site or In-Plant Training - Total jobs - 1 |      | 4,292  | 4,836    | 7,148  | 9,211  | 9,294   | 12,561  |
| to 4 years (jobs)                             |      |        |          |        |        |         |         |
| On-Site or In-Plant Training - Total jobs - 4 |      | 1,721  | 1,962    | 2,972  | 3,911  | 3,977   | 5,402   |
| to 10 years (jobs)                            |      |        |          |        |        |         |         |
| On-Site or In-Plant Training - Total jobs -   |      | 4,337  | 4,872    | 7,160  | 9,290  | 9,515   | 12,757  |
| None (jobs)                                   |      |        |          |        |        |         |         |
| On-Site or In-Plant Training - Total jobs -   |      | 216    | 251      | 381    | 498    | 508     | 693     |
| Over 10 years (jobs)                          |      |        |          |        |        |         |         |
| On-Site or In-Plant Training - Total jobs -   |      | 16,078 | 17,944   | 26,061 | 33,587 | 34,369  | 46,099  |
| Up to 1 year (jobs)                           |      |        |          |        |        |         |         |
| On-the-Job Training - All sectors - 1 to 4    |      | 5,538  | 6,243    | 9,246  | 11,929 | 12,040  | 16,297  |
| years (jobs)                                  |      |        |          |        |        |         |         |
| On-the-Job Training - All sectors - 4 to 10   |      | 1,631  | 1,885    | 2,911  | 3,863  | 3,924   | 5,347   |
| years (jobs)                                  |      |        |          |        |        |         |         |
| On-the-Job Training - All sectors - None      |      | 1,449  | 1,598    | 2,345  | 3,041  | 3,108   | 4,169   |
| (jobs)  |      | ,      | ,        |        |        |         | •       |
| On-the-Job Training - All sectors - Over 10   |      | 262    | 294      | 430    | 537    | 527     | 703     |
| years (jobs)                                  |      |        |          |        |        |         |         |
| On-the-Job Training - All sectors - Up to 1   |      | 17,766 | 19,845   | 28,789 | 37,127 | 38,066  | 50,995  |
| year (jobs)                                   |      | ,      | ,        | -, -   |        | ,       |         |
| Related work experience - All sectors - 1     |      | 9,737  | 10,843   | 15,763 | 20,344 | 20,782  | 27,917  |
| to 4 years (jobs)                             |      | ,      |          |        |        |         | •       |
| Related work experience - All sectors - 4     |      | 6,307  | 7,048    | 10,298 | 13,269 | 13,528  | 18,258  |
| to 10 years (jobs)                            |      | ,,,,,, | .,       | ,      | ,      | ,       | ,       |
| Related work experience - All sectors -       |      | 3,765  | 4,235    | 6,234  | 8,105  | 8,276   | 11,117  |
| None (jobs)                                   |      | 3,.55  | .,200    | 0,20 . | 0,.00  | 3,2.3   | ,       |
| Related work experience - All sectors -       |      | 1,750  | 1,931    | 2,762  | 3,489  | 3,529   | 4,753   |
| Over 10 years (jobs)                          |      | .,. 55 | .,,,,,,, | 2,.02  | 5, 107 | 3,327   | .,. 00  |
| Related work experience - All sectors - Up    |      | 5,087  | 5,808    | 8,665  | 11,289 | 11,550  | 15,465  |
| to 1 year (jobs)                              |      | 5,55.  | 2,000    | 2,000  | ,20,   | ,000    | .5, .55 |
| Wage income - All (million \$2019)            |      | 1,426  | 1,599    | 2,336  | 3,059  | 3,191   | 4,356   |
| **************************************        |      | 1,720  | 1,077    | 2,000  | 0,007  | 5,171   | -,000   |

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

| Item                                       | 2020 | 2025   | 2030   | 2035 | 2040 | 2045 | 2050 |
|--|------|--------|--------|------|------|------|------|
| Commercial HVAC investment in 2020s -      |      | 10,527 | 12,223 |      |      |      |      |
| Cumulative 5-yr (million \$2018)           |      |        |        |      |      |      |      |
| Sales of cooking units - Electric          | 30.1 | 34.2   | 39     | 52   | 70.1 | 81.2 | 85   |
| Resistance (%)                             |      |        |        |      |      |      |      |
| Sales of cooking units - Gas (%)           | 69.9 | 65.8   | 61     | 48   | 29.9 | 18.8 | 15   |
| Sales of space heating units - Electric    | 2.92 | 17.8   | 23.5   | 40   | 65.6 | 83.3 | 89.8 |
| Heat Pump (%)                              |      |        |        |      |      |      |      |
| Sales of space heating units - Electric    | 2.74 | 4.44   | 4.48   | 4.65 | 5.07 | 5.74 | 6.19 |
| Resistance (%)                             |      |        |        |      |      |      |      |
| Sales of space heating units - Fossil (%)  | 0    | 0      | 0      | 0    | 0    | 0    | 0    |
| Sales of space heating units - Gas Furnace | 94.3 | 77.8   | 72     | 55.4 | 29.3 | 11   | 3.97 |
| (%)  |      |        |        |      |      |      |      |
| Sales of water heating units - Electric    | 0.08 | 1.96   | 7.15   | 22.1 | 45   | 59.9 | 65.1 |
| Heat Pump (%)                              |      |        |        |      |      |      |      |
| Sales of water heating units - Electric    | 2.31 | 4.44   | 6.56   | 12.7 | 22.2 | 28.4 | 30.5 |
| Resistance (%)                             |      |        |        |      |      |      |      |
| Sales of water heating units - Gas Furnace | 96.5 | 91.8   | 84.5   | 63.4 | 31   | 9.91 | 2.58 |
| (%)  |      |        |        |      |      |      |      |
| Sales of water heating units - Other (%)   | 1.07 | 1.78   | 1.78   | 1.78 | 1.79 | 1.79 | 1.8  |

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

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|------|------|------|------|------|------|------|
| Electricity distribution capital invested - |      | 2.1  | 2.13 | 2.57 | 2.64 | 3.75 | 3.95 |
| 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)     | 90   | 90.7 | 90.4 | 89.6 | 87.6 | 85.4 | 84.4 |  |  |  |
| Final energy use - Industry (PJ)       | 236  | 243  | 246  | 249  | 254  | 253  | 258  |  |  |  |
| Final energy use - Residential (PJ)    | 123  | 118  | 114  | 110  | 103  | 94.4 | 86.6 |  |  |  |
| Final energy use - Transportation (PJ) | 324  | 305  | 276  | 255  | 238  | 219  | 197  |  |  |  |

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

| Item                                       | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--|------|------|------|------|------|------|------|
| Residential HVAC investment in 2020s vs.   |      | 2.28 | 2.67 |      |      |      |      |
| REF - Cumulative 5-yr (billion \$2018)     |      |      |      |      |      |      |      |
| Sales of cooking units - Electric          | 52.5 | 53.8 | 58.1 | 69.6 | 85.5 | 95.3 | 98.7 |
| Resistance (%)                             |      |      |      |      |      |      |      |
| Sales of cooking units - Gas (%)           | 47.5 | 46.2 | 41.9 | 30.4 | 14.5 | 4.68 | 1.26 |
| Sales of space heating units - Electric    | 11.9 | 18.1 | 23.5 | 39   | 62.6 | 78   | 83.3 |
| Heat Pump (%)                              |      |      |      |      |      |      |      |
| Sales of space heating units - Electric    | 34.9 | 37.6 | 35.2 | 28.7 | 19   | 12.7 | 10.5 |
| Resistance (%)                             |      |      |      |      |      |      |      |
| Sales of space heating units - Fossil (%)  | 8.14 | 13.1 | 12.5 | 10.3 | 7.08 | 5.03 | 4.32 |
| Sales of space heating units - Gas (%)     | 45.1 | 31.2 | 28.8 | 22   | 11.3 | 4.24 | 1.82 |
| Sales of water heating units - Electric    | 0    | 1.94 | 7.45 | 23.3 | 47.7 | 63.6 | 69.1 |
| Heat Pump (%)                              |      |      |      |      |      |      |      |
| Sales of water heating units - Electric    | 44.5 | 55.7 | 53.5 | 47.1 | 37   | 30.5 | 28.2 |
| Resistance (%)                             |      |      |      |      |      |      |      |
| Sales of water heating units - Gas Furnace | 53.7 | 40.9 | 37.5 | 28.1 | 13.8 | 4.37 | 1.13 |
| (%)  |      |      |      |      |      |      |      |
| Sales of water heating units - Other (%)   | 1.86 | 1.52 | 1.52 | 1.51 | 1.52 | 1.5  | 1.5  |

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

| Item                                       | 2020  | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|--|-------|-------|-------|-------|-------|-------|-------|
| Light-duty vehicle capital costs -         |       | 0     | 86.7  | 184   | 621   | 1,961 | 2,854 |
| Cumulative 5-yr (million \$2018)           |       |       |       |       |       |       |       |
| Public EV charging plugs - DC Fast (1000   | 0.043 |       | 0.334 |       | 1.85  |       | 5.2   |
| units)                                     |       |       |       |       |       |       |       |
| Public EV charging plugs - L2 (1000 units) | 0.243 |       | 8.03  |       | 44.4  |       | 125   |
| 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 (%)    | 1.82  | 2.19  | 2.11  | 1.69  | 1.1   | 0.572 | 0.244 |
| Vehicle sales - Light-duty - EV (%)        | 1.58  | 4.01  | 10.5  | 23.6  | 45.9  | 70.4  | 86.9  |
| Vehicle sales - Light-duty - gasoline (%)  | 92.7  | 88.7  | 81.8  | 69.5  | 49    | 26.6  | 11.7  |
| Vehicle sales - Light-duty - hybrid (%)    | 3.69  | 4.55  | 5.17  | 4.83  | 3.75  | 2.29  | 1.14  |
| Vehicle sales - Light-duty - hydrogen FC   | 0.113 | 0.388 | 0.341 | 0.266 | 0.193 | 0.109 | 0.05  |
| (%)  |       |       |       |       |       |       |       |
| Vehicle sales - Light-duty - other (%)     | 0.114 | 0.118 | 0.109 | 0.096 | 0.07  | 0.039 | 0.018 |
| 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      |      |      |      |      |      |      | -243    |
| deployment - Corn-ethanol to energy     |      |      |      |      |      |      |         |
| grasses (1000 tCO2e/y)                  |      |      |      |      |      |      |         |
| Carbon sink potential - Aggressive      |      |      |      |      |      |      | -10,076 |
| deployment - Cropland measures (1000    |      |      |      |      |      |      |         |
| tCO2e/y)                                |      |      |      |      |      |      |         |
| Carbon sink potential - Aggressive      |      |      |      |      |      |      | -64.8   |
| deployment - Permanent conservation     |      |      |      |      |      |      |         |
| cover (1000 tCO2e/y)                    |      |      |      |      |      |      |         |
| Carbon sink potential - Aggressive      |      |      |      |      |      |      | -10,383 |
| deployment - Total (1000 tCO2e/y)       |      |      |      |      |      |      |         |
| Carbon sink potential - Moderate        |      |      |      |      |      |      | -243    |
| deployment - Corn-ethanol to energy     |      |      |      |      |      |      |         |
| grasses (1000 tCO2e/y)                  |      |      |      |      |      |      |         |
| Carbon sink potential - Moderate        |      |      |      |      |      |      | -5,130  |
| deployment - Cropland measures (1000    |      |      |      |      |      |      |         |
| tCO2e/y)                                |      |      |      |      |      |      |         |
| Carbon sink potential - Moderate        |      |      |      |      |      |      | -32.4   |
| deployment - Permanent conservation     |      |      |      |      |      |      |         |
| cover (1000 tCO2e/y)                    |      |      |      |      |      |      |         |
| Carbon sink potential - Moderate        |      |      |      |      |      |      | -5,405  |
| deployment - Total (1000 tC02e/y)       |      |      |      |      |      |      |         |
| Land impacted for carbon sink -         |      |      |      |      |      |      | 96.4    |
| Aggressive deployment - Corn-ethanol to |      |      |      |      |      |      |         |
| energy grasses (1000 hectares)          |      |      |      |      |      |      |         |
| Land impacted for carbon sink -         |      |      |      |      |      |      | 2,955   |
| Aggressive deployment - Cropland        |      |      |      |      |      |      |         |
| measures (1000 hectares)                |      |      |      |      |      |      |         |
| Land impacted for carbon sink -         |      |      |      |      |      |      | 118     |
| 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 -          |      |      |      |      |      |      | 3,170 |
| Aggressive deployment - Total (1000      |      |      |      |      |      |      |       |
| hectares)                                |      |      |      |      |      |      |       |
| Land impacted for carbon sink - Moderate |      |      |      |      |      |      | 96.4  |
| deployment - Corn-ethanol to energy      |      |      |      |      |      |      |       |
| grasses (1000 hectares)                  |      |      |      |      |      |      |       |
| Land impacted for carbon sink - Moderate |      |      |      |      |      |      | 1,507 |
| deployment - Cropland measures (1000     |      |      |      |      |      |      |       |
| hectares)                                |      |      |      |      |      |      |       |
| Land impacted for carbon sink - Moderate |      |      |      |      |      |      | 58.9  |
| deployment - Permanent conservation      |      |      |      |      |      |      |       |
| cover (1000 hectares)                    |      |      |      |      |      |      |       |
| Land impacted for carbon sink - Moderate |      |      |      |      |      |      | 1,662 |
| 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 |      |      |      |      |      |      | -356    |
| regeneration (1000 tCO2e/y)               |      |      |      |      |      |      |         |
| Carbon sink potential - High - All (not   |      |      |      |      |      |      | -46,154 |
| counting overlap) (1000 tCO2e/y)          |      |      |      |      |      |      |         |
| Carbon sink potential - High - Avoid      |      |      |      |      |      |      | -1,334  |
| deforestation (1000 tCO2e/y)              |      |      |      |      |      |      |         |
| Carbon sink potential - High - Extend     |      |      |      |      |      |      | -9,227  |
| rotation length (1000 tCO2e/y)            |      |      |      |      |      |      |         |
| Carbon sink potential - High - Improve    |      |      |      |      |      |      | -3,044  |
| plantations (1000 tCO2e/y)                |      |      |      |      |      |      |         |
| Carbon sink potential - High - Increase   |      |      |      |      |      |      | -13,825 |
| retention of HWP (1000 tCO2e/y)           |      |      |      |      |      |      |         |
| Carbon sink potential - High - Increase   |      |      |      |      |      |      | -1,120  |
| trees outside forests (1000 tCO2e/y)      |      |      |      |      |      |      |         |
| Carbon sink potential - High - Reforest   |      |      |      |      |      |      | -1,077  |
| cropland (1000 tCO2e/y)                   |      |      |      |      |      |      |         |
| Carbon sink potential - High - Reforest   |      |      |      |      |      |      | -11,526 |
| pasture (1000 tCO2e/y)                    |      |      |      |      |      |      |         |
| Carbon sink potential - High - Restore    |      |      |      |      |      |      | -4,644  |
| productivity (1000 tCO2e/y)               |      |      |      |      |      |      |         |
| Carbon sink potential - Low - Accelerate  |      |      |      |      |      |      | -178    |
| regeneration (1000 tCO2e/y)               |      |      |      |      |      |      |         |
| Carbon sink potential - Low - All (not    |      |      |      |      |      |      | -13,471 |
| counting overlap) (1000 tCO2e/y)          |      |      |      |      |      |      |         |
| Carbon sink potential - Low - Avoid       |      |      |      |      |      |      | -222    |
| deforestation (1000 tCO2e/y)              |      |      |      |      |      |      |         |
| Carbon sink potential - Low - Extend      |      |      |      |      |      |      | -3,544  |
| rotation length (1000 tCO2e/y)            |      |      |      |      |      |      |         |
| Carbon sink potential - Low - Improve     |      |      |      |      |      |      | -1,549  |
| plantations (1000 tCO2e/y)                |      |      |      |      |      |      |         |
| Carbon sink potential - Low - Increase    |      |      |      |      |      |      | -4,608  |
| retention of HWP (1000 tCO2e/y)           |      |      |      |      |      |      |         |
| Carbon sink potential - Low - Increase    |      |      |      |      |      |      | -392    |
| trees outside forests (1000 tCO2e/y)      |      |      |      |      |      |      |         |
| Carbon sink potential - Low - Reforest    |      |      |      |      |      |      | -538    |
| cropland (1000 tCO2e/y)                   |      |      |      |      |      |      |         |
| Carbon sink potential - Low - Reforest    |      |      |      |      |      |      | -873    |
| pasture (1000 tCO2e/y)                    |      |      |      |      |      |      |         |
| Carbon sink potential - Low - Restore     |      |      |      |      |      |      | -1,565  |
| productivity (1000 tCO2e/y)               |      |      |      |      |      |      |         |
| Carbon sink potential - Mid - Accelerate  |      |      |      |      |      |      | -267    |
| regeneration (1000 tC02e/y)               |      |      |      |      |      |      |         |

