



## **Net-Zero America - Colorado data**

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See the [Data Sheet Guide](#) for explanations of the contents of this document. The data herein underlie graphs and tables found in Princeton's Net-Zero America report:

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Table 1: *E+ scenario - IMPACTS - Health*

| Item   | 2020 | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|--|------|-------|-------|-------|-------|-------|-------|
| Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)                |      | 24.8  | 0.03  | 0.03  | 0.022 | 0.014 | 0     |
| Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)         |      | 31.4  | 25.4  | 21.3  | 20.8  | 12.6  | 2.99  |
| Premature deaths from air pollution - Mobile - On-Road (deaths)                                      |      | 103   | 101   | 80.7  | 48.7  | 22.8  | 8.74  |
| Premature deaths from air pollution - Gas Stations (deaths)  |      | 10.8  | 10.5  | 8.3   | 5.07  | 2.45  | 1.05  |
| Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)                 |      | 23.1  | 22.4  | 17.7  | 11    | 5.68  | 2.33  |
| Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)                         |      | 0.086 | 0.076 | 0.059 | 0.04  | 0.025 | 0.015 |
| Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)                       |      | 2.34  | 2.41  | 2.09  | 1.5   | 0.868 | 0.412 |
| Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)                 |      | 0.278 | 0.277 | 0.274 | 0.269 | 0.262 | 0.252 |
| Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)          |      | 8.91  | 8.55  | 6.99  | 4.7   | 2.67  | 1.29  |
| Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)                  |      | 1.47  | 1.25  | 1.03  | 0.817 | 0.607 | 0.406 |
| Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)                |      | 1.84  | 1.65  | 1.42  | 1.17  | 0.898 | 0.618 |
| Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)                    |      | 1.56  | 0.198 | 0.187 | 0.169 | 0.158 | 0.156 |
| Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)           |      | 164   | 157   | 142   | 115   | 84.3  | 52    |
| Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)        |      | 220   | 0.264 | 0.262 | 0.199 | 0.123 | 0.001 |
| Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019) |      | 278   | 225   | 189   | 184   | 111   | 26.5  |
| Monetary damages from air pollution - Mobile - On-Road (million \$2019)                              |      | 914   | 899   | 717   | 433   | 203   | 77.7  |
| Monetary damages from air pollution - Gas Stations (million \$2019)                                  |      | 95.6  | 92.9  | 73.5  | 44.9  | 21.7  | 9.26  |
| Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)         |      | 205   | 199   | 157   | 97.5  | 50.3  | 20.6  |
| Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)                 |      | 0.758 | 0.672 | 0.519 | 0.355 | 0.223 | 0.135 |
| Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)               |      | 20.8  | 21.3  | 18.5  | 13.3  | 7.69  | 3.65  |
| Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)         |      | 2.46  | 2.45  | 2.42  | 2.38  | 2.32  | 2.23  |
| Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)  |      | 78.9  | 75.7  | 61.8  | 41.6  | 23.7  | 11.4  |

Table 1: *E+ scenario - IMPACTS - Health (continued)*

| Item   | 2020 | 2025  | 2030  | 2035  | 2040  | 2045 | 2050 |
|--|------|-------|-------|-------|-------|------|------|
| Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)        |      | 13    | 11    | 9.15  | 7.24  | 5.38 | 3.6  |
| Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)      |      | 16.3  | 14.6  | 12.6  | 10.3  | 7.95 | 5.47 |
| Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)          |      | 13.8  | 1.74  | 1.65  | 1.49  | 1.4  | 1.37 |
| Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019) |      | 1,456 | 1,392 | 1,263 | 1,020 | 748  | 462  |

Table 2: *E+ scenario - IMPACTS - Jobs*

| Item  | 2020 | 2025   | 2030   | 2035   | 2040   | 2045   | 2050   |
|---|------|--------|--------|--------|--------|--------|--------|
| By economic sector - Agriculture (jobs)                                     |      | 227    | 238    | 217    | 158    | 255    | 317    |
| By economic sector - Construction (jobs)                                    |      | 12,783 | 15,394 | 19,794 | 23,573 | 26,720 | 30,453 |
| By economic sector - Manufacturing (jobs)                                   |      | 12,053 | 15,027 | 16,510 | 14,853 | 13,060 | 13,106 |
| By economic sector - Mining (jobs)  |      | 14,440 | 11,148 | 8,609  | 5,627  | 3,632  | 2,001  |
| By economic sector - Other (jobs)   |      | 1,024  | 1,328  | 2,112  | 2,858  | 3,589  | 4,855  |
| By economic sector - Pipeline (jobs)  |      | 1,289  | 1,273  | 1,048  | 827    | 631    | 478    |
| By economic sector - Professional (jobs)                                    |      | 7,846  | 9,421  | 12,268 | 15,025 | 17,776 | 21,254 |
| By economic sector - Trade (jobs)   |      | 7,811  | 7,953  | 9,095  | 9,937  | 11,080 | 12,974 |
| By economic sector - Utilities (jobs)                                       |      | 8,322  | 10,350 | 13,634 | 17,804 | 21,227 | 23,467 |
| By resource sector - Biomass (jobs)   |      | 553    | 552    | 488    | 399    | 940    | 1,388  |
| By resource sector - CO2 (jobs)   |      | 18.7   | 861    | 190    | 326    | 524    | 982    |
| By resource sector - Coal (jobs)  |      | 1,735  | 395    | 82.3   | 68.3   | 59.3   | 51.9   |
| By resource sector - Grid (jobs)  |      | 9,068  | 13,062 | 21,222 | 29,120 | 36,814 | 41,533 |
| By resource sector - Natural Gas (jobs)                                     |      | 14,315 | 12,133 | 9,627  | 8,311  | 5,968  | 4,078  |
| By resource sector - Nuclear (jobs)   |      | 0      | 0.003  | 0.007  | 0.008  | 0.018  | 0.03   |
| By resource sector - Oil (jobs)   |      | 25,199 | 22,582 | 20,059 | 14,539 | 10,815 | 6,718  |
| By resource sector - Solar (jobs)   |      | 6,872  | 7,260  | 11,310 | 13,097 | 14,762 | 20,443 |
| By resource sector - Wind (jobs)  |      | 8,035  | 15,287 | 20,310 | 24,802 | 28,086 | 33,709 |
| By education level - All sectors - High school diploma or less (jobs)       |      | 26,905 | 29,646 | 34,359 | 37,256 | 40,104 | 44,361 |
| By education level - All sectors - Associates degree or some college (jobs) |      | 19,463 | 21,799 | 25,625 | 28,473 | 31,087 | 34,851 |
| By education level - All sectors - Bachelors degree (jobs)                  |      | 15,269 | 16,247 | 18,229 | 19,381 | 20,698 | 22,851 |
| By education level - All sectors - Masters or professional degree (jobs)    |      | 3,631  | 3,873  | 4,416  | 4,816  | 5,259  | 5,902  |
| By education level - All sectors - Doctoral degree (jobs)                   |      | 527    | 567    | 660    | 736    | 819    | 940    |
| Related work experience - All sectors - None (jobs)                         |      | 9,189  | 10,134 | 11,767 | 12,903 | 14,012 | 15,614 |
| Related work experience - All sectors - Up to 1 year (jobs)                 |      | 12,650 | 14,007 | 16,342 | 17,790 | 19,241 | 21,521 |
| Related work experience - All sectors - 1 to 4 years (jobs)                 |      | 24,259 | 26,398 | 30,322 | 32,901 | 35,502 | 39,355 |
| Related work experience - All sectors - 4 to 10 years (jobs)                |      | 15,423 | 16,927 | 19,541 | 21,370 | 23,136 | 25,718 |
| Related work experience - All sectors - Over 10 years (jobs)                |      | 4,275  | 4,667  | 5,317  | 5,698  | 6,077  | 6,697  |
| On-the-Job Training - All sectors - None (jobs)                             |      | 3,701  | 3,986  | 4,558  | 4,917  | 5,300  | 5,928  |
| On-the-Job Training - All sectors - Up to 1 year (jobs)                     |      | 44,361 | 48,388 | 55,505 | 59,803 | 64,254 | 71,217 |