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

| Item Carbon sink potential - Mid - All (not   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050<br>-29,786 |
|---|------|------|------|------|------|------|-----------------|
| counting overlap) (1000 tCO2e/y)  |      |      |      |      |      |      |                 |
| Carbon sink potential - Mid - Avoid   |      |      |      |      |      |      | -778            |
| deforestation (1000 tCO2e/y) Carbon sink potential - Mid - Extend                       |      |      |      |      |      |      | -6,386          |
| rotation length (1000 tC02e/y)  |      |      |      |      |      |      |                 |
| Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)                        |      |      |      |      |      |      | -2,270          |
| Carbon sink potential - Mid - Increase  |      |      |      |      |      |      | -9,217          |
| retention of HWP (1000 tCO2e/y)  Carbon sink potential - Mid - Increase                 |      |      |      |      |      |      | -756            |
| trees outside forests (1000 tC02e/y)  |      |      |      |      |      |      |                 |
| Carbon sink potential - Mid - Reforest  |      |      |      |      |      |      | -807            |
| cropland (1000 tCO2e/y) Carbon sink potential - Mid - Reforest                          |      |      |      |      |      |      | -6,200          |
| pasture (1000 tCO2e/y)  |      |      |      |      |      |      |                 |
| Carbon sink potential - Mid - Restore productivity (1000 tC02e/y)                       |      |      |      |      |      |      | -3,105          |
| Land impacted for carbon sink potential -   |      |      |      |      |      |      | 58.3            |
| High - Accelerate regeneration (1000  |      |      |      |      |      |      |                 |
| hectares)   |      |      |      |      |      |      | 181             |
| Land impacted for carbon sink potential -<br>High - Avoid deforestation (over 30 years) |      |      |      |      |      |      | 181             |
| (1000 hectares)   |      |      |      |      |      |      |                 |
| Land impacted for carbon sink potential -   |      |      |      |      |      |      | 4,705           |
| High - Extend rotation length (1000 hectares)   |      |      |      |      |      |      |                 |
| Land impacted for carbon sink potential -   |      |      |      |      |      |      | 1,121           |
| 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 -                                     |      |      |      |      |      |      | 106             |
| High - Increase trees outside forests   |      |      |      |      |      |      | 100             |
| (1000 hectares)   |      |      |      |      |      |      |                 |
| Land impacted for carbon sink potential -<br>High - Reforest cropland (1000 hectares)   |      |      |      |      |      |      | 71.2            |
| Land impacted for carbon sink potential -   |      |      |      |      |      |      | 327             |
| High - Reforest pasture (1000 hectares)   |      |      |      |      |      |      |                 |
| Land impacted for carbon sink potential -<br>High - Restore productivity (1000          |      |      |      |      |      |      | 1,539           |
| hectares)   |      |      |      |      |      |      |                 |
| Land impacted for carbon sink potential -   |      |      |      |      |      |      | 8,110           |
| High - Total impacted (over 30 years) (1000 hectares)                                   |      |      |      |      |      |      |                 |
| Land impacted for carbon sink potential -   |      |      |      |      |      |      | 29.1            |
| Low - Accelerate regeneration (1000   |      |      |      |      |      |      |                 |
| hectares) Land impacted for carbon sink potential -                                     |      |      |      |      |      |      | 170             |
| Low - Avoid deforestation (over 30 years)   |      |      |      |      |      |      | 110             |
| (1000 hectares)   |      |      |      |      |      |      |                 |
| Land impacted for carbon sink potential -<br>Low - Extend rotation length (1000         |      |      |      |      |      |      | 1,803           |
| hectares)   |      |      |      |      |      |      |                 |
| Land impacted for carbon sink potential -   |      |      |      |      |      |      | 561             |
| Low - Improve plantations (1000 hectares)   |      |      |      |      |      |      |                 |
| Land impacted for carbon sink potential -   |      |      |      |      |      |      | 0               |
| 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 -  |      |      |      |      |      |      | 56    |
| Low - Increase trees outside forests       |      |      |      |      |      |      |       |
| (1000 hectares)                            |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 35.6  |
| Low - Reforest cropland (1000 hectares)    |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 56.8  |
| Low - Reforest pasture (1000 hectares)     |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 931   |
| Low - Restore productivity (1000           |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 3,642 |
| Low - Total impacted (over 30 years)       |      |      |      |      |      |      |       |
| (1000 hectares)                            |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 43.7  |
| Mid - Accelerate regeneration (1000        |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 175   |
| Mid - Avoid deforestation (over 30 years)  |      |      |      |      |      |      |       |
| (1000 hectares)                            |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 3,254 |
| Mid - Extend rotation length (1000         |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 844   |
| 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 -  |      |      |      |      |      |      | 81.2  |
| Mid - Increase trees outside forests (1000 |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 53.4  |
| Mid - Reforest cropland (1000 hectares)    |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 410   |
| Mid - Reforest pasture (1000 hectares)     |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 1,876 |
| Mid - Restore productivity (1000           |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 6,737 |
| 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\$)           |      | 319  | 0.217 | 0.206 | 0.16  | 0.104 | 0.004 |
| Monetary damages from air pollution -<br>Natural Gas (million 2019\$)    |      | 110  | 54    | 25    | 11.9  | 4.22  | 3.25  |
| Monetary damages from air pollution -<br>Transportation (million 2019\$) |      | 410  | 410   | 397   | 357   | 283   | 194   |
| Premature deaths from air pollution -<br>Coal (deaths)                   |      | 36   | 0.024 | 0.023 | 0.018 | 0.012 | 0     |
| Premature deaths from air pollution -<br>Natural Gas (deaths)            |      | 12.4 | 6.1   | 2.82  | 1.34  | 0.476 | 0.367 |
| Premature deaths from air pollution -<br>Transportation (deaths)         |      | 46.1 | 46.1  | 44.7  | 40.1  | 31.8  | 21.8  |

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

| Item                                       | 2020 | 2025   | 2030   | 2035  | 2040 | 2045 | 2050 |
|--|------|--------|--------|-------|------|------|------|
| Commercial HVAC investment in 2020s -      |      | 10,539 | 12,307 |       |      |      |      |
| Cumulative 5-yr (million \$2018)           |      |        |        |       |      |      |      |
| Sales of cooking units - Electric          | 30.1 | 44.4   | 79.2   | 86.1  | 86.5 | 86.5 | 86.5 |
| Resistance (%)                             |      |        |        |       |      |      |      |
| Sales of cooking units - Gas (%)           | 69.9 | 55.6   | 20.8   | 13.9  | 13.5 | 13.5 | 13.5 |
| Sales of space heating units - Electric    | 2.92 | 27.3   | 77.1   | 91.1  | 92.3 | 92.3 | 92.3 |
| Heat Pump (%)                              |      |        |        |       |      |      |      |
| Sales of space heating units - Electric    | 2.74 | 4.44   | 4.73   | 6.05  | 6.35 | 6.37 | 6.39 |
| Resistance (%)                             |      |        |        |       |      |      |      |
| Sales of space heating units - Fossil (%)  | 0    | 0      | 0      | 0     | 0    | 0    | 0    |
| Sales of space heating units - Gas Furnace | 94.3 | 68.3   | 18.2   | 2.83  | 1.38 | 1.34 | 1.33 |
| (%)  |      |        |        |       |      |      |      |
| Sales of water heating units - Electric    | 0.08 | 10.7   | 56.3   | 66.5  | 66.9 | 66.9 | 66.9 |
| Heat Pump (%)                              |      |        |        |       |      |      |      |
| Sales of water heating units - Electric    | 2.31 | 8.07   | 26.9   | 31.1  | 31.3 | 31.3 | 31.3 |
| Resistance (%)                             |      |        |        |       |      |      |      |
| Sales of water heating units - Gas Furnace | 96.5 | 79.4   | 15     | 0.632 | 0    | 0    | 0    |
| (%)  |      |        |        |       |      |      |      |
| Sales of water heating units - Other (%)   | 1.07 | 1.78   | 1.78   | 1.78  | 1.79 | 1.79 | 1.8  |

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

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|------|------|------|------|------|------|------|
| Electricity distribution capital invested - |      | 2.42 | 2.48 | 3.87 | 4.09 | 4.01 | 4.2  |
| 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)     | 90   | 90.4 | 87   | 81.6 | 77.4 | 76.4 | 78.1 |
| Final energy use - Industry (PJ)       | 236  | 242  | 246  | 246  | 250  | 250  | 255  |
| Final energy use - Residential (PJ)    | 123  | 117  | 108  | 95.6 | 85.1 | 78.9 | 76.1 |
| Final energy use - Transportation (PJ) | 324  | 303  | 265  | 220  | 179  | 155  | 146  |

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

| Item                                       | 2020 | 2025 | 2030 | 2035  | 2040  | 2045  | 2050  |
|--|------|------|------|-------|-------|-------|-------|
| Residential HVAC investment in 2020s vs.   |      | 2.31 | 2.82 |       |       |       |       |
| REF - Cumulative 5-yr (billion \$2018)     |      |      |      |       |       |       |       |
| Sales of cooking units - Electric          | 52.7 | 62.8 | 93.6 | 99.7  | 100   | 100   | 100   |
| Resistance (%)                             |      |      |      |       |       |       |       |
| Sales of cooking units - Gas (%)           | 47.3 | 37.2 | 6.37 | 0.321 | 0     | 0     | 0     |
| Sales of space heating units - Electric    | 11.9 | 27.2 | 74.3 | 84.8  | 85.3  | 85.2  | 85.2  |
| Heat Pump (%)                              |      |      |      |       |       |       |       |
| Sales of space heating units - Electric    | 34.9 | 33.8 | 14.2 | 9.82  | 9.65  | 9.82  | 9.86  |
| Resistance (%)                             |      |      |      |       |       |       |       |
| Sales of space heating units - Fossil (%)  | 8.14 | 11.9 | 5.59 | 4.18  | 4.11  | 4.04  | 4.03  |
| Sales of space heating units - Gas (%)     | 45.1 | 27.1 | 5.9  | 1.18  | 0.978 | 0.957 | 0.954 |
| Sales of water heating units - Electric    | 0    | 11.3 | 59.7 | 70.6  | 71.1  | 71.1  | 71.1  |
| Heat Pump (%)                              |      |      |      |       |       |       |       |
| Sales of water heating units - Electric    | 44.5 | 51.9 | 32.1 | 27.6  | 27.4  | 27.4  | 27.4  |
| Resistance (%)                             |      |      |      |       |       |       |       |
| Sales of water heating units - Gas Furnace | 53.7 | 35.3 | 6.65 | 0.277 | 0     | 0     | 0     |
| (%)  |      |      |      |       |       |       |       |
| Sales of water heating units - Other (%)   | 1.86 | 1.52 | 1.52 | 1.49  | 1.49  | 1.5   | 1.5   |

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

| Item                                       | 2020  | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|--|-------|-------|-------|-------|-------|-------|-------|
| Light-duty vehicle capital costs -         |       | 542   | 1,384 | 2,253 | 3,409 | 3,714 | 3,539 |
| Cumulative 5-yr (million \$2018)           |       |       |       |       |       |       |       |
| Public EV charging plugs - DC Fast (1000   | 0.043 |       | 1.12  |       | 5.01  |       | 8.11  |
| units)                                     |       |       |       |       |       |       |       |
| Public EV charging plugs - L2 (1000 units) | 0.243 |       | 26.9  |       | 120   |       | 195   |
| 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 (%)    | 1.81  | 2.04  | 1.36  | 0.439 | 0.079 | 0.013 | 0     |
| Vehicle sales - Light-duty - EV (%)        | 3.04  | 12.5  | 42.3  | 80.1  | 96.1  | 99.3  | 100   |
| Vehicle sales - Light-duty - gasoline (%)  | 91.3  | 81    | 53.1  | 18.2  | 3.51  | 0.597 | 0     |
| Vehicle sales - Light-duty - hybrid (%)    | 3.57  | 3.93  | 2.92  | 1.11  | 0.266 | 0.056 | 0     |
| Vehicle sales - Light-duty - hydrogen FC   | 0.112 | 0.354 | 0.224 | 0.071 | 0.014 | 0.002 | 0     |
| (%)  |       |       |       |       |       |       |       |
| Vehicle sales - Light-duty - other (%)     | 0.113 | 0.11  | 0.074 | 0.026 | 0.005 | 0.001 | 0     |
| Vehicle sales - Medium-duty - diesel (%)   | 64.7  | 59.7  | 42.3  | 14.4  | 2.59  | 0.384 | 0     |
| Vehicle sales - Medium-duty - EV (%)       | 0.784 | 5.07  | 25.3  | 60.8  | 76.5  | 79.5  | 80    |
| Vehicle sales - Medium-duty - gasoline (%) | 33.7  | 33.3  | 25.5  | 9.32  | 1.77  | 0.277 | 0     |
| Vehicle sales - Medium-duty - hybrid (%)   | 0.363 | 0.402 | 0.341 | 0.14  | 0.03  | 0.005 | 0     |
| Vehicle sales - Medium-duty - hydrogen     | 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 - Solar PV - Base (billion |       | 0.463  | 3.64   | 3.66   | 3.27    | 10.3    | 9.23    |
| \$2018)                                     |       |        |        |        |         |         |         |
| Capital invested - Wind - Base (billion     |       | 3.54   | 8.66   | 17.5   | 15.8    | 25.6    | 45.4    |
| \$2018)                                     |       |        |        |        |         |         |         |
| Installed renewables - OffshoreWind -       | 0     | 0      | 0      | 0      | 0       | 0       | 0       |
| Base land use assumptions (MW)              |       |        |        |        |         |         |         |
| Installed renewables - OffshoreWind -       | 0     | 0      | 0      | 0      | 0       | 0       | 0       |
| Constrained land use assumptions (MW)       |       |        |        |        |         |         |         |
| Installed renewables - Solar - Base land    | 210   | 615    | 4,170  | 8,051  | 11,730  | 23,975  | 35,637  |
| use assumptions (MW)                        |       |        |        |        |         |         |         |
| Installed renewables - Solar -              | 420   | 2,602  | 5,415  | 12,165 | 21,255  | 51,254  | 81,104  |
| Constrained land use assumptions (MW)       |       |        |        |        |         |         |         |
| Installed renewables - Wind - Base land     | 84.5  | 2,493  | 8,997  | 23,141 | 36,480  | 59,292  | 102,194 |
| use assumptions (MW)                        |       |        |        |        |         |         |         |
| Installed renewables - Wind - Constrained   | 1,082 | 11,547 | 29,449 | 76,798 | 115,447 | 120,835 | 209,188 |
| 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       | 0       | 0       | 0       |
| assumptions (GWh)                        |       |        |         |         |         |         |         |
| OffshoreWind - Constrained land use      | 0     | 0      | 0       | 0       | 0       | 0       | 0       |
| assumptions (GWh)                        |       |        |         |         |         |         |         |
| Solar - Base land use assumptions (GWh)  | 409   | 1,067  | 6,857   | 13,206  | 19,204  | 39,180  | 58,106  |
| Solar - Constrained land use assumptions | 818   | 4,380  | 8,972   | 20,009  | 34,879  | 83,626  | 131,845 |
| (GWh)                                    |       |        |         |         |         |         |         |
| Wind - Base land use assumptions (GWh)   | 315   | 8,421  | 29,861  | 76,570  | 117,863 | 186,498 | 305,189 |
| Wind - Constrained land use assumptions  | 3,977 | 40,471 | 100,043 | 243,924 | 347,631 | 365,116 | 642,486 |
| (GWh)                                    |       |        |         |         |         |         |         |

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

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050    |
|--|------|------|------|------|------|------|---------|
| Carbon sink potential - Aggressive                 |      |      |      |      |      |      | -243    |
| deployment - Corn-ethanol to energy                |      |      |      |      |      |      |         |
| grasses (1000 tC02e/y)                             |      |      |      |      |      |      |         |
| Carbon sink potential - Aggressive                 |      |      |      |      |      |      | -10,076 |
| deployment - Cropland measures (1000               |      |      |      |      |      |      |         |
| tCO2e/y)   |      |      |      |      |      |      |         |
| Carbon sink potential - Aggressive                 |      |      |      |      |      |      | -64.8   |
| deployment - Permanent conservation                |      |      |      |      |      |      |         |
| cover (1000 tC02e/y)                               |      |      |      |      |      |      |         |
| Carbon sink potential - Aggressive                 |      |      |      |      |      |      | -10,383 |
| deployment - Total (1000 tCO2e/y)                  |      |      |      |      |      |      |         |
| Carbon sink potential - Moderate                   |      |      |      |      |      |      | -243    |
| deployment - Corn-ethanol to energy                |      |      |      |      |      |      |         |
| grasses (1000 tC02e/y)                             |      |      |      |      |      |      |         |
| Carbon sink potential - Moderate                   |      |      |      |      |      |      | -5,130  |
| deployment - Cropland measures (1000               |      |      |      |      |      |      | -,      |
| tCO2e/y)   |      |      |      |      |      |      |         |
| Carbon sink potential - Moderate                   |      |      |      |      |      |      | -32.4   |
| deployment - Permanent conservation                |      |      |      |      |      |      | 0       |
| cover (1000 tCO2e/y)                               |      |      |      |      |      |      |         |
| Carbon sink potential - Moderate                   |      | +    | +    |      |      |      | -5,405  |
| deployment - Total (1000 tC02e/y)                  |      |      |      |      |      |      | 0,400   |
| Land impacted for carbon sink -                    |      | +    | +    |      |      |      | 96.4    |
| Aggressive deployment - Corn-ethanol to            |      |      |      |      |      |      | 70.4    |
| energy grasses (1000 hectares)                     |      |      |      |      |      |      |         |
| Land impacted for carbon sink -                    |      | +    | +    |      |      |      | 2,955   |
| Aggressive deployment - Cropland                   |      |      |      |      |      |      | 2,700   |
| measures (1000 hectares)                           |      |      |      |      |      |      |         |
| Land impacted for carbon sink -                    |      | +    |      |      |      |      | 118     |
| Aggressive deployment - Permanent                  |      |      |      |      |      |      | 110     |
| conservation cover (1000 hectares)                 |      |      |      |      |      |      |         |
| Land impacted for carbon sink -                    |      |      |      |      |      |      | 3,170   |
| Aggressive deployment - Total (1000                |      |      |      |      |      |      | 3,170   |
|  |      |      |      |      |      |      |         |
| hectares) Land impacted for carbon sink - Moderate |      |      |      |      |      |      | 96.4    |
|  |      |      |      |      |      |      | 90.4    |
| deployment - Corn-ethanol to energy                |      |      |      |      |      |      |         |
| grasses (1000 hectares)                            |      |      |      |      |      |      | 1,507   |
| Land impacted for carbon sink - Moderate           |      |      |      |      |      |      | 1,507   |
| deployment - Cropland measures (1000               |      |      |      |      |      |      |         |
| hectares)  |      |      |      |      |      |      | 500     |
| Land impacted for carbon sink - Moderate           |      |      |      |      |      |      | 58.9    |
| deployment - Permanent conservation                |      |      |      |      |      |      |         |
| cover (1000 hectares)                              |      |      |      |      |      |      |         |
| Land impacted for carbon sink - Moderate           |      |      |      |      |      |      | 1,662   |
| 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 |      |      |      |      |      |      | -356    |
| regeneration (1000 tCO2e/y)               |      |      |      |      |      |      |         |
| Carbon sink potential - High - All (not   |      |      |      |      |      |      | -46,154 |
| counting overlap) (1000 tCO2e/y)          |      |      |      |      |      |      |         |
| Carbon sink potential - High - Avoid      |      |      |      |      |      |      | -1,334  |
| deforestation (1000 tCO2e/y)              |      |      |      |      |      |      |         |
| Carbon sink potential - High - Extend     |      |      |      |      |      |      | -9,227  |
| rotation length (1000 tCO2e/y)            |      |      |      |      |      |      |         |
| Carbon sink potential - High - Improve    |      |      |      |      |      |      | -3,044  |
| plantations (1000 tCO2e/y)                |      |      |      |      |      |      |         |
| Carbon sink potential - High - Increase   |      |      |      |      |      |      | -13,825 |
| retention of HWP (1000 tCO2e/y)           |      |      |      |      |      |      |         |

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

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050    |
|---|------|------|------|------|------|------|---------|
| Carbon sink potential - High - Increase   |      |      |      |      |      |      | -1,120  |
| trees outside forests (1000 tCO2e/y)  |      |      |      |      |      |      |         |
| Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)                               |      |      |      |      |      |      | -1,077  |
| Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)                                |      |      |      |      |      |      | -11,526 |
| Carbon sink potential - High - Restore productivity (1000 tC02e/y)                            |      |      |      |      |      |      | -4,644  |
| Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)                          |      |      |      |      |      |      | -178    |
| Carbon sink potential - Low - All (not  |      |      |      |      |      |      | -13,471 |
| counting overlap) (1000 tCO2e/y) Carbon sink potential - Low - Avoid                          |      |      |      |      |      |      | -222    |
| deforestation (1000 tCO2e/y) Carbon sink potential - Low - Extend                             |      |      |      |      |      |      | -3,544  |
| rotation length (1000 tCO2e/y) Carbon sink potential - Low - Improve                          |      |      |      |      |      |      | -1,549  |
| plantations (1000 tCO2e/y)  Carbon sink potential - Low - Increase                            |      |      |      |      |      |      | -4,608  |
| retention of HWP (1000 tC02e/y) Carbon sink potential - Low - Increase                        |      |      |      |      |      |      | -392    |
| trees outside forests (1000 tC02e/y) Carbon sink potential - Low - Reforest                   |      |      |      |      |      |      | -538    |
| cropland (1000 tCO2e/y)  Carbon sink potential - Low - Reforest                               |      |      |      |      |      |      | -873    |
| pasture (1000 tCO2e/y)  |      |      |      |      |      |      |         |
| Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)                             |      |      |      |      |      |      | -1,565  |
| Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)                          |      |      |      |      |      |      | -267    |
| Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)                       |      |      |      |      |      |      | -29,786 |
| Carbon sink potential - Mid - Avoid<br>deforestation (1000 tCO2e/y)                           |      |      |      |      |      |      | -778    |
| Carbon sink potential - Mid - Extend<br>rotation length (1000 tCO2e/y)                        |      |      |      |      |      |      | -6,386  |
| Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)                              |      |      |      |      |      |      | -2,270  |
| Carbon sink potential - Mid - Increase retention of HWP (1000 tC02e/y)                        |      |      |      |      |      |      | -9,217  |
| Carbon sink potential - Mid - Increase trees outside forests (1000 tC02e/y)                   |      |      |      |      |      |      | -756    |
| Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)                                |      |      |      |      |      |      | -807    |
| Carbon sink potential - Mid - Reforest  |      |      |      |      |      |      | -6,200  |
| pasture (1000 tC02e/y) Carbon sink potential - Mid - Restore                                  |      |      |      |      |      |      | -3,105  |
| productivity (1000 tC02e/y) Land impacted for carbon sink potential -                         |      |      |      |      |      |      | 58.3    |
| High - Accelerate regeneration (1000 hectares)  |      |      |      |      |      |      |         |
| Land impacted for carbon sink potential -<br>High - Avoid deforestation (over 30 years)       |      |      |      |      |      |      | 181     |
| (1000 hectares)   |      |      |      |      |      |      | 4,705   |
| Land impacted for carbon sink potential -<br>High - Extend rotation length (1000<br>hectares) |      |      |      |      |      |      | 4,705   |
| Land impacted for carbon sink potential -<br>High - Improve plantations (1000                 |      |      |      |      |      |      | 1,121   |
| hectares)   |      |      |      |      |      |      |         |

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 -<br>High - Increase retention of HWP (1000     |      |      |          |      |      |      | 0     |
| hectares)   |      |      |          |      |      |      |       |
| Land impacted for carbon sink potential -   |      |      |          |      |      |      | 106   |
| High - Increase trees outside forests   |      |      |          |      |      |      |       |
| (1000 hectares)   |      |      |          |      |      |      | 71.2  |
| Land impacted for carbon sink potential -<br>High - Reforest cropland (1000 hectares)   |      |      |          |      |      |      | 71.2  |
| Land impacted for carbon sink potential -   |      |      |          |      |      |      | 327   |
| High - Reforest pasture (1000 hectares)   |      |      |          |      |      |      | 321   |
| Land impacted for carbon sink potential -   |      |      |          |      |      |      | 1,539 |
| High - Restore productivity (1000   |      |      |          |      |      |      | .,007 |
| hectares)   |      |      |          |      |      |      |       |
| Land impacted for carbon sink potential -   |      |      |          |      |      |      | 8,110 |
| High - Total impacted (over 30 years)   |      |      |          |      |      |      |       |
| (1000 hectares)   |      |      |          |      |      |      |       |
| Land impacted for carbon sink potential -   |      |      |          |      |      |      | 29.1  |
| Low - Accelerate regeneration (1000   |      |      |          |      |      |      |       |
| hectares)   |      |      |          |      |      |      |       |
| Land impacted for carbon sink potential -   |      |      |          |      |      |      | 170   |
| Low - Avoid deforestation (over 30 years)   |      |      |          |      |      |      |       |
| (1000 hectares)  Land impacted for carbon sink potential -                              |      |      |          |      |      |      | 1.000 |
| Low - Extend rotation length (1000  |      |      |          |      |      |      | 1,803 |
| hectares)   |      |      |          |      |      |      |       |
| Land impacted for carbon sink potential -   |      |      |          |      |      |      | 561   |
| Low - Improve plantations (1000   |      |      |          |      |      |      | 301   |
| hectares)   |      |      |          |      |      |      |       |
| Land impacted for carbon sink potential -   |      |      |          |      |      |      | 0     |
| Low - Increase retention of HWP (1000   |      |      |          |      |      |      |       |
| hectares)   |      |      |          |      |      |      |       |
| Land impacted for carbon sink potential -   |      |      |          |      |      |      | 56    |
| Low - Increase trees outside forests  |      |      |          |      |      |      |       |
| (1000 hectares)   |      |      |          |      |      |      |       |
| Land impacted for carbon sink potential -   |      |      |          |      |      |      | 35.6  |
| Low - Reforest cropland (1000 hectares)   |      |      |          |      |      |      |       |
| Land impacted for carbon sink potential -   |      |      |          |      |      |      | 56.8  |
| Low - Reforest pasture (1000 hectares)  |      |      |          |      |      |      | 001   |
| Land impacted for carbon sink potential -<br>Low - Restore productivity (1000           |      |      |          |      |      |      | 931   |
| hectares)   |      |      |          |      |      |      |       |
| Land impacted for carbon sink potential -   |      |      |          |      |      |      | 3,642 |
| Low - Total impacted (over 30 years)  |      |      |          |      |      |      | 3,042 |
| (1000 hectares)   |      |      |          |      |      |      |       |
| Land impacted for carbon sink potential -   |      |      |          |      |      |      | 43.7  |
| Mid - Accelerate regeneration (1000   |      |      |          |      |      |      |       |
| hectares)   |      |      |          |      |      |      |       |
| Land impacted for carbon sink potential -   |      |      |          |      |      |      | 175   |
| Mid - Avoid deforestation (over 30 years)   |      |      |          |      |      |      |       |
| (1000 hectares)   |      |      |          |      |      |      |       |
| Land impacted for carbon sink potential -   |      |      |          |      |      |      | 3,254 |
| Mid - Extend rotation length (1000  |      |      |          |      |      |      |       |
| hectares)   |      |      |          |      |      |      |       |
| Land impacted for carbon sink potential -   |      |      |          |      |      |      | 844   |
| Mid - Improve plantations (1000 hectares)   |      |      |          |      |      |      |       |
| Land impacted for carbon sink potential -   |      |      |          |      |      |      | 0     |
| Mid - Increase retention of HWP (1000   |      |      |          |      |      |      |       |
| hectares)   |      |      |          |      |      |      | 81.2  |
| Land impacted for carbon sink potential -<br>Mid - Increase trees outside forests (1000 |      |      |          |      |      |      | 01.2  |
| הוומ - דווסו פמפה נו פפפ המנפומב והו בפנפ (1000   |      |      | <b>I</b> |      |      | 1    |       |