Table 2: *E+ scenario - IMPACTS - Jobs (continued)*

| Item  | 2020 | 2025   | 2030   | 2035   | 2040   | 2045   | 2050   |
|---|------|--------|--------|--------|--------|--------|--------|
| On-the-Job Training - All sectors - 1 to 4 years (jobs)           |      | 13,265 | 14,723 | 17,197 | 19,049 | 20,753 | 23,129 |
| On-the-Job Training - All sectors - 4 to 10 years (jobs)          |      | 3,818  | 4,313  | 5,200  | 6,015  | 6,736  | 7,609  |
| On-the-Job Training - All sectors - Over 10 years (jobs)          |      | 650    | 723    | 827    | 879    | 925    | 1,021  |
| On-Site or In-Plant Training - All sectors - None (jobs)          |      | 10,643 | 11,706 | 13,531 | 14,743 | 15,952 | 17,856 |
| On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)  |      | 40,142 | 43,760 | 50,226 | 54,183 | 58,254 | 64,549 |
| On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)  |      | 10,396 | 11,508 | 13,406 | 14,771 | 16,045 | 17,847 |
| On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs) |      | 4,118  | 4,587  | 5,439  | 6,184  | 6,854  | 7,684  |
| On-Site or In-Plant Training - All sectors - Over 10 years (jobs) |      | 497    | 572    | 686    | 780    | 863    | 970    |
| Wage income - All (million \$2019)                                |      | 4,060  | 4,437  | 5,123  | 5,614  | 6,128  | 6,853  |

Table 3: *E+ scenario - IMPACTS - Fossil fuel industries*

| Item  | 2020 | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|---|------|-------|-------|-------|-------|-------|-------|
| Oil consumption - Annual (million bbls)     |      | 87.6  | 75.4  | 57.8  | 41.6  | 28.7  | 18.8  |
| Oil consumption - Cumulative (million bbls) |      |       |       |       |       |       | 1,793 |
| Oil production - Annual (million bbls)      |      | 230   | 231   | 231   | 183   | 149   | 98.9  |
| Natural gas consumption - Annual (tcf)      |      | 377   | 318   | 255   | 192   | 121   | 83.7  |
| Natural gas consumption - Cumulative (tcf)  |      |       |       |       |       |       | 7,678 |
| Natural gas production - Annual (tcf)       |      | 2,061 | 1,948 | 1,697 | 1,435 | 1,138 | 884   |

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

| Item                                   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--|------|------|------|------|------|------|------|
| Final energy use - Transportation (PJ) | 472  | 443  | 394  | 334  | 279  | 243  | 226  |
| Final energy use - Residential (PJ)    | 237  | 229  | 221  | 199  | 170  | 148  | 133  |
| Final energy use - Commercial (PJ)     | 162  | 162  | 159  | 152  | 144  | 138  | 135  |
| Final energy use - Industry (PJ)       | 171  | 180  | 187  | 200  | 221  | 233  | 246  |

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

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--|------|------|------|------|------|------|------|
| Electricity distribution capital invested - Cumulative 5-yr (billion \$2018) |      | 2.81 | 2.93 | 5.73 | 6.16 | 6.1  | 6.47 |

Table 6: *E+ scenario - PILLAR 1: Efficiency/Electrification - Transportation*

| Item  | 2020  | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|---|-------|-------|-------|-------|-------|-------|-------|
| Vehicle stocks - LDV – EV (1000 units)                                      | 111   | 542   | 974   | 2,485 | 3,997 | 5,204 | 6,412 |
| Vehicle stocks - LDV – All others (1000 units)                              | 5,347 | 5,091 | 4,835 | 3,524 | 2,212 | 1,251 | 291   |
| Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018) |       | 1,014 | 2,644 | 4,211 | 6,408 | 6,943 | 6,637 |
| Public EV charging plugs - DC Fast (1000 units)                             | 0.303 |       | 1.77  |       | 7.25  |       | 11.6  |
| Public EV charging plugs - L2 (1000 units)                                  | 2.12  |       | 42.5  |       | 174   |       | 280   |

Table 7: E+ scenario - PILLAR 1: Efficiency/Electrification - Residential

| Item  | 2020 | 2025 | 2030 | 2035  | 2040  | 2045 | 2050 |
|---|------|------|------|-------|-------|------|------|
| Sales of space heating units - Electric Heat Pump (%)                           | 5.62 | 14.5 | 37.2 | 82.6  | 92    | 92.7 | 92.7 |
| Sales of space heating units - Electric Resistance (%)                          | 7.65 | 13.8 | 11   | 4.91  | 3.67  | 3.58 | 3.63 |
| Sales of space heating units - Gas (%)  | 83.5 | 66   | 47.3 | 10.4  | 2.8   | 2.21 | 2.19 |
| Sales of space heating units - Fossil (%)                                       | 3.24 | 5.67 | 4.53 | 2.12  | 1.56  | 1.5  | 1.52 |
| Sales of water heating units - Electric Heat Pump (%)                           | 0    | 0.93 | 12.1 | 36.4  | 41.4  | 41.7 | 41.8 |
| Sales of water heating units - Electric Resistance (%)                          | 13.2 | 25.9 | 34.2 | 52.7  | 56.7  | 57   | 57   |
| Sales of water heating units - Gas Furnace (%)                                  | 85.7 | 72   | 52.4 | 9.64  | 0.728 | 0.02 | 0    |
| Sales of water heating units - Other (%)  | 1.07 | 1.23 | 1.23 | 1.23  | 1.21  | 1.21 | 1.21 |
| Sales of cooking units - Electric Resistance (%)                                | 50.5 | 61   | 93.3 | 99.7  | 100   | 100  | 100  |
| Sales of cooking units - Gas (%)  | 49.5 | 39   | 6.67 | 0.336 | 0     | 0    | 0    |
| Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018) |      | 4.42 | 4.7  |       |       |      |      |

Table 8: E+ scenario - PILLAR 1: Efficiency/Electrification - Commercial

| Item   | 2020  | 2025   | 2030   | 2035  | 2040  | 2045  | 2050  |
|--|-------|--------|--------|-------|-------|-------|-------|
| Sales of space heating units - Electric Heat Pump (%)                  | 2.64  | 8.18   | 30.6   | 79.8  | 90    | 90.8  | 90.8  |
| Sales of space heating units - Electric Resistance (%)                 | 2.48  | 3.49   | 4.92   | 8.08  | 8.66  | 8.7   | 8.7   |
| Sales of space heating units - Gas Furnace (%)                         | 94.9  | 88.1   | 64.4   | 12.2  | 1.37  | 0.522 | 0.498 |
| Sales of space heating units - Fossil (%)                              | 0     | 0.208  | 0.04   | 0.002 | 0     | 0     | 0     |
| Sales of water heating units - Electric Heat Pump (%)                  | 0.022 | 1.12   | 14.3   | 42.9  | 48.9  | 49.4  | 49.4  |
| Sales of water heating units - Electric Resistance (%)                 | 1.1   | 2.5    | 15.4   | 43.8  | 49.7  | 50.2  | 50.2  |
| Sales of water heating units - Gas Furnace (%)                         | 98.6  | 96     | 69.9   | 12.9  | 0.972 | 0.027 | 0     |
| Sales of water heating units - Other (%)                               | 0.269 | 0.383  | 0.382  | 0.383 | 0.382 | 0.383 | 0.383 |
| Sales of cooking units - Electric Resistance (%)                       | 41.9  | 54.6   | 83     | 88.6  | 88.9  | 88.9  | 88.9  |
| Sales of cooking units - Gas (%)                                       | 58.1  | 45.4   | 17     | 11.4  | 11.1  | 11.1  | 11.1  |
| Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018) |       | 14,374 | 15,990 |       |       |       |       |