| Table 33: <i>E+RE+</i> | scenario -  | DTII AR 6.  | I and sinks - | Forests   | (continued) |
|------------------------|-------------|-------------|---------------|-----------|-------------|
| I ADIC JJ. LTNLT       | acenui iu - | · FILLAN O. | LUHU ƏHINƏ "  | ายเกลาเลา | COHILINGER  |

| Item                                       | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|--|------|------|------|------|------|------|-------|
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 53.4  |
| Mid - Reforest cropland (1000 hectares)    |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 410   |
| Mid - Reforest pasture (1000 hectares)     |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 1,876 |
| Mid - Restore productivity (1000           |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 6,737 |
| 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 - |      | 319  | 0.217 | 0.206 | 0.16  | 0.104 | 0.004 |
| Coal (million 2019\$)                 |      |      |       |       |       |       |       |
| Monetary damages from air pollution - |      | 104  | 59.7  | 24.6  | 17.2  | 5.17  | 2.89  |
| Natural Gas (million 2019\$)          |      |      |       |       |       |       |       |
| Monetary damages from air pollution - |      | 404  | 374   | 283   | 163   | 74.8  | 30.8  |
| Transportation (million 2019\$)       |      |      |       |       |       |       |       |
| Premature deaths from air pollution - |      | 36   | 0.024 | 0.023 | 0.018 | 0.012 | 0     |
| Coal (deaths)                         |      |      |       |       |       |       |       |
| Premature deaths from air pollution - |      | 11.7 | 6.74  | 2.78  | 1.95  | 0.583 | 0.326 |
| Natural Gas (deaths)                  |      |      |       |       |       |       |       |
| Premature deaths from air pollution - |      | 45.5 | 42.1  | 31.8  | 18.3  | 8.42  | 3.46  |
| 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 -<br>Cumulative 5-yr (million \$2018) |      | 10,539 | 12,307 |       |      |      |      |
| Sales of cooking units - Electric<br>Resistance (%)                       | 30.1 | 44.4   | 79.2   | 86.1  | 86.5 | 86.5 | 86.5 |
| Sales of cooking units - Gas (%)  | 69.9 | 55.6   | 20.8   | 13.9  | 13.5 | 13.5 | 13.5 |
| Sales of space heating units - Electric<br>Heat Pump (%)                  | 2.92 | 27.3   | 77.1   | 91.1  | 92.3 | 92.3 | 92.3 |
| Sales of space heating units - Electric<br>Resistance (%)                 | 2.74 | 4.44   | 4.73   | 6.05  | 6.35 | 6.37 | 6.39 |
| Sales of space heating units - Fossil (%)                                 | 0    | 0      | 0      | 0     | 0    | 0    | 0    |
| Sales of space heating units - Gas Furnace (%)                            | 94.3 | 68.3   | 18.2   | 2.83  | 1.38 | 1.34 | 1.33 |
| Sales of water heating units - Electric<br>Heat Pump (%)                  | 0.08 | 10.7   | 56.3   | 66.5  | 66.9 | 66.9 | 66.9 |
| Sales of water heating units - Electric<br>Resistance (%)                 | 2.31 | 8.07   | 26.9   | 31.1  | 31.3 | 31.3 | 31.3 |
| Sales of water heating units - Gas Furnace (%)                            | 96.5 | 79.4   | 15     | 0.632 | 0    | 0    | 0    |
| Sales of water heating units - Other (%)                                  | 1.07 | 1.78   | 1.78   | 1.78  | 1.79 | 1.79 | 1.8  |

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

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|------|------|------|------|------|------|------|
| Electricity distribution capital invested - |      | 2.42 | 2.48 | 3.87 | 4.09 | 4.01 | 4.2  |
| 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) | 90   | 90.4 | 87   | 81.6 | 77.4 | 76.4 | 78.1 |

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

| Item                                   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--|------|------|------|------|------|------|------|
| Final energy use - Industry (PJ)       | 236  | 242  | 246  | 246  | 250  | 250  | 255  |
| Final energy use - Residential (PJ)    | 123  | 117  | 108  | 95.6 | 85.1 | 78.9 | 76.1 |
| Final energy use - Transportation (PJ) | 324  | 303  | 265  | 220  | 179  | 155  | 146  |

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

| Item                                       | 2020 | 2025 | 2030 | 2035  | 2040  | 2045  | 2050  |
|--|------|------|------|-------|-------|-------|-------|
| Residential HVAC investment in 2020s vs.   |      | 2.31 | 2.82 |       |       |       |       |
| REF - Cumulative 5-yr (billion \$2018)     |      |      |      |       |       |       |       |
| Sales of cooking units - Electric          | 52.7 | 62.8 | 93.6 | 99.7  | 100   | 100   | 100   |
| Resistance (%)                             |      |      |      |       |       |       |       |
| Sales of cooking units - Gas (%)           | 47.3 | 37.2 | 6.37 | 0.321 | 0     | 0     | 0     |
| Sales of space heating units - Electric    | 11.9 | 27.2 | 74.3 | 84.8  | 85.3  | 85.2  | 85.2  |
| Heat Pump (%)                              |      |      |      |       |       |       |       |
| Sales of space heating units - Electric    | 34.9 | 33.8 | 14.2 | 9.82  | 9.65  | 9.82  | 9.86  |
| Resistance (%)                             |      |      |      |       |       |       |       |
| Sales of space heating units - Fossil (%)  | 8.14 | 11.9 | 5.59 | 4.18  | 4.11  | 4.04  | 4.03  |
| Sales of space heating units - Gas (%)     | 45.1 | 27.1 | 5.9  | 1.18  | 0.978 | 0.957 | 0.954 |
| Sales of water heating units - Electric    | 0    | 11.3 | 59.7 | 70.6  | 71.1  | 71.1  | 71.1  |
| Heat Pump (%)                              |      |      |      |       |       |       |       |
| Sales of water heating units - Electric    | 44.5 | 51.9 | 32.1 | 27.6  | 27.4  | 27.4  | 27.4  |
| Resistance (%)                             |      |      |      |       |       |       |       |
| Sales of water heating units - Gas Furnace | 53.7 | 35.3 | 6.65 | 0.277 | 0     | 0     | 0     |
| (%)  |      |      |      |       |       |       |       |
| Sales of water heating units - Other (%)   | 1.86 | 1.52 | 1.52 | 1.49  | 1.49  | 1.5   | 1.5   |

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

| 2020  | 2025  | 2030   | 2035   | 2040  | 2045   | 2050   |
|-------|---|--|--|---|--|--|
|       | 542   | 1,384  | 2,253  | 3,409   | 3,714  | 3,539  |
|       |   |  |  |   |  |  |
| 0.043 |   | 1.12   |  | 5.01  |  | 8.11   |
|       |   |  |  |   |  |  |
| 0.243 |   | 26.9   |  | 120   |  | 195  |
| 97.2  | 92.1  | 67   | 23.3   | 4.22  | 0.628  | 0  |
| 0.588 | 3.81  | 19   | 45.6   | 57.4  | 59.6   | 60   |
| 0.227 | 0.227   | 0.176  | 0.066  | 0.013   | 0.002  | 0  |
| 0.082 | 0.09  | 0.077  | 0.031  | 0.007   | 0.001  | 0  |
| 0.392 | 2.54  | 12.7   | 30.4   | 38.2  | 39.7   | 40   |
|       |   |  |  |   |  |  |
| 1.5   | 1.23  | 1.07   | 0.568  | 0.163   | 0.038  | 0  |
| 1.81  | 2.04  | 1.36   | 0.439  | 0.079   | 0.013  | 0  |
| 3.04  | 12.5  | 42.3   | 80.1   | 96.1  | 99.3   | 100  |
| 91.3  | 81  | 53.1   | 18.2   | 3.51  | 0.597  | 0  |
| 3.57  | 3.93  | 2.92   | 1.11   | 0.266   | 0.056  | 0  |
| 0.112 | 0.354   | 0.224  | 0.071  | 0.014   | 0.002  | 0  |
|       |   |  |  |   |  |  |
| 0.113 | 0.11  | 0.074  | 0.026  | 0.005   | 0.001  | 0  |
| 64.7  | 59.7  | 42.3   | 14.4   | 2.59  | 0.384  | 0  |
| 0.784 | 5.07  | 25.3   | 60.8   | 76.5  | 79.5   | 80   |
| 33.7  | 33.3  | 25.5   | 9.32   | 1.77  | 0.277  | 0  |
| 0.363 | 0.402   | 0.341  | 0.14   | 0.03  | 0.005  | 0  |
| 0.196 | 1.27  | 6.33   | 15.2   | 19.1  | 19.9   | 20   |
|       |   |  |  |   |  |  |
| 0.253 | 0.255   | 0.205  | 0.083  | 0.019   | 0.004  | 0  |
|       | 0.243<br>97.2<br>0.588<br>0.227<br>0.082<br>0.392<br>1.5<br>1.81<br>3.04<br>91.3<br>3.57<br>0.112<br>0.113<br>64.7<br>0.784<br>33.7<br>0.363<br>0.196 | 0.043       0.243       97.2     92.1       0.588     3.81       0.227     0.227       0.082     0.09       0.392     2.54       1.5     1.23       1.81     2.04       3.04     12.5       91.3     81       3.57     3.93       0.112     0.354       0.113     0.11       64.7     59.7       0.784     5.07       33.7     33.3       0.363     0.402       0.196     1.27 | 542         1,384           0.043         1.12           0.243         26.9           97.2         92.1         67           0.588         3.81         19           0.227         0.227         0.176           0.082         0.09         0.077           0.392         2.54         12.7           1.5         1.23         1.07           1.81         2.04         1.36           3.04         12.5         42.3           91.3         81         53.1           3.57         3.93         2.92           0.112         0.354         0.224           0.113         0.11         0.074           64.7         59.7         42.3           0.784         5.07         25.3           33.7         33.3         25.5           0.363         0.402         0.341           0.196         1.27         6.33 | 542         1,384         2,253           0.043         1.12           0.243         26.9           97.2         92.1         67         23.3           0.588         3.81         19         45.6           0.227         0.227         0.176         0.066           0.082         0.09         0.077         0.031           0.392         2.54         12.7         30.4           1.5         1.23         1.07         0.568           1.81         2.04         1.36         0.439           3.04         12.5         42.3         80.1           91.3         81         53.1         18.2           3.57         3.93         2.92         1.11           0.112         0.354         0.224         0.071           0.113         0.11         0.074         0.026           64.7         59.7         42.3         14.4           0.784         5.07         25.3         60.8           33.7         33.3         25.5         9.32           0.363         0.402         0.341         0.14           0.196         1.27         6.33         15.2     < | 542         1,384         2,253         3,409           0.043         1.12         5.01           0.243         26.9         120           97.2         92.1         67         23.3         4.22           0.588         3.81         19         45.6         57.4           0.227         0.227         0.176         0.066         0.013           0.082         0.09         0.077         0.031         0.007           0.392         2.54         12.7         30.4         38.2           1.5         1.23         1.07         0.568         0.163           1.81         2.04         1.36         0.439         0.079           3.04         12.5         42.3         80.1         96.1           91.3         81         53.1         18.2         3.51           3.57         3.93         2.92         1.11         0.266           0.112         0.354         0.224         0.071         0.014           0.113         0.11         0.074         0.026         0.005           64.7         59.7         42.3         14.4         2.59           0.784         5.07         25. | 542         1,384         2,253         3,409         3,714           0.043         1.12         5.01         5.01           0.243         26.9         120           97.2         92.1         67         23.3         4.22         0.628           0.588         3.81         19         45.6         57.4         59.6           0.227         0.227         0.176         0.066         0.013         0.002           0.082         0.09         0.077         0.031         0.007         0.001           0.392         2.54         12.7         30.4         38.2         39.7           1.5         1.23         1.07         0.568         0.163         0.038           1.81         2.04         1.36         0.439         0.079         0.013           3.04         12.5         42.3         80.1         96.1         99.3           91.3         81         53.1         18.2         3.51         0.597           3.57         3.93         2.92         1.11         0.266         0.056           0.112         0.354         0.224         0.071         0.014         0.002           0.13 |

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

| Item   | 2020 | 2025  | 2030  | 2035  | 2040   | 2045   | 2050   |
|--|------|-------|-------|-------|--------|--------|--------|
| Capital invested - Solar PV - Base (billion<br>\$2018)                         |      | 0.463 | 1.85  | 2     | 1.93   | 0      | 0      |
| Capital invested - Solar PV - Constrained (billion \$2018)                     |      | 1.81  | 2.13  | 1.76  | 3.38   | 2.64   | 0      |
| Capital invested - Wind - Base (billion<br>\$2018)                             |      | 2.7   | 1.94  | 0.055 | 4.45   | 5.63   | 10.7   |
| Capital invested - Wind - Constrained (billion \$2018)                         |      | 4.74  | 4.41  | 0.402 | 6.29   | 6.57   | 19.3   |
| 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      | 0      | 0      |
| Installed renewables - Solar - Base land use assumptions (MW)                  | 210  | 615   | 2,426 | 4,552 | 6,724  | 6,724  | 6,724  |
| Installed renewables - Solar -<br>Constrained land use assumptions (MW)        | 210  | 1,796 | 3,878 | 5,745 | 9,548  | 12,703 | 12,703 |
| Installed renewables - Wind - Base land use assumptions (MW)                   | 0.1  | 1,833 | 3,290 | 3,335 | 7,100  | 12,120 | 22,237 |
| Installed renewables - Wind - Constrained land use assumptions (MW)            | 454  | 3,673 | 6,982 | 7,306 | 12,631 | 18,491 | 36,708 |

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      | 0      | 0       |
| assumptions (GWh)                        |       |        |        |        |        |        |         |
| Solar - Base land use assumptions (GWh)  | 409   | 1,067  | 4,016  | 7,492  | 11,030 | 11,030 | 11,030  |
| Solar - Constrained land use assumptions | 409   | 2,985  | 6,383  | 9,427  | 15,643 | 20,795 | 20,795  |
| (GWh)                                    |       |        |        |        |        |        |         |
| Wind - Base land use assumptions (GWh)   | 0.381 | 6,347  | 11,018 | 11,183 | 23,559 | 40,418 | 73,548  |
| Wind - Constrained land use assumptions  | 1,673 | 13,018 | 24,317 | 25,503 | 43,224 | 61,883 | 116,904 |
| (GWh)                                    |       |        |        |        |        |        |         |

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

| Item                                 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050    |
|--------------------------------------|------|------|------|------|------|------|---------|
| Carbon sink potential - Aggressive   |      |      |      |      |      |      | -243    |
| deployment - Corn-ethanol to energy  |      |      |      |      |      |      |         |
| grasses (1000 tCO2e/y)               |      |      |      |      |      |      |         |
| Carbon sink potential - Aggressive   |      |      |      |      |      |      | -10,076 |
| deployment - Cropland measures (1000 |      |      |      |      |      |      |         |
| tCO2e/y)                             |      |      |      |      |      |      |         |
| Carbon sink potential - Aggressive   |      |      |      |      |      |      | -64.8   |
| deployment - Permanent conservation  |      |      |      |      |      |      |         |
| cover (1000 tCO2e/y)                 |      |      |      |      |      |      |         |
| Carbon sink potential - Aggressive   |      |      |      |      |      |      | -10,383 |
| deployment - Total (1000 tCO2e/y)    |      |      |      |      |      |      |         |
| Carbon sink potential - Moderate     |      |      |      |      |      |      | -243    |
| deployment - Corn-ethanol to energy  |      |      |      |      |      |      |         |
| grasses (1000 tCO2e/y)               |      |      |      |      |      |      |         |
| Carbon sink potential - Moderate     |      |      |      |      |      |      | -5,130  |
| deployment - Cropland measures (1000 |      |      |      |      |      |      |         |
| tCO2e/y)                             |      |      |      |      |      |      |         |
| Carbon sink potential - Moderate     |      |      |      |      |      |      | -32.4   |
| deployment - Permanent conservation  |      |      |      |      |      |      |         |
| cover (1000 tCO2e/y)                 |      |      |      |      |      |      |         |
| Carbon sink potential - Moderate     |      |      |      |      |      |      | -5,405  |
| deployment - Total (1000 tCO2e/y)    |      |      |      |      |      |      |         |

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

| Item                                     | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|--|------|------|------|------|------|------|-------|
| Land impacted for carbon sink -          |      |      |      |      |      |      | 96.4  |
| Aggressive deployment - Corn-ethanol to  |      |      |      |      |      |      |       |
| energy grasses (1000 hectares)           |      |      |      |      |      |      |       |
| Land impacted for carbon sink -          |      |      |      |      |      |      | 2,955 |
| Aggressive deployment - Cropland         |      |      |      |      |      |      |       |
| measures (1000 hectares)                 |      |      |      |      |      |      |       |
| Land impacted for carbon sink -          |      |      |      |      |      |      | 118   |
| Aggressive deployment - Permanent        |      |      |      |      |      |      |       |
| conservation cover (1000 hectares)       |      |      |      |      |      |      |       |
| Land impacted for carbon sink -          |      |      |      |      |      |      | 3,170 |
| Aggressive deployment - Total (1000      |      |      |      |      |      |      |       |
| hectares)                                |      |      |      |      |      |      |       |
| Land impacted for carbon sink - Moderate |      |      |      |      |      |      | 96.4  |
| deployment - Corn-ethanol to energy      |      |      |      |      |      |      |       |
| grasses (1000 hectares)                  |      |      |      |      |      |      |       |
| Land impacted for carbon sink - Moderate |      |      |      |      |      |      | 1,507 |
| deployment - Cropland measures (1000     |      |      |      |      |      |      |       |
| hectares)                                |      |      |      |      |      |      |       |
| Land impacted for carbon sink - Moderate |      |      |      |      |      |      | 58.9  |
| deployment - Permanent conservation      |      |      |      |      |      |      |       |
| cover (1000 hectares)                    |      |      |      |      |      |      |       |
| Land impacted for carbon sink - Moderate |      |      |      |      |      |      | 1,662 |
| 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 |      |      |      |      |      |      | -356    |
| regeneration (1000 tCO2e/y)               |      |      |      |      |      |      |         |
| Carbon sink potential - High - All (not   |      |      |      |      |      |      | -46,154 |
| counting overlap) (1000 tCO2e/y)          |      |      |      |      |      |      |         |
| Carbon sink potential - High - Avoid      |      |      |      |      |      |      | -1,334  |
| deforestation (1000 tCO2e/y)              |      |      |      |      |      |      |         |
| Carbon sink potential - High - Extend     |      |      |      |      |      |      | -9,227  |
| rotation length (1000 tCO2e/y)            |      |      |      |      |      |      |         |
| Carbon sink potential - High - Improve    |      |      |      |      |      |      | -3,044  |
| plantations (1000 tCO2e/y)                |      |      |      |      |      |      |         |
| Carbon sink potential - High - Increase   |      |      |      |      |      |      | -13,825 |
| retention of HWP (1000 tCO2e/y)           |      |      |      |      |      |      |         |
| Carbon sink potential - High - Increase   |      |      |      |      |      |      | -1,120  |
| trees outside forests (1000 tCO2e/y)      |      |      |      |      |      |      |         |
| Carbon sink potential - High - Reforest   |      |      |      |      |      |      | -1,077  |
| cropland (1000 tCO2e/y)                   |      |      |      |      |      |      |         |
| Carbon sink potential - High - Reforest   |      |      |      |      |      |      | -11,526 |
| pasture (1000 tCO2e/y)                    |      |      |      |      |      |      |         |
| Carbon sink potential - High - Restore    |      |      |      |      |      |      | -4,644  |
| productivity (1000 tCO2e/y)               |      |      |      |      |      |      |         |
| Carbon sink potential - Low - Accelerate  |      |      |      |      |      |      | -178    |
| regeneration (1000 tCO2e/y)               |      |      |      |      |      |      |         |
| Carbon sink potential - Low - All (not    |      |      |      |      |      |      | -13,471 |
| counting overlap) (1000 tCO2e/y)          |      |      |      |      |      |      |         |
| Carbon sink potential - Low - Avoid       |      |      |      |      |      |      | -222    |
| deforestation (1000 tCO2e/y)              |      |      |      |      |      |      |         |
| Carbon sink potential - Low - Extend      |      |      |      |      |      |      | -3,544  |
| rotation length (1000 tCO2e/y)            |      |      |      |      |      |      |         |
| Carbon sink potential - Low - Improve     |      |      |      |      |      |      | -1,549  |
| plantations (1000 tCO2e/y)                |      |      |      |      |      |      |         |
| Carbon sink potential - Low - Increase    |      |      |      |      |      |      | -4,608  |
| retention of HWP (1000 tCO2e/y)           |      |      |      |      |      |      |         |
| Carbon sink potential - Low - Increase    |      |      |      |      |      |      | -392    |
| trees outside forests (1000 tC02e/y)      |      |      |      |      |      |      |         |

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

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 205    |
|--|------|------|------|------|------|------|--------|
| Carbon sink potential - Low - Reforest   |      |      |      |      |      |      | -53    |
| cropland (1000 tCO2e/y)  |      |      |      |      |      |      |        |
| Carbon sink potential - Low - Reforest   |      |      |      |      |      |      | -87    |
| pasture (1000 tC02e/y)   |      |      |      |      |      |      | 4.5.4  |
| Carbon sink potential - Low - Restore  |      |      |      |      |      |      | -1,56  |
| productivity (1000 tC02e/y)  |      |      |      |      |      |      | 0.4    |
| Carbon sink potential - Mid - Accelerate   |      |      |      |      |      |      | -26    |
| regeneration (1000 tCO2e/y)  |      |      |      |      |      |      | 0070   |
| Carbon sink potential - Mid - All (not   |      |      |      |      |      |      | -29,78 |
| counting overlap) (1000 tCO2e/y)   |      |      |      |      |      |      |        |
| Carbon sink potential - Mid - Avoid  |      |      |      |      |      |      | -77    |
| deforestation (1000 tC02e/y)   |      |      |      |      |      |      |        |
| Carbon sink potential - Mid - Extend   |      |      |      |      |      |      | -6,38  |
| rotation length (1000 tCO2e/y)   |      |      |      |      |      |      |        |
| Carbon sink potential - Mid - Improve  |      |      |      |      |      |      | -2,27  |
| plantations (1000 tCO2e/y)   |      |      |      |      |      |      |        |
| Carbon sink potential - Mid - Increase   |      |      |      |      |      |      | -9,21  |
| retention of HWP (1000 tCO2e/y)  |      |      |      |      |      |      |        |
| Carbon sink potential - Mid - Increase   |      |      |      |      |      |      | -75    |
| trees outside forests (1000 tCO2e/y)   |      |      |      |      |      |      |        |
| Carbon sink potential - Mid - Reforest   |      |      |      |      |      |      | -80    |
| cropland (1000 tCO2e/y)  |      |      |      |      |      |      |        |
| Carbon sink potential - Mid - Reforest   |      |      |      |      |      |      | -6,20  |
| pasture (1000 tCO2e/y)   |      |      |      |      |      |      |        |
| Carbon sink potential - Mid - Restore  |      |      |      |      |      |      | -3,10  |
| productivity (1000 tCO2e/y)  |      |      |      |      |      |      |        |
| and impacted for carbon sink potential -   |      |      |      |      |      |      | 58     |
| High - Accelerate regeneration (1000   |      |      |      |      |      |      |        |
| nectares)  |      |      |      |      |      |      |        |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 18     |
| High - Avoid deforestation (over 30 years)                                       |      |      |      |      |      |      |        |
| (1000 hectares)  |      |      |      |      |      |      |        |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 4,70   |
| High - Extend rotation length (1000  |      |      |      |      |      |      |        |
| hectares)  |      |      |      |      |      |      |        |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 1,12   |
| High - Improve plantations (1000   |      |      |      |      |      |      |        |
| hectares)  |      |      |      |      |      |      |        |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      |        |
| High - Increase retention of HWP (1000   |      |      |      |      |      |      |        |
| nectares)  |      |      |      |      |      |      |        |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 10     |
| High - Increase trees outside forests  |      |      |      |      |      |      |        |
| (1000 hectares)  |      |      |      |      |      |      |        |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 71     |
| High - Reforest cropland (1000 hectares)   |      |      |      |      |      |      |        |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 32     |
| High - Reforest pasture (1000 hectares)  |      |      |      |      |      |      | 0.     |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 1,53   |
| High - Restore productivity (1000  |      |      |      |      |      |      | .,00   |
| nectares)  |      |      |      |      |      |      |        |
| and impacted for carbon sink potential -   |      |      |      |      |      |      | 8,11   |
| High - Total impacted (over 30 years)  |      |      |      |      |      |      | 0,11   |
| 1000 hectares)   |      |      |      |      |      |      |        |
| and impacted for carbon sink potential -   |      |      |      |      |      |      | 29     |
| Land impacted for carbon sink potential -<br>Low - Accelerate regeneration (1000 |      |      |      |      |      |      | 29     |
| nectares)  |      |      |      |      |      |      |        |
| •  |      |      |      |      |      |      | 17     |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 17     |
| Low - Avoid deforestation (over 30 years)  |      |      | [    |      |      |      |        |

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

| Item                                       | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|--|------|------|------|------|------|------|-------|
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 1,803 |
| Low - Extend rotation length (1000         |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 561   |
| 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 -  |      |      |      |      |      |      | 56    |
| Low - Increase trees outside forests       |      |      |      |      |      |      |       |
| (1000 hectares)                            |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 35.6  |
| Low - Reforest cropland (1000 hectares)    |      |      |      |      |      |      | 00.0  |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 56.8  |
| Low - Reforest pasture (1000 hectares)     |      |      |      |      |      |      | 50.0  |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 931   |
| Low - Restore productivity (1000           |      |      |      |      |      |      | 731   |
| , , , ,                                    |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      | 0.//0 |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 3,642 |
| Low - Total impacted (over 30 years)       |      |      |      |      |      |      |       |
| (1000 hectares)                            |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 43.7  |
| Mid - Accelerate regeneration (1000        |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 175   |
| Mid - Avoid deforestation (over 30 years)  |      |      |      |      |      |      |       |
| (1000 hectares)                            |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 3,254 |
| Mid - Extend rotation length (1000         |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 844   |
| 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 -  |      |      |      |      |      |      | 81.2  |
| Mid - Increase trees outside forests (1000 |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 53.4  |
| Mid - Reforest cropland (1000 hectares)    |      |      |      |      |      |      | 00. 1 |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 410   |
| Mid - Reforest pasture (1000 hectares)     |      |      |      |      |      |      | 710   |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 1,876 |
| Mid - Restore productivity (1000           |      |      |      |      |      |      | 1,010 |
|  |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      | / 707 |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 6,737 |
| Mid - Total impacted (over 30 years) (1000 |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |

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

| Item                                  | 2020 | 2025 | 2030  | 2035  | 2040  | 2045  | 2050  |
|---------------------------------------|------|------|-------|-------|-------|-------|-------|
| Monetary damages from air pollution - |      | 319  | 0.217 | 0.206 | 0.16  | 0.104 | 0.004 |
| Coal (million 2019\$)                 |      |      |       |       |       |       |       |
| Monetary damages from air pollution - |      | 117  | 64.9  | 68    | 54.8  | 18.6  | 5.95  |
| Natural Gas (million 2019\$)          |      |      |       |       |       |       |       |
| Monetary damages from air pollution - |      | 404  | 374   | 283   | 163   | 74.8  | 30.8  |
| Transportation (million 2019\$)       |      |      |       |       |       |       |       |
| Premature deaths from air pollution - |      | 36   | 0.024 | 0.023 | 0.018 | 0.012 | 0     |
| Coal (deaths)                         |      |      |       |       |       |       |       |

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

| Item                                  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|---------------------------------------|------|------|------|------|------|------|-------|
| Premature deaths from air pollution - |      | 13.2 | 7.33 | 7.68 | 6.19 | 2.1  | 0.672 |
| Natural Gas (deaths)                  |      |      |      |      |      |      |       |
| Premature deaths from air pollution - |      | 45.5 | 42.1 | 31.8 | 18.3 | 8.42 | 3.46  |
| Transportation (deaths)               |      |      |      |      |      |      |       |