Table 9: E+ scenario - PILLAR 2: Clean Electricity - Generating capacity

| Item   | 2020  | 2025  | 2030  | 2035  | 2040   | 2045   | 2050   |
|--|-------|-------|-------|-------|--------|--------|--------|
| Installed thermal - Coal (MW)  | 4,905 | 2,238 | 0     | 0     | 0      | 0      | 0      |
| Installed thermal - Natural gas (MW)                                 | 5,482 | 5,261 | 7,803 | 8,430 | 11,112 | 12,889 | 13,606 |
| Installed thermal - Nuclear (MW)                                     | 0     | 0     | 0.001 | 0.004 | 0.007  | 0.013  | 0.024  |
| Installed renewables - Rooftop PV (MW)                               | 895   | 1,362 | 1,825 | 2,410 | 3,134  | 4,018  | 5,120  |
| Installed renewables - Solar - Base land use assumptions (MW)        | 454   | 954   | 1,492 | 3,798 | 6,651  | 10,148 | 12,829 |
| Installed renewables - Wind - Base land use assumptions (MW)         | 4,381 | 4,886 | 6,317 | 6,818 | 8,895  | 11,556 | 12,854 |
| Installed renewables - Solar - Constrained land use assumptions (MW) | 437   | 437   | 1,484 | 4,289 | 8,277  | 9,660  | 12,254 |
| Installed renewables - Wind - Constrained land use assumptions (MW)  | 4,732 | 4,905 | 5,667 | 7,069 | 12,061 | 17,295 | 20,797 |
| Capital invested - Solar PV - Base (billion \$2018)                  |       | 0.669 | 0.644 | 2.54  | 2.97   | 3.43   | 2.48   |

Table 9: E+ scenario - PILLAR 2: Clean Electricity - Generating capacity (continued)

| Item  | 2020 | 2025  | 2030 | 2035  | 2040 | 2045  | 2050  |
|---|------|-------|------|-------|------|-------|-------|
| Capital invested - Wind - Base (billion \$2018)                     |      | 0.226 | 1.91 | 0.621 | 2.45 | 2.98  | 1.38  |
| Capital invested - Solar PV - Constrained (billion \$2018)          |      | 1.95  | 1.04 | 2.19  | 2.61 | 2.02  | 0.721 |
| Capital invested - Wind - Constrained (billion \$2018)              |      | 1.32  | 2.22 | 2.91  | 6.72 | 6.61  | 3.73  |
| Capital invested - Biomass power plant (billion \$2018)             | 0    | 0     | 0    | 0     | 0    | 0     | 0     |
| Capital invested - Biomass w/ccu allam power plant (billion \$2018) | 0    | 0     | 0    | 0     | 0    | 0.01  | 0     |
| Capital invested - Biomass w/ccu power plant (billion \$2018)       | 0    | 0     | 0    | 0     | 0    | 0.041 | 0.399 |

Table 10: E+ scenario - PILLAR 2: Clean Electricity - Generation

| Item  | 2020   | 2025   | 2030   | 2035   | 2040   | 2045   | 2050   |
|---|--------|--------|--------|--------|--------|--------|--------|
| Solar - Base land use assumptions (GWh)               | 1,142  | 2,233  | 3,442  | 8,566  | 14,947 | 22,796 | 28,849 |
| Wind - Base land use assumptions (GWh)                | 16,760 | 17,332 | 22,431 | 24,110 | 31,262 | 40,168 | 44,490 |
| OffshoreWind - Base land use assumptions (GWh)        | 0      | 0      | 0      | 0      | 0      | 0      | 0      |
| Solar - Constrained land use assumptions (GWh)        | 856    | 856    | 3,149  | 9,300  | 18,183 | 21,314 | 27,135 |
| Wind - Constrained land use assumptions (GWh)         | 16,760 | 17,346 | 19,845 | 24,217 | 39,633 | 55,075 | 64,986 |
| OffshoreWind - Constrained land use assumptions (GWh) | 0      | 0      | 0      | 0      | 0      | 0      | 0      |
| Biomass power plant (GWh)                             | 0      | 0      | 0      | 0      | 0      | 0      | 0      |
| Biomass w/ccu power plant (GWh)                       | 0      | 0      | 0      | 0      | 0      | 46.2   | 494    |
| Biomass w/ccu allam power plant (GWh)                 | 0      | 0      | 0      | 0      | 0      | 9.89   | 9.89   |

Table 11: E+ scenario - PILLAR 3: Clean fuels - Bioenergy

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045  | 2050  |
|--|------|------|------|------|------|-------|-------|
| Number of facilities - Power (quantity)                          | 0    | 0    | 0    | 0    | 0    | 0     | 0     |
| Number of facilities - Power ccu (quantity)                      | 0    | 0    | 0    | 0    | 0    | 2     | 3     |
| Number of facilities - Allam power w ccu (quantity)              | 0    | 0    | 0    | 0    | 0    | 1     | 1     |
| Number of facilities - Beccs hydrogen (quantity)                 | 0    | 0    | 0    | 0    | 1    | 3     | 5     |
| Number of facilities - Diesel (quantity)                         | 0    | 0    | 0    | 0    | 0    | 0     | 0     |
| Number of facilities - Diesel ccu (quantity)                     | 0    | 0    | 0    | 0    | 0    | 1     | 1     |
| Number of facilities - Pyrolysis (quantity)                      | 0    | 0    | 0    | 0    | 0    | 0     | 0     |
| Number of facilities - Pyrolysis ccu (quantity)                  | 0    | 0    | 0    | 0    | 0    | 1     | 1     |
| Number of facilities - Sng (quantity)                            | 0    | 0    | 0    | 0    | 0    | 0     | 0     |
| Number of facilities - Sng ccu (quantity)                        | 0    | 0    | 0    | 0    | 0    | 1     | 1     |
| Conversion capital investment - Cumulative 5-yr (million \$2018) |      | 0    | 0    | 0    | 330  | 2,342 | 2,221 |
| Biomass purchases (million \$2018/y)                             |      | 0    | 0    | 0    | 23.6 | 190   | 345   |

Table 12: E+ scenario - PILLAR 4: CCUS - CO2 capture

| Item                           | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--------------------------------|------|------|------|------|------|------|------|
| Annual - All (MMT)             |      | 0    | 0.02 | 3.38 | 3.77 | 6.87 | 9.81 |
| Annual - BECCS (MMT)           |      | 0    | 0    | 0    | 0.42 | 3.41 | 6.22 |
| Annual - NGCC (MMT)            |      | 0    | 0.02 | 0.02 | 0.03 | 0.03 | 0.05 |
| Annual - Cement and lime (MMT) |      | 0    | 0    | 3.35 | 3.32 | 3.42 | 3.53 |
| Cumulative - All (MMT)         |      | 0    | 0.02 | 3.4  | 7.17 | 14   | 23.9 |
| Cumulative - BECCS (MMT)       |      | 0    | 0    | 0    | 0.42 | 3.83 | 10.1 |



Table 12: *E+ scenario - PILLAR 4: CCUS - CO2 capture (continued)*

| Item                               | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|------------------------------------|------|------|------|------|------|------|------|
| Cumulative - NGCC (MMT)            |      | 0    | 0.02 | 0.04 | 0.07 | 0.1  | 0.15 |
| Cumulative - Cement and lime (MMT) |      | 0    | 0    | 3.35 | 6.67 | 10.1 | 13.6 |

Table 13: *E+ scenario - PILLAR 4: CCUS - CO2 pipelines*

| Item   | 2020 | 2025 | 2030  | 2035  | 2040  | 2045  | 2050  |
|--|------|------|-------|-------|-------|-------|-------|
| Trunk (km)                                     |      | 0    | 255   | 255   | 255   | 255   | 255   |
| Spur (km)                                      |      | 0    | 0.5   | 301   | 605   | 843   | 1,963 |
| All (km)                                       |      | 0    | 256   | 556   | 861   | 1,099 | 2,219 |
| Cumulative investment - Trunk (million \$2018) |      | 0    | 1,225 | 1,225 | 1,225 | 1,225 | 1,225 |
| Cumulative investment - Spur (million \$2018)  |      | 0    | 0.3   | 259   | 463   | 677   | 1,424 |
| Cumulative investment - All (million \$2018)   |      | 0    | 1,225 | 1,484 | 1,687 | 1,902 | 2,649 |

Table 14: *E+ scenario - PILLAR 4: CCUS - CO2 storage*

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|------|------|------|------|------|------|------|
| Annual (MMT)  |      | 0    | 0    | 0.88 | 0.9  | 1.72 | 2.8  |
| Injection wells (wells)   |      | 0    | 0    | 2    | 3    | 5    | 6    |
| Resource characterization, appraisal, permitting costs (million \$2020) |      | 36   | 86.3 | 101  | 101  | 101  | 101  |
| Wells and facilities construction costs (million \$2020)                |      | 0    | 12   | 46.7 | 83.2 | 139  | 173  |