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

| - / 1 |   |  |  |  |   |  |
|-------|---|--|--|--|---|--|
| 2020  | 2025  | 2030   | 2035   | 2040   | 2045  | 2050   |
|       | 10,527  | 12,223   |  |  |   |  |
|       |   |  |  |  |   |  |
| 30.1  | 34.2  | 39   | 52   | 70.1   | 81.2  | 85   |
|       |   |  |  |  |   |  |
| 69.9  | 65.8  | 61   | 48   | 29.9   | 18.8  | 15   |
| 2.92  | 17.8  | 23.5   | 40   | 65.6   | 83.3  | 89.8   |
|       |   |  |  |  |   |  |
| 2.74  | 4.44  | 4.48   | 4.65   | 5.07   | 5.74  | 6.19   |
|       |   |  |  |  |   |  |
| 0     | 0   | 0  | 0  | 0  | 0   | 0  |
| 94.3  | 77.8  | 72   | 55.4   | 29.3   | 11  | 3.97   |
|       |   |  |  |  |   |  |
| 0.08  | 1.96  | 7.15   | 22.1   | 45   | 59.9  | 65.1   |
|       |   |  |  |  |   |  |
| 2.31  | 4.44  | 6.56   | 12.7   | 22.2   | 28.4  | 30.5   |
|       |   |  |  |  |   |  |
| 96.5  | 91.8  | 84.5   | 63.4   | 31   | 9.91  | 2.58   |
|       |   |  |  |  |   |  |
| 1.07  | 1.78  | 1.78   | 1.78   | 1.79   | 1.79  | 1.8  |
|       | 2020<br>30.1<br>69.9<br>2.92<br>2.74<br>0<br>94.3<br>0.08<br>2.31<br>96.5 | 10,527 30.1 34.2 69.9 65.8 2.92 17.8 2.74 4.44 0 0 0 94.3 77.8 0.08 1.96 2.31 4.44 96.5 91.8 | 2020         2025         2030           10,527         12,223           30.1         34.2         39           69.9         65.8         61           2.92         17.8         23.5           2.74         4.44         4.48           0         0         0           94.3         77.8         72           0.08         1.96         7.15           2.31         4.44         6.56           96.5         91.8         84.5 | 2020         2025         2030         2035           10,527         12,223         2035           30.1         34.2         39         52           69.9         65.8         61         48           2.92         17.8         23.5         40           2.74         4.44         4.48         4.65           0         0         0         0           94.3         77.8         72         55.4           0.08         1.96         7.15         22.1           2.31         4.44         6.56         12.7           96.5         91.8         84.5         63.4 | 2020         2025         2030         2035         2040           10,527         12,223         2030         2035         2040           30.1         34.2         39         52         70.1           69.9         65.8         61         48         29.9           2.92         17.8         23.5         40         65.6           2.74         4.44         4.48         4.65         5.07           0         0         0         0         0           94.3         77.8         72         55.4         29.3           0.08         1.96         7.15         22.1         45           2.31         4.44         6.56         12.7         22.2           96.5         91.8         84.5         63.4         31 | 2020         2025         2030         2035         2040         2045           10,527         12,223         2035         2040         2045           30.1         34.2         39         52         70.1         81.2           69.9         65.8         61         48         29.9         18.8           2.92         17.8         23.5         40         65.6         83.3           2.74         4.44         4.48         4.65         5.07         5.74           0         0         0         0         0         0           94.3         77.8         72         55.4         29.3         11           0.08         1.96         7.15         22.1         45         59.9           2.31         4.44         6.56         12.7         22.2         28.4           96.5         91.8         84.5         63.4         31         9.91 |

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

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|------|------|------|------|------|------|------|
| Electricity distribution capital invested - |      | 2.1  | 2.13 | 2.57 | 2.64 | 3.75 | 3.95 |
| 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)     | 90   | 90.7 | 90.4 | 89.6 | 87.6 | 85.4 | 84.4 |
| Final energy use - Industry (PJ)       | 236  | 243  | 246  | 249  | 254  | 253  | 258  |
| Final energy use - Residential (PJ)    | 123  | 118  | 114  | 110  | 103  | 94.4 | 86.6 |
| Final energy use - Transportation (PJ) | 324  | 305  | 276  | 255  | 238  | 219  | 197  |

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

| Item                                      | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|------|------|------|------|------|------|------|
| Residential HVAC investment in 2020s vs.  |      | 2.28 | 2.67 |      |      |      |      |
| REF - Cumulative 5-yr (billion \$2018)    |      |      |      |      |      |      |      |
| Sales of cooking units - Electric         | 52.5 | 53.8 | 58.1 | 69.6 | 85.5 | 95.3 | 98.7 |
| Resistance (%)                            |      |      |      |      |      |      |      |
| Sales of cooking units - Gas (%)          | 47.5 | 46.2 | 41.9 | 30.4 | 14.5 | 4.68 | 1.26 |
| Sales of space heating units - Electric   | 11.9 | 18.1 | 23.5 | 39   | 62.6 | 78   | 83.3 |
| Heat Pump (%)                             |      |      |      |      |      |      |      |
| Sales of space heating units - Electric   | 34.9 | 37.6 | 35.2 | 28.7 | 19   | 12.7 | 10.5 |
| Resistance (%)                            |      |      |      |      |      |      |      |
| Sales of space heating units - Fossil (%) | 8.14 | 13.1 | 12.5 | 10.3 | 7.08 | 5.03 | 4.32 |
| Sales of space heating units - Gas (%)    | 45.1 | 31.2 | 28.8 | 22   | 11.3 | 4.24 | 1.82 |
| Sales of water heating units - Electric   | 0    | 1.94 | 7.45 | 23.3 | 47.7 | 63.6 | 69.1 |
| Heat Pump (%)                             |      |      |      |      |      |      |      |
| Sales of water heating units - Electric   | 44.5 | 55.7 | 53.5 | 47.1 | 37   | 30.5 | 28.2 |
| Resistance (%)                            |      |      |      |      |      |      |      |

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

|  | -    | -    |      | -    |      |      |      |
|--|------|------|------|------|------|------|------|
| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
| Sales of water heating units - Gas Furnace (%) | 53.7 | 40.9 | 37.5 | 28.1 | 13.8 | 4.37 | 1.13 |
| Sales of water heating units - Other (%)       | 1.86 | 1.52 | 1.52 | 1.51 | 1.52 | 1.5  | 1.5  |

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

| Item                                       | 2020  | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|--|-------|-------|-------|-------|-------|-------|-------|
| Light-duty vehicle capital costs -         |       | 0     | 86.7  | 184   | 621   | 1,961 | 2,854 |
| Cumulative 5-yr (million \$2018)           |       |       |       |       |       |       |       |
| Public EV charging plugs - DC Fast (1000   | 0.043 |       | 0.334 |       | 1.85  |       | 5.2   |
| units)                                     |       |       |       |       |       |       |       |
| Public EV charging plugs - L2 (1000 units) | 0.243 |       | 8.03  |       | 44.4  |       | 125   |
| 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 (%)    | 1.82  | 2.19  | 2.11  | 1.69  | 1.1   | 0.572 | 0.244 |
| Vehicle sales - Light-duty - EV (%)        | 1.58  | 4.01  | 10.5  | 23.6  | 45.9  | 70.4  | 86.9  |
| Vehicle sales - Light-duty - gasoline (%)  | 92.7  | 88.7  | 81.8  | 69.5  | 49    | 26.6  | 11.7  |
| Vehicle sales - Light-duty - hybrid (%)    | 3.69  | 4.55  | 5.17  | 4.83  | 3.75  | 2.29  | 1.14  |
| Vehicle sales - Light-duty - hydrogen FC   | 0.113 | 0.388 | 0.341 | 0.266 | 0.193 | 0.109 | 0.05  |
| (%)  |       |       |       |       |       |       |       |
| Vehicle sales - Light-duty - other (%)     | 0.114 | 0.118 | 0.109 | 0.096 | 0.07  | 0.039 | 0.018 |
| 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 50: E-B+ scenario - PILLAR 2: Clean Electricity - Generating capacity

| Item                                   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|--|------|------|------|------|------|------|-------|
| Capital invested - Biomass power plant | 0    | 0    | 0    | 0    | 0    | 0    | 0     |
| (billion \$2018)                       |      |      |      |      |      |      |       |
| Capital invested - Biomass w/ccu allam | 0    | 0    | 0    | 0    | 0    | 0    | 0.063 |
| power plant (billion \$2018)           |      |      |      |      |      |      |       |
| Capital invested - Biomass w/ccu power | 0    | 0    | 0    | 13.1 | 6.33 | 8.69 | 5.05  |
| plant (billion \$2018)                 |      |      |      |      |      |      |       |

#### 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      | 62.9   |
| Biomass w/ccu power plant (GWh)       | 0    | 0    | 0    | 14,741 | 21,844 | 31,603 | 37,270 |

#### 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    | 886    | 1,910  | 2,497 | 2,840 |
| Conversion capital investment -                     |      | 0    | 0    | 12,047 | 12,821 | 7,975 | 4,709 |
| Cumulative 5-yr (million \$2018)                    |      |      |      |        |        |       |       |
| Number of facilities - Allam power w ccu (quantity) | 0    | 0    | 0    | 0      | 0      | 0     | 1     |

|                           | DT1 / 4 D O O/          | 5' ( '' ')             |
|---------------------------|-------------------------|------------------------|
| Table 52: E-B+ scenario - | PILLAR 3: Clean fuels - | Bioeneray Icontinued I |

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--|------|------|------|------|------|------|------|
| Number of facilities - Beccs hydrogen        | 0    | 0    | 0    | 0    | 8    | 8    | 8    |
| (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    | 12   | 18   | 26   | 30   |
| (quantity)                                   |      |      |      |      |      |      |      |
| Number of facilities - Pyrolysis (quantity)  | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| 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    | 14.6 | 30.6 | 40.3 | 45.8 |
| Annual - BECCS (MMT)               |      | 0    | 0    | 14.6 | 30.6 | 40.3 | 45.8 |
| 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    | 14.6 | 45.2 | 85.5 | 131  |
| Cumulative - BECCS (MMT)           |      | 0    | 0    | 14.6 | 45.2 | 85.5 | 131  |
| 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    | 39.8 | 150  | 721   | 1,074 | 1,074 |
| Cumulative investment - All (million<br>\$2018)   |      | 0    | 284  | 887  | 1,728 | 2,267 | 2,443 |
| Cumulative investment - Spur (million<br>\$2018)  |      | 0    | 0    | 318  | 874   | 1,414 | 1,589 |
| Cumulative investment - Trunk (million<br>\$2018) |      | 0    | 284  | 569  | 853   | 853   | 853   |
| Spur (km)   |      | 0    | 0    | 69.9 | 602   | 955   | 955   |
| Trunk (km)  |      | 0    | 39.8 | 79.6 | 119   | 119   | 119   |

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

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045  | 2050  |
|---|------|------|------|------|------|-------|-------|
| CO2 storage (MMT)   |      | 0    | 3.69 | 15   | 30.9 | 41.4  | 45.1  |
| Injection wells (wells)   |      | 0    | 4    | 14   | 26   | 42    | 54    |
| Resource characterization, appraisal, permitting costs (million \$2020) |      | 14.2 | 350  | 562  | 562  | 562   | 562   |
| Wells and facilities construction costs (million \$2020)                |      | 0    | 111  | 432  | 770  | 1,288 | 1,600 |

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

| Item                                  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050   |
|---------------------------------------|------|------|------|------|------|------|--------|
| Carbon sink potential - Aggressive    |      |      |      |      |      |      | -923   |
| deployment - Corn-ethanol to energy   |      |      |      |      |      |      |        |
| grasses (1000 tCO2e/y)                |      |      |      |      |      |      |        |
| Carbon sink potential - Aggressive    |      |      |      |      |      |      | -9,220 |
| deployment - Cropland measures (1000  |      |      |      |      |      |      |        |
| tCO2e/y)                              |      |      |      |      |      |      |        |
| Carbon sink potential - Aggressive    |      |      |      |      |      |      | 0      |
| deployment - Cropland to woody energy |      |      |      |      |      |      |        |
| crops (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       |      |      |      |      |      |      | 0       |
| deployment - Pasture to energy crops     |      |      |      |      |      |      |         |
| (1000 tC02e/y)                           |      |      |      |      |      |      |         |
| Carbon sink potential - Aggressive       |      |      |      |      |      |      | -49.6   |
| deployment - Permanent conservation      |      |      |      |      |      |      |         |
| cover (1000 tC02e/y)                     |      |      |      |      |      |      |         |
| Carbon sink potential - Aggressive       |      |      |      |      |      |      | -10,192 |
| deployment - Total (1000 tC02e/y)        |      |      |      |      |      |      |         |
| Carbon sink potential - Moderate         |      |      |      |      |      |      | -923    |
| deployment - Corn-ethanol to energy      |      |      |      |      |      |      |         |
| grasses (1000 tCO2e/y)                   |      |      |      |      |      |      |         |
| Carbon sink potential - Moderate         |      |      |      |      |      |      | -4,678  |
| deployment - Cropland measures (1000     |      |      |      |      |      |      |         |
| 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         |      |      |      |      |      |      | -24.8   |
| deployment - Permanent conservation      |      |      |      |      |      |      |         |
| cover (1000 tCO2e/y)                     |      |      |      |      |      |      |         |
| Carbon sink potential - Moderate         |      |      |      |      |      |      | -5,626  |
| deployment - Total (1000 tCO2e/y)        |      |      |      |      |      |      |         |
| Land impacted for carbon sink -          |      |      |      |      |      |      | 367     |
| Aggressive deployment - Corn-ethanol to  |      |      |      |      |      |      |         |
| energy grasses (1000 hectares)           |      |      |      |      |      |      |         |
| Land impacted for carbon sink -          |      |      |      |      |      |      | 6,684   |
| Aggressive deployment - Cropland         |      |      |      |      |      |      |         |
| measures (1000 hectares)                 |      |      |      |      |      |      |         |
| Land impacted for carbon sink -          |      |      |      |      |      |      | 143     |
| Aggressive deployment - Cropland to      |      |      |      |      |      |      |         |
| woody energy crops (1000 hectares)       |      |      |      |      |      |      |         |
| Land impacted for carbon sink -          |      |      |      |      |      |      | 440     |
| Aggressive deployment - Pasture to       |      |      |      |      |      |      |         |
| energy crops (1000 hectares)             |      |      |      |      |      |      |         |
| Land impacted for carbon sink -          |      |      |      |      |      |      | 90.3    |
| Aggressive deployment - Permanent        |      |      |      |      |      |      |         |
| conservation cover (1000 hectares)       |      |      |      |      |      |      |         |
| Land impacted for carbon sink -          |      |      |      |      |      |      | 7,724   |
| Aggressive deployment - Total (1000      |      |      |      |      |      |      | •       |
| hectares)                                |      |      |      |      |      |      |         |
| Land impacted for carbon sink - Moderate |      |      |      |      |      |      | 367     |
| deployment - Corn-ethanol to energy      |      |      |      |      |      |      |         |
| grasses (1000 hectares)                  |      |      |      |      |      |      |         |
| Land impacted for carbon sink - Moderate |      |      |      |      |      |      | 1,376   |
| deployment - Cropland measures (1000     |      |      |      |      |      |      | 1,010   |
| hectares)                                |      |      |      |      |      |      |         |
| Land impacted for carbon sink - Moderate |      |      |      |      |      |      | 143     |
| deployment - Cropland to woody energy    |      |      |      |      |      |      | 1-10    |
| crops (1000 hectares)                    |      |      |      |      |      |      |         |
| Land impacted for carbon sink - Moderate |      |      |      |      |      |      | 440     |
| deployment - Pasture to energy crops     |      |      |      |      |      |      | 440     |
| (1000 hectares)                          |      |      |      |      |      |      |         |
| 7  |      |      |      |      |      |      | 45.1    |
| Land impacted for carbon sink - Moderate |      |      |      |      |      |      | 45.1    |
| deployment - Permanent conservation      |      |      |      |      |      |      |         |
| cover (1000 hectares)                    |      |      |      |      |      |      | 0.074   |
| Land impacted for carbon sink - Moderate |      |      |      |      |      |      | 2,371   |
| deployment - Total (1000 hectares)       |      |      |      |      |      |      |         |

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

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050    |
|---|------|------|------|------|------|------|---------|
| Carbon sink potential - High - Accelerate                             |      |      |      |      |      |      | -356    |
| regeneration (1000 tCO2e/y)   |      |      |      |      |      |      |         |
| Carbon sink potential - High - All (not                               |      |      |      |      |      |      | -46,154 |
| counting overlap) (1000 tCO2e/y)                                      |      |      |      |      |      |      |         |
| Carbon sink potential - High - Avoid                                  |      |      |      |      |      |      | -1,334  |
| deforestation (1000 tCO2e/y)  |      |      |      |      |      |      |         |
| Carbon sink potential - High - Extend                                 |      |      |      |      |      |      | -9,227  |
| rotation length (1000 tC02e/y)  |      |      |      |      |      |      |         |
| Carbon sink potential - High - Improve                                |      |      |      |      |      |      | -3,044  |
| plantations (1000 tCO2e/y)  |      |      |      |      |      |      |         |
| Carbon sink potential - High - Increase                               |      |      |      |      |      |      | -13,825 |
| retention of HWP (1000 tCO2e/y)                                       |      |      |      |      |      |      |         |
| Carbon sink potential - High - Increase                               |      |      |      |      |      |      | -1,120  |
| trees outside forests (1000 tCO2e/y)                                  |      |      |      |      |      |      |         |
| Carbon sink potential - High - Reforest                               |      |      |      |      |      |      | -1,077  |
| cropland (1000 tCO2e/y)   |      |      |      |      |      |      |         |
| Carbon sink potential - High - Reforest                               |      |      |      |      |      |      | -11,526 |
| pasture (1000 tCO2e/y)  |      |      |      |      |      |      |         |
| Carbon sink potential - High - Restore                                |      |      |      |      |      |      | -4,644  |
| productivity (1000 tC02e/y)   |      |      |      |      |      |      |         |
| Carbon sink potential - Low - Accelerate                              |      |      |      |      |      |      | -178    |
| regeneration (1000 tC02e/y)   |      |      |      |      |      |      |         |
| Carbon sink potential - Low - All (not                                |      |      |      |      |      |      | -13,471 |
| counting overlap) (1000 tCO2e/y)                                      |      |      |      |      |      |      |         |
| Carbon sink potential - Low - Avoid                                   |      |      |      |      |      |      | -222    |
| deforestation (1000 tCO2e/y)  |      |      |      |      |      |      |         |
| Carbon sink potential - Low - Extend                                  |      |      |      |      |      |      | -3,544  |
| rotation length (1000 tC02e/y)  |      |      |      |      |      |      | 15/0    |
| Carbon sink potential - Low - Improve                                 |      |      |      |      |      |      | -1,549  |
| plantations (1000 tCO2e/y)  |      |      |      |      |      |      |         |
| Carbon sink potential - Low - Increase                                |      |      |      |      |      |      | -4,608  |
| retention of HWP (1000 tC02e/y)                                       |      |      |      |      |      |      |         |
| Carbon sink potential - Low - Increase                                |      |      |      |      |      |      | -392    |
| trees outside forests (1000 tC02e/y)                                  |      |      |      |      |      |      |         |
| Carbon sink potential - Low - Reforest                                |      |      |      |      |      |      | -538    |
| cropland (1000 tC02e/y)   |      |      |      |      |      |      | 070     |
| Carbon sink potential - Low - Reforest                                |      |      |      |      |      |      | -873    |
| pasture (1000 tC02e/y)  |      |      |      |      |      |      | 15/5    |
| Carbon sink potential - Low - Restore                                 |      |      |      |      |      |      | -1,565  |
| productivity (1000 tC02e/y)   |      |      |      |      |      |      | 0/7     |
| Carbon sink potential - Mid - Accelerate                              |      |      |      |      |      |      | -267    |
| regeneration (1000 tC02e/y)   |      |      |      |      |      |      | 00707   |
| Carbon sink potential - Mid - All (not                                |      |      |      |      |      |      | -29,786 |
| counting overlap) (1000 tC02e/y)  Carbon sink potential - Mid - Avoid |      |      |      |      |      |      | -778    |
|   |      |      |      |      |      |      | -110    |
| deforestation (1000 tC02e/y) Carbon sink potential - Mid - Extend     |      |      |      |      |      |      | ( 20 (  |
|   |      |      |      |      |      |      | -6,386  |
| rotation length (1000 tC02e/y)  Carbon sink potential - Mid - Improve |      |      |      |      |      |      | -2,270  |
| plantations (1000 tCO2e/y)  |      |      |      |      |      |      | -2,210  |
| Carbon sink potential - Mid - Increase                                |      |      |      |      |      |      | -9,217  |
| retention of HWP (1000 tCO2e/y)                                       |      |      |      |      |      |      | -9,217  |
| Carbon sink potential - Mid - Increase                                |      |      |      |      |      |      | -756    |
| trees outside forests (1000 tCO2e/y)                                  |      |      |      |      |      |      | -120    |
| Carbon sink potential - Mid - Reforest                                |      |      |      |      |      |      | -807    |
| ·   |      |      |      |      |      |      | -807    |
| cropland (1000 tCO2e/y)  Carbon sink potential - Mid - Reforest       |      |      |      |      |      | +    | -6,200  |
| pasture (1000 tCO2e/y)  |      |      |      |      |      |      | -0,200  |
| Carbon sink potential - Mid - Restore                                 |      |      |      |      |      |      | -3,105  |
| productivity (1000 tC02e/y)   |      |      |      |      |      |      | -3,103  |
| pi oddotivity (1000 to028/9)  |      |      |      |      |      |      |         |

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

| Table 57: E-B+ scenario - PILLAR 6: Land s |      | •    |      |      |      |      |       |
|--|------|------|------|------|------|------|-------|
| Item                                       | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 58.3  |
| High - Accelerate regeneration (1000       |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 181   |
| High - Avoid deforestation (over 30 years) |      |      |      |      |      |      |       |
| (1000 hectares)                            |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 4,705 |
| High - Extend rotation length (1000        |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 1,121 |
| 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 -  |      |      |      |      |      |      | 106   |
| High - Increase trees outside forests      |      |      |      |      |      |      |       |
| (1000 hectares)                            |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 71.2  |
| High - Reforest cropland (1000 hectares)   |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 327   |
| High - Reforest pasture (1000 hectares)    |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 1,539 |
| High - Restore productivity (1000          |      |      |      |      |      |      | .,    |
| hectares)                                  |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 8,110 |
| High - Total impacted (over 30 years)      |      |      |      |      |      |      | -,    |
| (1000 hectares)                            |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      | +    | 29.1  |
| Low - Accelerate regeneration (1000        |      |      |      |      |      |      | 27.1  |
| hectares)                                  |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 170   |
| Low - Avoid deforestation (over 30 years)  |      |      |      |      |      |      | 110   |
| (1000 hectares)                            |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 1,803 |
| Low - Extend rotation length (1000         |      |      |      |      |      |      | 1,003 |
| hectares)                                  |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 561   |
|  |      |      |      |      |      |      | 301   |
| 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 -  |      |      |      |      |      |      | 56    |
| Low - Increase trees outside forests       |      |      |      |      |      |      |       |
| (1000 hectares)                            |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 35.6  |
| Low - Reforest cropland (1000 hectares)    |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 56.8  |
| Low - Reforest pasture (1000 hectares)     |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 931   |
| Low - Restore productivity (1000           |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 3,642 |
| Low - Total impacted (over 30 years)       |      |      |      |      |      |      |       |
| (1000 hectares)                            |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 43.7  |
| Mid - Accelerate regeneration (1000        |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |

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

| Item                                       | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|--|------|------|------|------|------|------|-------|
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 175   |
| Mid - Avoid deforestation (over 30 years)  |      |      |      |      |      |      |       |
| (1000 hectares)                            |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 3,254 |
| Mid - Extend rotation length (1000         |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 844   |
| 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 -  |      |      |      |      |      |      | 81.2  |
| Mid - Increase trees outside forests (1000 |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 53.4  |
| Mid - Reforest cropland (1000 hectares)    |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 410   |
| Mid - Reforest pasture (1000 hectares)     |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 1,876 |
| Mid - Restore productivity (1000           |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |
| Land impacted for carbon sink potential -  |      |      |      |      |      |      | 6,737 |
| Mid - Total impacted (over 30 years) (1000 |      |      |      |      |      |      |       |
| hectares)                                  |      |      |      |      |      |      |       |

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

| Item                                  | 2020 | 2025 | 2030  | 2035  | 2040  | 2045  | 2050  |
|---------------------------------------|------|------|-------|-------|-------|-------|-------|
| Monetary damages from air pollution - |      | 319  | 0.217 | 0.206 | 0.16  | 0.104 | 0.004 |
| Coal (million 2019\$)                 |      |      |       |       |       |       |       |
| Monetary damages from air pollution - |      | 110  | 52.6  | 30.1  | 21.1  | 8.66  | 4.65  |
| Natural Gas (million 2019\$)          |      |      |       |       |       |       |       |
| Monetary damages from air pollution - |      | 410  | 410   | 397   | 357   | 283   | 194   |
| Transportation (million 2019\$)       |      |      |       |       |       |       |       |
| Premature deaths from air pollution - |      | 36   | 0.024 | 0.023 | 0.018 | 0.012 | 0     |
| Coal (deaths)                         |      |      |       |       |       |       |       |
| Premature deaths from air pollution - |      | 12.4 | 5.93  | 3.4   | 2.39  | 0.977 | 0.525 |
| Natural Gas (deaths)                  |      |      |       |       |       |       |       |
| Premature deaths from air pollution - |      | 46.1 | 46.1  | 44.7  | 40.1  | 31.8  | 21.8  |
| Transportation (deaths)               |      |      |       |       |       |       |       |

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

| Item                                       | 2020 | 2025   | 2030   | 2035 | 2040 | 2045  | 2050  |
|--|------|--------|--------|------|------|-------|-------|
| Commercial HVAC investment in 2020s -      |      | 10,305 | 10,816 |      |      |       |       |
| Cumulative 5-yr (million \$2018)           |      |        |        |      |      |       |       |
| Sales of cooking units - Electric          | 30.1 | 32.3   | 32.3   | 32.3 | 32.3 | 32.3  | 32.3  |
| Resistance (%)                             |      |        |        |      |      |       |       |
| Sales of cooking units - Gas (%)           | 69.9 | 67.7   | 67.7   | 67.7 | 67.7 | 67.7  | 67.7  |
| Sales of space heating units - Electric    | 2.92 | 28.4   | 67     | 78.3 | 79.4 | 79.5  | 79.5  |
| Heat Pump (%)                              |      |        |        |      |      |       |       |
| Sales of space heating units - Electric    | 2.74 | 6.12   | 11.6   | 15.8 | 18.7 | 19.1  | 19.2  |
| Resistance (%)                             |      |        |        |      |      |       |       |
| Sales of space heating units - Fossil (%)  | 0    | 0      | 0      | 0    | 0    | 0     | 0     |
| Sales of space heating units - Gas Furnace | 94.3 | 65.5   | 21.4   | 5.92 | 1.92 | 1.38  | 1.33  |
| (%)  |      |        |        |      |      |       |       |
| Sales of water heating units - Electric    | 0.08 | 0.13   | 0.128  | 0.13 | 0.13 | 0.128 | 0.128 |
| Heat Pump (%)                              |      |        |        |      |      |       |       |
| Sales of water heating units - Electric    | 2.31 | 3.68   | 3.66   | 3.67 | 3.69 | 3.68  | 3.7   |
| Resistance (%)                             |      |        |        |      |      |       |       |

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

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--|------|------|------|------|------|------|------|
| Sales of water heating units - Gas Furnace (%) | 96.5 | 94.4 | 94.4 | 94.4 | 94.4 | 94.4 | 94.4 |
| Sales of water heating units - Other (%)       | 1.07 | 1.78 | 1.78 | 1.78 | 1.79 | 1.79 | 1.8  |

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

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|------|------|------|------|------|------|------|
| Electricity distribution capital invested - |      | 2.28 | 2.33 | 3.46 | 3.64 | 3.57 | 3.72 |
| Cumulative 5-yr (billion \$2018)            |      |      |      |      |      |      |      |

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

| Item                                   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--|------|------|------|------|------|------|------|
| Final energy use - Commercial (PJ)     | 90   | 91.9 | 92.9 | 93.6 | 95.4 | 100  | 108  |
| Final energy use - Industry (PJ)       | 236  | 248  | 257  | 261  | 270  | 278  | 287  |
| Final energy use - Residential (PJ)    | 123  | 117  | 115  | 115  | 116  | 119  | 121  |
| Final energy use - Transportation (PJ) | 324  | 305  | 279  | 263  | 263  | 271  | 282  |

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

| Item                                       | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--|------|------|------|------|------|------|------|
| Residential HVAC investment in 2020s vs.   |      | 2.25 | 2.32 |      |      |      |      |
| REF - Cumulative 5-yr (billion \$2018)     |      |      |      |      |      |      |      |
| Sales of cooking units - Electric          | 52.1 | 52.1 | 52.1 | 52.1 | 52.1 | 52.1 | 52.1 |
| Resistance (%)                             |      |      |      |      |      |      |      |
| Sales of cooking units - Gas (%)           | 47.9 | 47.9 | 47.9 | 47.9 | 47.9 | 47.9 | 47.9 |
| Sales of space heating units - Electric    | 8.95 | 36.6 | 37.8 | 39.7 | 41.3 | 43.3 | 46.3 |
| Heat Pump (%)                              |      |      |      |      |      |      |      |
| Sales of space heating units - Electric    | 36.2 | 30.2 | 29.6 | 28.9 | 27.9 | 26.1 | 23   |
| Resistance (%)                             |      |      |      |      |      |      |      |
| Sales of space heating units - Fossil (%)  | 8.35 | 8.61 | 8.72 | 8.67 | 8.53 | 8.52 | 8.55 |
| Sales of space heating units - Gas (%)     | 46.5 | 24.5 | 23.8 | 22.8 | 22.3 | 22.1 | 22.2 |
| Sales of water heating units - Electric    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| Heat Pump (%)                              |      |      |      |      |      |      |      |
| Sales of water heating units - Electric    | 44.5 | 56.5 | 56.6 | 56.6 | 56.5 | 56.5 | 56.5 |
| Resistance (%)                             |      |      |      |      |      |      |      |
| Sales of water heating units - Gas Furnace | 53.7 | 42   | 41.9 | 41.8 | 42   | 42   | 42   |
| (%)  |      |      |      |      |      |      |      |
| Sales of water heating units - Other (%)   | 1.86 | 1.52 | 1.52 | 1.52 | 1.53 | 1.53 | 1.53 |