Table 15: *E+ scenario - PILLAR 6: Land sinks - Forests*

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050    |
|---|------|------|------|------|------|------|---------|
| Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)        |      |      |      |      |      |      | -812    |
| Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)            |      |      |      |      |      |      | -260    |
| Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)         |      |      |      |      |      |      | -3,547  |
| Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)            |      |      |      |      |      |      | -13.7   |
| Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)      |      |      |      |      |      |      | -58.1   |
| Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y) |      |      |      |      |      |      | -446    |
| Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)              |      |      |      |      |      |      | -12,451 |
| Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)               |      |      |      |      |      |      | -245    |
| Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)           |      |      |      |      |      |      | -2,063  |
| Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)     |      |      |      |      |      |      | -19,895 |
| Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)        |      |      |      |      |      |      | -1,216  |
| Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)            |      |      |      |      |      |      | -909    |
| Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)         |      |      |      |      |      |      | -6,390  |
| Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)            |      |      |      |      |      |      | -20     |
| Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)      |      |      |      |      |      |      | -116    |

Table 15: E+ scenario - PILLAR 6: Land sinks - Forests (continued)

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050    |
|---|------|------|------|------|------|------|---------|
| Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)                         |      |      |      |      |      |      | -859    |
| Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)                                      |      |      |      |      |      |      | -18,676 |
| Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)                                       |      |      |      |      |      |      | -1,742  |
| Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)                                   |      |      |      |      |      |      | -4,092  |
| Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)                             |      |      |      |      |      |      | -34,021 |
| Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)                               |      |      |      |      |      |      | -1,620  |
| Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)                                   |      |      |      |      |      |      | -1,559  |
| Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)                                |      |      |      |      |      |      | -9,233  |
| Carbon sink potential - High - Improve plantations (1000 tCO2e/y)                                   |      |      |      |      |      |      | -26.8   |
| Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)                             |      |      |      |      |      |      | -174    |
| Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)                        |      |      |      |      |      |      | -1,273  |
| Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)                                     |      |      |      |      |      |      | -24,902 |
| Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)                                      |      |      |      |      |      |      | -3,239  |
| Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)                            |      |      |      |      |      |      | -48,148 |
| Carbon sink potential - High - Restore productivity (1000 tCO2e/y)                                  |      |      |      |      |      |      | -6,121  |
| Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)             |      |      |      |      |      |      | 133     |
| Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares) |      |      |      |      |      |      | 198     |
| Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)              |      |      |      |      |      |      | 1,804   |
| Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)                 |      |      |      |      |      |      | 4.95    |
| Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)           |      |      |      |      |      |      | 0       |
| Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)      |      |      |      |      |      |      | 63.7    |
| Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)                   |      |      |      |      |      |      | 823     |
| Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)                    |      |      |      |      |      |      | 15.9    |
| Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)                |      |      |      |      |      |      | 1,228   |
| Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)      |      |      |      |      |      |      | 4,270   |
| Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)             |      |      |      |      |      |      | 199     |

Table 15: *E+ scenario - PILLAR 6: Land sinks - Forests (continued)*

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|--|------|------|------|------|------|------|-------|
| Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)  |      |      |      |      |      |      | 205   |
| Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)               |      |      |      |      |      |      | 3,256 |
| Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)                  |      |      |      |      |      |      | 7.44  |
| Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)            |      |      |      |      |      |      | 0     |
| Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)       |      |      |      |      |      |      | 92.3  |
| Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)                    |      |      |      |      |      |      | 1,235 |
| Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)                     |      |      |      |      |      |      | 115   |
| Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)                 |      |      |      |      |      |      | 2,472 |
| Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)       |      |      |      |      |      |      | 7,582 |
| Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)             |      |      |      |      |      |      | 265   |
| Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares) |      |      |      |      |      |      | 211   |
| Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)              |      |      |      |      |      |      | 4,708 |
| Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)                 |      |      |      |      |      |      | 9.89  |
| Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)           |      |      |      |      |      |      | 0     |
| Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)      |      |      |      |      |      |      | 121   |
| Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)                   |      |      |      |      |      |      | 1,646 |
| Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)                    |      |      |      |      |      |      | 92    |
| Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)                |      |      |      |      |      |      | 2,029 |
| Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)      |      |      |      |      |      |      | 9,083 |

Table 16: *E+ scenario - PILLAR 6: Land sinks - Agriculture*

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|------|------|------|------|------|------|------|
| Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y) |      |      |      |      |      |      | -173 |

Table 16: E+ scenario - PILLAR 6: Land sinks - Agriculture (continued)

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050   |
|--|------|------|------|------|------|------|--------|
| Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)                         |      |      |      |      |      |      | -1,384 |
| Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)              |      |      |      |      |      |      | -107   |
| Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)                                     |      |      |      |      |      |      | -1,664 |
| Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)          |      |      |      |      |      |      | -173   |
| Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)                       |      |      |      |      |      |      | -2,661 |
| Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)            |      |      |      |      |      |      | -214   |
| Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)                                   |      |      |      |      |      |      | -3,048 |
| Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)   |      |      |      |      |      |      | 172    |
| Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)                |      |      |      |      |      |      | 2,071  |
| Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)     |      |      |      |      |      |      | 164    |
| Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)                            |      |      |      |      |      |      | 2,407  |
| Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares) |      |      |      |      |      |      | 172    |
| Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)              |      |      |      |      |      |      | 3,977  |
| Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)   |      |      |      |      |      |      | 329    |
| Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)                          |      |      |      |      |      |      | 4,478  |

Table 17: E- scenario - IMPACTS - Health

| Item   | 2020 | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|--|------|-------|-------|-------|-------|-------|-------|
| Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)        |      | 24.8  | 0.03  | 0.03  | 0.022 | 0.014 | 0     |
| Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths) |      | 31.1  | 22.4  | 19.1  | 13.7  | 6.58  | 1.91  |
| Premature deaths from air pollution - Mobile - On-Road (deaths)                              |      | 104   | 111   | 113   | 106   | 88    | 62.5  |
| Premature deaths from air pollution - Gas Stations (deaths)                                  |      | 11    | 11.7  | 11.8  | 11.1  | 9.14  | 6.5   |
| Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)         |      | 23.2  | 23.6  | 23.5  | 22.1  | 18.7  | 13.6  |
| Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)                 |      | 0.088 | 0.087 | 0.083 | 0.076 | 0.065 | 0.054 |

Table 17: E- scenario - IMPACTS - Health (continued)

| Item   | 2020 | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|--|------|-------|-------|-------|-------|-------|-------|
| Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)                       |      | 2.36  | 2.57  | 2.76  | 2.77  | 2.41  | 1.84  |
| Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)                 |      | 0.278 | 0.277 | 0.274 | 0.269 | 0.262 | 0.252 |
| Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)          |      | 8.93  | 9.18  | 9.25  | 8.79  | 7.62  | 5.92  |
| Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)                  |      | 1.47  | 1.34  | 1.22  | 1.09  | 0.964 | 0.834 |
| Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)                |      | 1.84  | 1.77  | 1.67  | 1.54  | 1.41  | 1.26  |
| Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)                    |      | 1.47  | 0.201 | 0.201 | 0.193 | 0.161 | 0.104 |
| Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)           |      | 163   | 148   | 125   | 106   | 92.6  | 69    |
| Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)        |      | 220   | 0.264 | 0.262 | 0.199 | 0.123 | 0.001 |
| Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019) |      | 275   | 198   | 169   | 121   | 58.3  | 16.9  |
| Monetary damages from air pollution - Mobile - On-Road (million \$2019)                              |      | 929   | 987   | 1,006 | 945   | 783   | 556   |
| Monetary damages from air pollution - Gas Stations (million \$2019)                                  |      | 97.5  | 104   | 105   | 98    | 80.9  | 57.6  |
| Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)         |      | 205   | 209   | 208   | 196   | 165   | 120   |
| Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)                 |      | 0.78  | 0.774 | 0.74  | 0.67  | 0.578 | 0.477 |
| Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)               |      | 20.9  | 22.7  | 24.5  | 24.6  | 21.3  | 16.3  |
| Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)         |      | 2.46  | 2.45  | 2.42  | 2.38  | 2.32  | 2.23  |
| Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)  |      | 79    | 81.3  | 81.9  | 77.8  | 67.4  | 52.4  |
| Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)          |      | 13    | 11.9  | 10.8  | 9.69  | 8.53  | 7.39  |
| Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)        |      | 16.3  | 15.6  | 14.8  | 13.7  | 12.5  | 11.1  |
| Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)            |      | 13    | 1.78  | 1.77  | 1.7   | 1.42  | 0.919 |
| Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)   |      | 1,451 | 1,317 | 1,108 | 942   | 822   | 613   |

Table 18: E- scenario - IMPACTS - Jobs

| Item  | 2020 | 2025   | 2030   | 2035   | 2040   | 2045   | 2050   |
|---|------|--------|--------|--------|--------|--------|--------|
| By economic sector - Agriculture (jobs)                                     |      | 230    | 233    | 215    | 187    | 349    | 317    |
| By economic sector - Construction (jobs)                                    |      | 12,819 | 15,567 | 18,270 | 21,963 | 28,732 | 35,158 |
| By economic sector - Manufacturing (jobs)                                   |      | 12,221 | 15,259 | 15,013 | 14,735 | 16,347 | 16,160 |
| By economic sector - Mining (jobs)  |      | 14,426 | 10,980 | 8,406  | 6,429  | 4,917  | 2,913  |
| By economic sector - Other (jobs)   |      | 1,032  | 1,341  | 1,953  | 2,645  | 3,775  | 5,308  |
| By economic sector - Pipeline (jobs)  |      | 1,289  | 1,312  | 1,017  | 925    | 855    | 721    |
| By economic sector - Professional (jobs)                                    |      | 7,882  | 9,445  | 11,528 | 14,396 | 19,509 | 24,920 |
| By economic sector - Trade (jobs)   |      | 7,831  | 7,978  | 8,741  | 9,943  | 12,468 | 15,301 |
| By economic sector - Utilities (jobs)                                       |      | 8,210  | 10,193 | 11,568 | 14,733 | 21,478 | 27,002 |
| By resource sector - Biomass (jobs)   |      | 556    | 538    | 486    | 575    | 1,484  | 1,342  |
| By resource sector - CO2 (jobs)   |      | 18.8   | 1,462  | 328    | 569    | 899    | 1,671  |
| By resource sector - Coal (jobs)  |      | 1,711  | 396    | 84.9   | 72.3   | 59.7   | 45.7   |
| By resource sector - Grid (jobs)  |      | 8,811  | 12,607 | 17,711 | 23,918 | 37,443 | 46,972 |
| By resource sector - Natural Gas (jobs)                                     |      | 14,280 | 11,158 | 7,968  | 6,359  | 5,209  | 4,960  |
| By resource sector - Nuclear (jobs)   |      | 0      | 0.004  | 0.008  | 0.009  | 0.022  | 0.035  |
| By resource sector - Oil (jobs)   |      | 25,245 | 22,812 | 20,662 | 18,316 | 15,928 | 10,168 |
| By resource sector - Solar (jobs)   |      | 7,003  | 7,415  | 10,132 | 12,025 | 15,676 | 20,618 |
| By resource sector - Wind (jobs)  |      | 8,314  | 15,922 | 19,340 | 24,120 | 31,732 | 42,024 |
| By education level - All sectors - High school diploma or less (jobs)       |      | 26,964 | 29,749 | 31,596 | 35,276 | 44,430 | 51,942 |
| By education level - All sectors - Associates degree or some college (jobs) |      | 19,503 | 21,857 | 23,447 | 26,660 | 34,087 | 40,777 |
| By education level - All sectors - Bachelors degree (jobs)                  |      | 15,306 | 16,264 | 16,941 | 18,683 | 23,163 | 27,017 |
| By education level - All sectors - Masters or professional degree (jobs)    |      | 3,638  | 3,871  | 4,106  | 4,621  | 5,837  | 6,955  |
| By education level - All sectors - Doctoral degree (jobs)                   |      | 529    | 567    | 621    | 716    | 912    | 1,108  |
| Related work experience - All sectors - None (jobs)                         |      | 9,206  | 10,158 | 10,812 | 12,176 | 15,452 | 18,281 |
| Related work experience - All sectors - Up to 1 year (jobs)                 |      | 12,687 | 14,067 | 15,052 | 16,872 | 21,339 | 25,161 |
| Related work experience - All sectors - 1 to 4 years (jobs)                 |      | 24,306 | 26,446 | 27,967 | 31,274 | 39,342 | 46,250 |
| Related work experience - All sectors - 4 to 10 years (jobs)                |      | 15,455 | 16,961 | 17,988 | 20,220 | 25,540 | 30,218 |
| Related work experience - All sectors - Over 10 years (jobs)                |      | 4,286  | 4,676  | 4,892  | 5,414  | 6,757  | 7,891  |
| On-the-Job Training - All sectors - None (jobs)                             |      | 3,712  | 3,998  | 4,227  | 4,708  | 5,894  | 6,949  |
| On-the-Job Training - All sectors - Up to 1 year (jobs)                     |      | 44,468 | 48,508 | 51,214 | 56,985 | 71,496 | 83,696 |
| On-the-Job Training - All sectors - 1 to 4 years (jobs)                     |      | 13,288 | 14,755 | 15,756 | 17,859 | 22,746 | 27,091 |
| On-the-Job Training - All sectors - 4 to 10 years (jobs)                    |      | 3,820  | 4,320  | 4,751  | 5,564  | 7,260  | 8,862  |
| On-the-Job Training - All sectors - Over 10 years (jobs)                    |      | 653    | 728    | 763    | 840    | 1,034  | 1,202  |
| On-Site or In-Plant Training - All sectors - None (jobs)                    |      | 10,674 | 11,745 | 12,482 | 14,007 | 17,676 | 20,944 |
| On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)            |      | 40,233 | 43,863 | 46,322 | 51,575 | 64,749 | 75,834 |
| On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)            |      | 10,415 | 11,535 | 12,296 | 13,887 | 17,632 | 20,911 |
| On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)           |      | 4,120  | 4,593  | 4,986  | 5,764  | 7,435  | 8,978  |
| On-Site or In-Plant Training - All sectors - Over 10 years (jobs)           |      | 498    | 573    | 625    | 723    | 938    | 1,133  |
| Wage income - All (million \$2019)  |      | 4,066  | 4,439  | 4,725  | 5,334  | 6,784  | 8,064  |

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

| Item                                   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--|------|------|------|------|------|------|------|
| Final energy use - Transportation (PJ) | 472  | 446  | 410  | 379  | 355  | 326  | 292  |
| Final energy use - Residential (PJ)    | 237  | 229  | 225  | 220  | 212  | 196  | 175  |
| Final energy use - Commercial (PJ)     | 162  | 162  | 161  | 160  | 158  | 155  | 151  |
| Final energy use - Industry (PJ)       | 171  | 181  | 188  | 203  | 226  | 238  | 250  |

Table 20: E- scenario - PILLAR 1: Efficiency/Electrification - Electricity demand

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--|------|------|------|------|------|------|------|
| Electricity distribution capital invested - Cumulative 5-yr (billion \$2018) |      | 2.32 | 2.38 | 3.28 | 3.43 | 5.13 | 5.47 |

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

| Item  | 2020  | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|---|-------|-------|-------|-------|-------|-------|-------|
| Vehicle stocks - LDV – EV (1000 units)                                      | 85.6  | 212   | 339   | 925   | 1,511 | 2,809 | 4,107 |
| Vehicle stocks - LDV – All others (1000 units)                              | 5,368 | 5,368 | 5,368 | 5,092 | 4,816 | 3,711 | 2,606 |
| Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018) |       | 0     | 172   | 344   | 1,178 | 3,652 | 5,339 |
| Public EV charging plugs - DC Fast (1000 units)                             | 0.303 |       | 0.614 |       | 2.74  |       | 7.45  |
| Public EV charging plugs - L2 (1000 units)                                  | 2.12  |       | 14.8  |       | 65.9  |       | 179   |