#### 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 (%)    | 1.82  | 2.19  | 2.23  | 2.07  | 1.88  | 1.75  | 1.67  |
| Vehicle sales - Light-duty - EV (%)        | 2.7   | 4.49  | 5.15  | 6.27  | 7.7   | 9.08  | 10.2  |
| Vehicle sales - Light-duty - gasoline (%)  | 91.7  | 88.3  | 86.6  | 85.1  | 83.3  | 81.3  | 79.6  |
| Vehicle sales - Light-duty - hybrid (%)    | 3.59  | 4.48  | 5.51  | 6.09  | 6.72  | 7.41  | 8.05  |
| Vehicle sales - Light-duty - hydrogen FC   | 0.112 | 0.386 | 0.361 | 0.325 | 0.325 | 0.327 | 0.339 |
| (%)  |       |       |       |       |       |       |       |
| Vehicle sales - Light-duty - other (%)     | 0.114 | 0.118 | 0.115 | 0.116 | 0.116 | 0.115 | 0.118 |
| Vehicle sales - Medium-duty - diesel (%)   | 65.2  | 63.5  | 61.6  | 59.6  | 58    | 56.5  | 55.2  |
| Vehicle sales - Medium-duty - EV (%)       | 0.027 | 0.105 | 0.329 | 0.671 | 0.895 | 0.973 | 0.993 |
| Vehicle sales - Medium-duty - gasoline (%) | 34    | 35.5  | 37    | 38.5  | 39.7  | 40.8  | 41.7  |

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

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

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

| Item Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045              | 2050    |
|--|------|------|------|------|------|-------------------|---------|
| Carbon sink potential - High - Accelerate                            | 2020 | 2025 | 2030 | 2035 | 2040 | 2045              | -356    |
| regeneration (1000 tCO2e/y)  |      |      |      |      |      |                   | -330    |
| Carbon sink potential - High - All (not                              |      |      |      |      |      |                   | -46,154 |
| counting overlap) (1000 tC02e/y)                                     |      |      |      |      |      |                   | -40,134 |
| Carbon sink potential - High - Avoid                                 |      |      |      |      |      |                   | -1,334  |
| deforestation (1000 tCO2e/y)   |      |      |      |      |      |                   | -1,334  |
| Carbon sink potential - High - Extend                                |      |      |      |      |      |                   | -9,227  |
| rotation length (1000 tCO2e/y)                                       |      |      |      |      |      |                   | -9,221  |
| Carbon sink potential - High - Improve                               |      |      |      |      |      |                   | -3,044  |
| plantations (1000 tCO2e/y)   |      |      |      |      |      |                   | -3,044  |
| Carbon sink potential - High - Increase                              |      |      |      |      |      |                   | -13,825 |
| retention of HWP (1000 tCO2e/y)                                      |      |      |      |      |      |                   | -13,623 |
| Carbon sink potential - High - Increase                              |      |      |      |      |      |                   | -1,120  |
| trees outside forests (1000 tC02e/y)                                 |      |      |      |      |      |                   | -1,120  |
|  |      |      |      |      |      | <del></del>       | -1,077  |
| Carbon sink potential - High - Reforest                              |      |      |      |      |      |                   | -1,077  |
| cropland (1000 tC02e/y)  |      |      |      |      |      |                   | 11 50/  |
| Carbon sink potential - High - Reforest                              |      |      |      |      |      |                   | -11,526 |
| pasture (1000 tC02e/y)   |      |      |      |      |      | $\longrightarrow$ | 1 / 1 1 |
| Carbon sink potential - High - Restore                               |      |      |      |      |      |                   | -4,644  |
| productivity (1000 tC02e/y)  |      |      |      |      |      |                   | 170     |
| Carbon sink potential - Low - Accelerate                             |      |      |      |      |      |                   | -178    |
| regeneration (1000 tC02e/y)  |      |      |      |      |      |                   | 10 / 71 |
| Carbon sink potential - Low - All (not                               |      |      |      |      |      |                   | -13,471 |
| counting overlap) (1000 tC02e/y)                                     |      |      |      |      |      |                   | 000     |
| Carbon sink potential - Low - Avoid                                  |      |      |      |      |      |                   | -222    |
| deforestation (1000 tC02e/y)   |      |      |      |      |      |                   | 0.577   |
| Carbon sink potential - Low - Extend                                 |      |      |      |      |      |                   | -3,544  |
| rotation length (1000 tC02e/y)                                       |      |      |      |      |      |                   | 1510    |
| Carbon sink potential - Low - Improve                                |      |      |      |      |      |                   | -1,549  |
| plantations (1000 tC02e/y)   |      |      |      |      |      |                   | / / 0.0 |
| Carbon sink potential - Low - Increase                               |      |      |      |      |      |                   | -4,608  |
| retention of HWP (1000 tC02e/y)                                      |      |      |      |      |      | $\longrightarrow$ | 000     |
| Carbon sink potential - Low - Increase                               |      |      |      |      |      |                   | -392    |
| trees outside forests (1000 tC02e/y)                                 |      |      |      |      |      | $\longrightarrow$ | -538    |
| Carbon sink potential - Low - Reforest                               |      |      |      |      |      |                   | -538    |
| cropland (1000 tC02e/y)  |      |      |      |      |      | $\longrightarrow$ | 070     |
| Carbon sink potential - Low - Reforest                               |      |      |      |      |      |                   | -873    |
| pasture (1000 tC02e/y)   |      |      |      |      |      | $\longrightarrow$ | 1 5 / 5 |
| Carbon sink potential - Low - Restore                                |      |      |      |      |      |                   | -1,565  |
| productivity (1000 tC02e/y)  |      |      |      |      |      |                   | -267    |
| Carbon sink potential - Mid - Accelerate regeneration (1000 tC02e/y) |      |      |      |      |      |                   | -267    |
| Carbon sink potential - Mid - All (not                               |      |      |      |      |      |                   | -29,786 |
| counting overlap) (1000 tC02e/y)                                     |      |      |      |      |      |                   | -29,100 |
|  |      |      |      |      |      |                   | 770     |
| Carbon sink potential - Mid - Avoid                                  |      |      |      |      |      |                   | -778    |
| deforestation (1000 tC02e/y)  Carbon sink potential - Mid - Extend   |      |      |      |      |      |                   | / 20/   |
| · ·  |      |      |      |      |      |                   | -6,386  |
| rotation length (1000 tC02e/y)                                       |      |      |      |      |      |                   | 0.070   |
| Carbon sink potential - Mid - Improve                                |      |      |      |      |      |                   | -2,270  |
| plantations (1000 tC02e/y)   |      |      |      |      |      |                   | 0.017   |
| Carbon sink potential - Mid - Increase                               |      |      |      |      |      |                   | -9,217  |
| retention of HWP (1000 tCO2e/y)                                      |      |      |      |      |      |                   |         |

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

| Item  Copper sink notantial, Mid. Increase                             | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050   |
|--|------|------|------|------|------|------|--------|
| Carbon sink potential - Mid - Increase                                 |      |      |      |      |      |      | -756   |
| trees outside forests (1000 tC02e/y)                                   |      |      |      |      |      |      | 007    |
| Carbon sink potential - Mid - Reforest                                 |      |      |      |      |      |      | -807   |
| cropland (1000 tCO2e/y)  |      |      |      |      |      |      | / 000  |
| Carbon sink potential - Mid - Reforest                                 |      |      |      |      |      |      | -6,200 |
| pasture (1000 tCO2e/y)   |      |      |      |      |      |      | 0.105  |
| Carbon sink potential - Mid - Restore                                  |      |      |      |      |      |      | -3,105 |
| productivity (1000 tCO2e/y)  Land impacted for carbon sink potential - |      |      |      |      |      |      | 58.3   |
| High - Accelerate regeneration (1000                                   |      |      |      |      |      |      | 58.3   |
| ,  |      |      |      |      |      |      |        |
| hectares)  |      |      |      |      |      |      | 101    |
| Land impacted for carbon sink potential -                              |      |      |      |      |      |      | 181    |
| High - Avoid deforestation (over 30 years)                             |      |      |      |      |      |      |        |
| (1000 hectares)  |      |      |      |      |      |      | / 705  |
| Land impacted for carbon sink potential -                              |      |      |      |      |      |      | 4,705  |
| High - Extend rotation length (1000                                    |      |      |      |      |      |      |        |
| hectares)  |      |      |      |      |      |      | 1.101  |
| Land impacted for carbon sink potential -                              |      |      |      |      |      |      | 1,121  |
| 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 -                              |      |      |      |      |      |      | 106    |
| High - Increase trees outside forests                                  |      |      |      |      |      |      |        |
| (1000 hectares)  |      |      |      |      |      |      |        |
| Land impacted for carbon sink potential -                              |      |      |      |      |      |      | 71.2   |
| High - Reforest cropland (1000 hectares)                               |      |      |      |      |      |      |        |
| Land impacted for carbon sink potential -                              |      |      |      |      |      |      | 327    |
| High - Reforest pasture (1000 hectares)                                |      |      |      |      |      |      |        |
| Land impacted for carbon sink potential -                              |      |      |      |      |      |      | 1,539  |
| High - Restore productivity (1000                                      |      |      |      |      |      |      |        |
| hectares)  |      |      |      |      |      |      |        |
| Land impacted for carbon sink potential -                              |      |      |      |      |      |      | 8,110  |
| High - Total impacted (over 30 years)                                  |      |      |      |      |      |      |        |
| (1000 hectares)  |      |      |      |      |      |      |        |
| Land impacted for carbon sink potential -                              |      |      |      |      |      |      | 29.1   |
| Low - Accelerate regeneration (1000                                    |      |      |      |      |      |      |        |
| hectares)  |      |      |      |      |      |      |        |
| Land impacted for carbon sink potential -                              |      |      |      |      |      |      | 170    |
| Low - Avoid deforestation (over 30 years)                              |      |      |      |      |      |      |        |
| (1000 hectares)  |      |      |      |      |      |      |        |
| Land impacted for carbon sink potential -                              |      |      |      |      |      |      | 1,803  |
| Low - Extend rotation length (1000                                     |      |      |      |      |      |      | •      |
| hectares)  |      |      |      |      |      |      |        |
| Land impacted for carbon sink potential -                              |      |      |      |      |      |      | 561    |
| 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 -                              |      |      |      |      |      |      | 56     |
| Low - Increase trees outside forests                                   |      |      |      |      |      |      | 00     |
| (1000 hectares)  |      |      |      |      |      |      |        |
| Land impacted for carbon sink potential -                              |      |      |      |      |      |      | 35.6   |
| Low - Reforest cropland (1000 hectares)                                |      |      |      |      |      |      | 33.0   |
| Land impacted for carbon sink potential -                              |      |      |      |      |      |      | 56.8   |
| Low - Reforest pasture (1000 hectares)                                 |      |      |      |      |      |      | JU.0   |
| Land impacted for carbon sink potential -                              |      |      |      |      |      |      | 931    |
| Low - Restore productivity (1000                                       |      |      |      |      |      |      | 731    |
| LOVY - NOSCOLO DI DUUGLIVILY (1000                                     | 1    | I    | [    |      |      | 1    |        |

Table 64: REF 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)      |      |      |      |      |      |      | 3,642 |
| Land impacted for carbon sink potential -<br>Mid - Accelerate regeneration (1000<br>hectares)             |      |      |      |      |      |      | 43.7  |
| Land impacted for carbon sink potential -<br>Mid - Avoid deforestation (over 30 years)<br>(1000 hectares) |      |      |      |      |      |      | 175   |
| Land impacted for carbon sink potential -<br>Mid - Extend rotation length (1000<br>hectares)              |      |      |      |      |      |      | 3,254 |
| Land impacted for carbon sink potential -<br>Mid - Improve plantations (1000 hectares)                    |      |      |      |      |      |      | 844   |
| 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)      |      |      |      |      |      |      | 81.2  |
| Land impacted for carbon sink potential -<br>Mid - Reforest cropland (1000 hectares)                      |      |      |      |      |      |      | 53.4  |
| Land impacted for carbon sink potential -<br>Mid - Reforest pasture (1000 hectares)                       |      |      |      |      |      |      | 410   |
| Land impacted for carbon sink potential -<br>Mid - Restore productivity (1000<br>hectares)                |      |      |      |      |      |      | 1,876 |
| Land impacted for carbon sink potential -<br>Mid - Total impacted (over 30 years) (1000<br>hectares)      |      |      |      |      |      |      | 6,737 |

#### 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)                | -22.2 |      | -14.6 |      |      |      | -11.9 |
| Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y) | -3.76 |      | -6.27 |      |      |      | -6.6  |
| Business-as-usual carbon sink - Total (Mt<br>CO2e/y)                      | -26   |      | -20.9 |      |      |      | -18.5 |

#### Table 66: REF scenario - IMPACTS - Health

| Item                                  | 2020 | 2025  | 2030 | 2035 | 2040 | 2045 | 2050 |
|---------------------------------------|------|-------|------|------|------|------|------|
| Monetary damages from air pollution - |      | 1,291 | 810  | 532  | 419  | 377  | 374  |
| Coal (million 2019\$)                 |      |       |      |      |      |      |      |
| Monetary damages from air pollution - |      | 122   | 119  | 126  | 95.4 | 75.3 | 67.7 |
| Natural Gas (million 2019\$)          |      |       |      |      |      |      |      |
| Monetary damages from air pollution - |      | 410   | 416  | 424  | 433  | 443  | 453  |
| Transportation (million 2019\$)       |      |       |      |      |      |      |      |
| Premature deaths from air pollution - |      | 146   | 91.5 | 60.1 | 47.3 | 42.6 | 42.2 |
| Coal (deaths)                         |      |       |      |      |      |      |      |
| Premature deaths from air pollution - |      | 13.8  | 13.5 | 14.2 | 10.8 | 8.5  | 7.64 |
| Natural Gas (deaths)                  |      |       |      |      |      |      |      |
| Premature deaths from air pollution - |      | 46.2  | 46.8 | 47.7 | 48.7 | 49.8 | 51   |
| Transportation (deaths)               |      |       |      |      |      |      |      |