Table 22: E- scenario - PILLAR 1: Efficiency/Electrification - Residential

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|------|------|------|------|------|------|------|
| Sales of space heating units - Electric Heat Pump (%)                           | 5.62 | 13.3 | 15.8 | 24.3 | 44   | 68.4 | 82.7 |
| Sales of space heating units - Electric Resistance (%)                          | 7.65 | 13.9 | 13.5 | 12.5 | 10.1 | 6.84 | 4.95 |
| Sales of space heating units - Gas (%)  | 83.5 | 67.1 | 65   | 58.1 | 42   | 22.1 | 10.3 |
| Sales of space heating units - Fossil (%)                                       | 3.24 | 5.74 | 5.68 | 5.1  | 3.9  | 2.66 | 2.01 |
| Sales of water heating units - Electric Heat Pump (%)                           | 0    | 0.46 | 1.74 | 5.96 | 16.1 | 28.9 | 36.5 |
| Sales of water heating units - Electric Resistance (%)                          | 13.2 | 25.6 | 26.5 | 29.7 | 37.4 | 47.1 | 52.9 |
| Sales of water heating units - Gas Furnace (%)                                  | 85.7 | 72.7 | 70.5 | 63.1 | 45.3 | 22.7 | 9.32 |
| Sales of water heating units - Other (%)  | 1.07 | 1.23 | 1.23 | 1.23 | 1.22 | 1.22 | 1.21 |
| Sales of cooking units - Electric Resistance (%)                                | 50.3 | 51.6 | 56.1 | 68.1 | 84.8 | 95.1 | 98.7 |
| Sales of cooking units - Gas (%)  | 49.7 | 48.4 | 43.9 | 31.9 | 15.2 | 4.9  | 1.32 |
| Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018) |      | 4.41 | 4.7  |      |      |      |      |

Table 23: E- scenario - PILLAR 1: Efficiency/Electrification - Commercial

| Item   | 2020  | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|--|-------|-------|-------|-------|-------|-------|-------|
| Sales of space heating units - Electric Heat Pump (%)  | 2.64  | 7.26  | 9.83  | 18.3  | 38.7  | 64.6  | 80    |
| Sales of space heating units - Electric Resistance (%) | 2.48  | 3.43  | 3.58  | 4.11  | 5.42  | 7.07  | 8.03  |
| Sales of space heating units - Gas Furnace (%)         | 94.9  | 89.1  | 86.4  | 77.4  | 55.8  | 28.3  | 12    |
| Sales of space heating units - Fossil (%)              | 0     | 0.241 | 0.225 | 0.171 | 0.089 | 0.035 | 0.016 |
| Sales of water heating units - Electric Heat Pump (%)  | 0.022 | 0.571 | 2.07  | 7.05  | 19    | 34.1  | 43.1  |
| Sales of water heating units - Electric Resistance (%) | 1.1   | 2     | 3.47  | 8.35  | 20.1  | 35.1  | 44    |

Table 23: E- scenario - PILLAR 1: Efficiency/Electrification - Commercial (continued)

| Item   | 2020  | 2025   | 2030   | 2035  | 2040  | 2045  | 2050  |
|--|-------|--------|--------|-------|-------|-------|-------|
| Sales of water heating units - Gas Furnace (%)                         | 98.6  | 97     | 94.1   | 84.2  | 60.5  | 30.4  | 12.5  |
| Sales of water heating units - Other (%)                               | 0.269 | 0.383  | 0.382  | 0.383 | 0.382 | 0.383 | 0.383 |
| Sales of cooking units - Electric Resistance (%)                       | 41.9  | 46.2   | 50.2   | 60.8  | 75.4  | 84.6  | 87.8  |
| Sales of cooking units - Gas (%)                                       | 58.1  | 53.8   | 49.8   | 39.2  | 24.6  | 15.4  | 12.2  |
| Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018) |       | 14,373 | 15,986 |       |       |       |       |

Table 24: E- scenario - PILLAR 2: Clean Electricity - Generating capacity

| Item                                 | 2020  | 2025  | 2030  | 2035  | 2040  | 2045  | 2050   |
|--------------------------------------|-------|-------|-------|-------|-------|-------|--------|
| Installed thermal - Coal (MW)        | 4,905 | 2,238 | 0     | 0     | 0     | 0     | 0      |
| Installed thermal - Natural gas (MW) | 5,482 | 5,273 | 6,919 | 6,498 | 5,438 | 6,649 | 13,230 |
| Installed thermal - Nuclear (MW)     | 0     | 0     | 0.002 | 0.005 | 0.007 | 0.015 | 0.028  |

Table 25: E- scenario - PILLAR 6: Land sinks - Forests

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050    |
|---|------|------|------|------|------|------|---------|
| Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)        |      |      |      |      |      |      | -812    |
| Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)            |      |      |      |      |      |      | -260    |
| Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)         |      |      |      |      |      |      | -3,547  |
| Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)            |      |      |      |      |      |      | -13.7   |
| Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)      |      |      |      |      |      |      | -58.1   |
| Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y) |      |      |      |      |      |      | -446    |
| Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)              |      |      |      |      |      |      | -12,451 |
| Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)               |      |      |      |      |      |      | -245    |
| Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)           |      |      |      |      |      |      | -2,063  |
| Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)     |      |      |      |      |      |      | -19,895 |
| Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)        |      |      |      |      |      |      | -1,216  |
| Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)            |      |      |      |      |      |      | -909    |
| Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)         |      |      |      |      |      |      | -6,390  |
| Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)            |      |      |      |      |      |      | -20     |
| Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)      |      |      |      |      |      |      | -116    |
| Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y) |      |      |      |      |      |      | -859    |
| Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)              |      |      |      |      |      |      | -18,676 |
| Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)               |      |      |      |      |      |      | -1,742  |
| Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)           |      |      |      |      |      |      | -4,092  |
| Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)     |      |      |      |      |      |      | -34,021 |



Table 25: E- scenario - PILLAR 6: Land sinks - Forests (continued)

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050    |
|---|------|------|------|------|------|------|---------|
| Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)                               |      |      |      |      |      |      | -1,620  |
| Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)                                   |      |      |      |      |      |      | -1,559  |
| Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)                                |      |      |      |      |      |      | -9,233  |
| Carbon sink potential - High - Improve plantations (1000 tCO2e/y)                                   |      |      |      |      |      |      | -26.8   |
| Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)                             |      |      |      |      |      |      | -174    |
| Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)                        |      |      |      |      |      |      | -1,273  |
| Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)                                     |      |      |      |      |      |      | -24,902 |
| Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)                                      |      |      |      |      |      |      | -3,239  |
| Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)                            |      |      |      |      |      |      | -48,148 |
| Carbon sink potential - High - Restore productivity (1000 tCO2e/y)                                  |      |      |      |      |      |      | -6,121  |
| Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)             |      |      |      |      |      |      | 133     |
| Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares) |      |      |      |      |      |      | 198     |
| Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)              |      |      |      |      |      |      | 1,804   |
| Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)                 |      |      |      |      |      |      | 4.95    |
| Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)           |      |      |      |      |      |      | 0       |
| Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)      |      |      |      |      |      |      | 63.7    |
| Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)                   |      |      |      |      |      |      | 823     |
| Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)                    |      |      |      |      |      |      | 15.9    |
| Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)                |      |      |      |      |      |      | 1,228   |
| Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)      |      |      |      |      |      |      | 4,270   |
| Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)             |      |      |      |      |      |      | 199     |
| Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares) |      |      |      |      |      |      | 205     |
| Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)              |      |      |      |      |      |      | 3,256   |
| Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)                 |      |      |      |      |      |      | 7.44    |

Table 25: E- scenario - PILLAR 6: Land sinks - Forests (continued)

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|--|------|------|------|------|------|------|-------|
| Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)            |      |      |      |      |      |      | 0     |
| Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)       |      |      |      |      |      |      | 92.3  |
| Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)                    |      |      |      |      |      |      | 1,235 |
| Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)                     |      |      |      |      |      |      | 115   |
| Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)                 |      |      |      |      |      |      | 2,472 |
| Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)       |      |      |      |      |      |      | 7,582 |
| Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)             |      |      |      |      |      |      | 265   |
| Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares) |      |      |      |      |      |      | 211   |
| Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)              |      |      |      |      |      |      | 4,708 |
| Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)                 |      |      |      |      |      |      | 9.89  |
| Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)           |      |      |      |      |      |      | 0     |
| Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)      |      |      |      |      |      |      | 121   |
| Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)                   |      |      |      |      |      |      | 1,646 |
| Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)                    |      |      |      |      |      |      | 92    |
| Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)                |      |      |      |      |      |      | 2,029 |
| Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)      |      |      |      |      |      |      | 9,083 |

Table 26: E- scenario - PILLAR 6: Land sinks - Agriculture

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050   |
|---|------|------|------|------|------|------|--------|
| Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y) |      |      |      |      |      |      | -173   |
| Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)              |      |      |      |      |      |      | -1,384 |
| Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)   |      |      |      |      |      |      | -107   |
| Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)                          |      |      |      |      |      |      | -1,664 |

Table 26: E- scenario - PILLAR 6: Land sinks - Agriculture (continued)

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050   |
|--|------|------|------|------|------|------|--------|
| Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)          |      |      |      |      |      |      | -173   |
| Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)                       |      |      |      |      |      |      | -2,661 |
| Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)            |      |      |      |      |      |      | -214   |
| Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)                                   |      |      |      |      |      |      | -3,048 |
| Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)   |      |      |      |      |      |      | 172    |
| Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)                |      |      |      |      |      |      | 2,071  |
| Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)     |      |      |      |      |      |      | 164    |
| Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)                            |      |      |      |      |      |      | 2,407  |
| Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares) |      |      |      |      |      |      | 172    |
| Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)              |      |      |      |      |      |      | 3,977  |
| Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)   |      |      |      |      |      |      | 329    |
| Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)                          |      |      |      |      |      |      | 4,478  |

Table 27: E+RE+ scenario - IMPACTS - Health

| Item   | 2020 | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|--|------|-------|-------|-------|-------|-------|-------|
| Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)        |      | 24.8  | 0.03  | 0.03  | 0.022 | 0.014 | 0     |
| Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths) |      | 28.4  | 19.2  | 12.2  | 10.9  | 5.28  | 1.53  |
| Premature deaths from air pollution - Mobile - On-Road (deaths)                              |      | 103   | 101   | 80.7  | 48.7  | 22.8  | 8.74  |
| Premature deaths from air pollution - Gas Stations (deaths)                                  |      | 10.8  | 10.5  | 8.3   | 5.07  | 2.45  | 1.05  |
| Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)         |      | 23.1  | 22.4  | 17.7  | 11    | 5.68  | 2.33  |
| Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)                 |      | 0.086 | 0.076 | 0.059 | 0.04  | 0.025 | 0.015 |
| Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)               |      | 2.34  | 2.41  | 2.09  | 1.5   | 0.868 | 0.412 |
| Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)         |      | 0.278 | 0.277 | 0.274 | 0.269 | 0.262 | 0.252 |
| Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)  |      | 8.91  | 8.55  | 6.99  | 4.7   | 2.67  | 1.29  |

Table 27: *E+RE+ scenario - IMPACTS - Health (continued)*

| Item   | 2020 | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|--|------|-------|-------|-------|-------|-------|-------|
| Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)                  |      | 1.47  | 1.25  | 1.03  | 0.817 | 0.607 | 0.406 |
| Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)                |      | 1.84  | 1.65  | 1.42  | 1.17  | 0.898 | 0.618 |
| Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)                    |      | 1.79  | 0.198 | 0.186 | 0.166 | 0.156 | 0.041 |
| Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)           |      | 160   | 153   | 130   | 95.7  | 55.8  | 5.56  |
| Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)        |      | 220   | 0.264 | 0.262 | 0.199 | 0.123 | 0.001 |
| Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019) |      | 251   | 170   | 108   | 96.9  | 46.8  | 13.5  |
| Monetary damages from air pollution - Mobile - On-Road (million \$2019)                              |      | 914   | 899   | 717   | 433   | 203   | 77.7  |
| Monetary damages from air pollution - Gas Stations (million \$2019)                                  |      | 95.6  | 92.9  | 73.5  | 44.9  | 21.7  | 9.26  |
| Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)         |      | 205   | 199   | 157   | 97.5  | 50.3  | 20.6  |
| Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)                 |      | 0.758 | 0.672 | 0.519 | 0.355 | 0.223 | 0.135 |
| Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)               |      | 20.8  | 21.3  | 18.5  | 13.3  | 7.69  | 3.65  |
| Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)         |      | 2.46  | 2.45  | 2.42  | 2.38  | 2.32  | 2.23  |
| Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)  |      | 78.9  | 75.7  | 61.8  | 41.6  | 23.7  | 11.4  |
| Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)          |      | 13    | 11    | 9.15  | 7.24  | 5.38  | 3.6   |
| Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)        |      | 16.3  | 14.6  | 12.6  | 10.3  | 7.95  | 5.47  |
| Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)            |      | 15.8  | 1.75  | 1.64  | 1.46  | 1.38  | 0.358 |
| Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)   |      | 1,422 | 1,362 | 1,154 | 849   | 496   | 49.3  |

Table 28: *E+RE+ scenario - IMPACTS - Jobs*

| Item                                      | 2020 | 2025   | 2030   | 2035   | 2040   | 2045   | 2050   |
|---|------|--------|--------|--------|--------|--------|--------|
| By economic sector - Agriculture (jobs)   |      | 227    | 239    | 217    | 154    | 220    | 318    |
| By economic sector - Construction (jobs)  |      | 12,474 | 16,695 | 22,569 | 30,681 | 39,028 | 70,920 |
| By economic sector - Manufacturing (jobs) |      | 13,359 | 16,285 | 19,914 | 20,225 | 18,669 | 30,796 |
| By economic sector - Mining (jobs)        |      | 14,317 | 11,007 | 8,137  | 4,925  | 2,650  | 416    |
| By economic sector - Other (jobs)         |      | 954    | 1,634  | 2,431  | 3,759  | 5,624  | 12,851 |
| By economic sector - Pipeline (jobs)      |      | 1,265  | 1,147  | 945    | 666    | 411    | 91.9   |
| By economic sector - Professional (jobs)  |      | 7,832  | 10,239 | 14,304 | 19,814 | 26,539 | 45,182 |

Table 28: E+RE+ scenario - IMPACTS - Jobs (continued)

| Item  | 2020 | 2025   | 2030   | 2035   | 2040   | 2045   | 2050    |
|---|------|--------|--------|--------|--------|--------|---------|
| By economic sector - Trade (jobs)   |      | 7,766  | 8,403  | 10,005 | 12,281 | 15,719 | 27,417  |
| By economic sector - Utilities (jobs)                                       |      | 8,185  | 10,364 | 15,725 | 24,013 | 30,198 | 56,301  |
| By resource sector - Biomass (jobs)   |      | 549    | 555    | 487    | 397    | 826    | 1,433   |
| By resource sector - CO2 (jobs)   |      | 0      | 0      | 0      | 0      | 0      | 0       |
| By resource sector - Coal (jobs)  |      | 1,797  | 395    | 82     | 67.9   | 59     | 38.1    |
| By resource sector - Grid (jobs)  |      | 8,922  | 14,022 | 26,024 | 42,550 | 54,940 | 108,779 |
| By resource sector - Natural Gas (jobs)                                     |      | 13,855 | 11,618 | 8,213  | 6,411  | 4,337  | 2,316   |
| By resource sector - Nuclear (jobs)   |      | 0      | 0      | 0      | 0      | 0      | 0       |
| By resource sector - Oil (jobs)   |      | 25,200 | 22,541 | 19,524 | 13,291 | 8,434  | 1,605   |
| By resource sector - Solar (jobs)   |      | 6,911  | 10,157 | 12,201 | 16,517 | 23,133 | 58,187  |
| By resource sector - Wind (jobs)  |      | 9,143  | 16,724 | 27,716 | 37,285 | 47,328 | 71,935  |
| By education level - All sectors - High school diploma or less (jobs)       |      | 27,167 | 31,304 | 38,899 | 47,936 | 56,770 | 100,683 |
| By education level - All sectors - Associates degree or some college (jobs) |      | 19,642 | 23,015 | 29,180 | 36,908 | 44,519 | 79,164  |
| By education level - All sectors - Bachelors degree (jobs)                  |      | 15,399 | 17,027 | 20,460 | 24,602 | 29,119 | 49,675  |
| By education level - All sectors - Masters or professional degree (jobs)    |      | 3,643  | 4,065  | 4,964  | 6,137  | 7,470  | 12,789  |
| By education level - All sectors - Doctoral degree (jobs)                   |      | 526    | 601    | 744    | 937    | 1,180  | 1,982   |
| Related work experience - All sectors - None (jobs)                         |      | 9,254  | 10,670 | 13,301 | 16,579 | 19,867 | 35,225  |
| Related work experience - All sectors - Up to 1 year (jobs)                 |      | 12,802 | 14,877 | 18,621 | 23,052 | 27,538 | 48,968  |
| Related work experience - All sectors - 1 to 4 years (jobs)                 |      | 24,451 | 27,756 | 34,203 | 42,116 | 50,192 | 87,752  |
| Related work experience - All sectors - 4 to 10 years (jobs)                |      | 15,540 | 17,801 | 22,099 | 27,447 | 32,854 | 57,397  |
| Related work experience - All sectors - Over 10 years (jobs)                |      | 4,330  | 4,909  | 6,022  | 7,324  | 8,606  | 14,950  |
| On-the-Job Training - All sectors - None (jobs)                             |      | 3,726  | 4,213  | 5,142  | 6,290  | 7,541  | 13,269  |
| On-the-Job Training - All sectors - Up to 1 year (jobs)                     |      | 44,856 | 50,996 | 62,792 | 76,763 | 90,969 | 159,202 |
| On-the-Job Training - All sectors - 1 to 4 years (jobs)                     |      | 13,346 | 15,496 | 19,491 | 24,571 | 29,570 | 52,266  |
| On-the-Job Training - All sectors - 4 to 10 years (jobs)                    |      | 3,789  | 4,538  | 5,879  | 7,762  | 9,655  | 17,248  |
| On-the-Job Training - All sectors - Over 10 years (jobs)                    |      | 661    | 768    | 943    | 1,133  | 1,322  | 2,307   |
| On-Site or In-Plant Training - All sectors - None (jobs)                    |      | 10,751 | 12,381 | 15,368 | 19,008 | 22,800 | 40,036  |
| On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)            |      | 40,564 | 46,101 | 56,791 | 69,537 | 82,449 | 144,485 |
| On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)            |      | 10,468 | 12,116 | 15,184 | 19,031 | 22,818 | 40,323  |
| On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)           |      | 4,094  | 4,812  | 6,122  | 7,929  | 9,755  | 17,248  |
| On-Site or In-Plant Training - All sectors - Over 10 years (jobs)           |      | 499    | 602    | 782    | 1,013  | 1,236  | 2,201   |
| Wage income - All (million \$2019)  |      | 4,082  | 4,646  | 5,751  | 7,149  | 8,615  | 15,159  |

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

| Item                                   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--|------|------|------|------|------|------|------|
| Final energy use - Transportation (PJ) | 472  | 443  | 394  | 334  | 279  | 243  | 226  |
| Final energy use - Residential (PJ)    | 237  | 229  | 221  | 199  | 170  | 148  | 133  |
| Final energy use - Commercial (PJ)     | 162  | 162  | 159  | 152  | 144  | 138  | 135  |
| Final energy use - Industry (PJ)       | 171  | 180  | 187  | 200  | 221  | 233  | 246  |

Table 30: E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--|------|------|------|------|------|------|------|
| Electricity distribution capital invested - Cumulative 5-yr (billion \$2018) |      | 2.81 | 2.93 | 5.73 | 6.16 | 6.1  | 6.47 |

Table 31: E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Transportation

| Item  | 2020  | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|---|-------|-------|-------|-------|-------|-------|-------|
| Vehicle stocks - LDV - EV (1000 units)                                      | 111   | 542   | 974   | 2,485 | 3,997 | 5,204 | 6,412 |
| Vehicle stocks - LDV - All others (1000 units)                              | 5,347 | 5,091 | 4,835 | 3,524 | 2,212 | 1,251 | 291   |
| Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018) |       | 1,014 | 2,644 | 4,211 | 6,408 | 6,943 | 6,637 |
| Public EV charging plugs - DC Fast (1000 units)                             | 0.303 |       | 1.77  |       | 7.25  |       | 11.6  |
| Public EV charging plugs - L2 (1000 units)                                  | 2.12  |       | 42.5  |       | 174   |       | 280   |

Table 32: E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Residential

| Item  | 2020 | 2025 | 2030 | 2035  | 2040  | 2045 | 2050 |
|---|------|------|------|-------|-------|------|------|
| Sales of space heating units - Electric Heat Pump (%)                           | 5.62 | 14.5 | 37.2 | 82.6  | 92    | 92.7 | 92.7 |
| Sales of space heating units - Electric Resistance (%)                          | 7.65 | 13.8 | 11   | 4.91  | 3.67  | 3.58 | 3.63 |
| Sales of space heating units - Gas (%)  | 83.5 | 66   | 47.3 | 10.4  | 2.8   | 2.21 | 2.19 |
| Sales of space heating units - Fossil (%)                                       | 3.24 | 5.67 | 4.53 | 2.12  | 1.56  | 1.5  | 1.52 |
| Sales of water heating units - Electric Heat Pump (%)                           | 0    | 0.93 | 12.1 | 36.4  | 41.4  | 41.7 | 41.8 |
| Sales of water heating units - Electric Resistance (%)                          | 13.2 | 25.9 | 34.2 | 52.7  | 56.7  | 57   | 57   |
| Sales of water heating units - Gas Furnace (%)                                  | 85.7 | 72   | 52.4 | 9.64  | 0.728 | 0.02 | 0    |
| Sales of water heating units - Other (%)  | 1.07 | 1.23 | 1.23 | 1.23  | 1.21  | 1.21 | 1.21 |
| Sales of cooking units - Electric Resistance (%)                                | 50.5 | 61   | 93.3 | 99.7  | 100   | 100  | 100  |
| Sales of cooking units - Gas (%)  | 49.5 | 39   | 6.67 | 0.336 | 0     | 0    | 0    |
| Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018) |      | 4.42 | 4.7  |       |       |      |      |

Table 33: E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Commercial

| Item   | 2020  | 2025   | 2030   | 2035  | 2040  | 2045  | 2050  |
|--|-------|--------|--------|-------|-------|-------|-------|
| Sales of space heating units - Electric Heat Pump (%)                  | 2.64  | 8.18   | 30.6   | 79.8  | 90    | 90.8  | 90.8  |
| Sales of space heating units - Electric Resistance (%)                 | 2.48  | 3.49   | 4.92   | 8.08  | 8.66  | 8.7   | 8.7   |
| Sales of space heating units - Gas Furnace (%)                         | 94.9  | 88.1   | 64.4   | 12.2  | 1.37  | 0.522 | 0.498 |
| Sales of space heating units - Fossil (%)                              | 0     | 0.208  | 0.04   | 0.002 | 0     | 0     | 0     |
| Sales of water heating units - Electric Heat Pump (%)                  | 0.022 | 1.12   | 14.3   | 42.9  | 48.9  | 49.4  | 49.4  |
| Sales of water heating units - Electric Resistance (%)                 | 1.1   | 2.5    | 15.4   | 43.8  | 49.7  | 50.2  | 50.2  |
| Sales of water heating units - Gas Furnace (%)                         | 98.6  | 96     | 69.9   | 12.9  | 0.972 | 0.027 | 0     |
| Sales of water heating units - Other (%)                               | 0.269 | 0.383  | 0.382  | 0.383 | 0.382 | 0.383 | 0.383 |
| Sales of cooking units - Electric Resistance (%)                       | 41.9  | 54.6   | 83     | 88.6  | 88.9  | 88.9  | 88.9  |
| Sales of cooking units - Gas (%)                                       | 58.1  | 45.4   | 17     | 11.4  | 11.1  | 11.1  | 11.1  |
| Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018) |       | 14,374 | 15,990 |       |       |       |       |

Table 34: *E+RE+ scenario - PILLAR 2: Clean Electricity - Generating capacity*

| Item   | 2020  | 2025  | 2030  | 2035   | 2040   | 2045   | 2050    |
|--|-------|-------|-------|--------|--------|--------|---------|
| Installed thermal - Coal (MW)  | 4,905 | 2,238 | 0     | 0      | 0      | 0      | 0       |
| Installed thermal - Natural gas (MW)   | 5,482 | 5,265 | 7,178 | 6,783  | 8,005  | 11,160 | 13,419  |
| Installed thermal - Nuclear (MW)   | 0     | 0     | 0     | 0      | 0      | 0      | 0       |
| Installed renewables - Rooftop PV (MW)                                       | 895   | 1,362 | 1,825 | 2,410  | 3,134  | 4,018  | 5,120   |
| Installed renewables - Solar - Base land use assumptions (MW)                | 454   | 454   | 2,501 | 4,835  | 8,938  | 16,787 | 55,294  |
| Installed renewables - Wind - Base land use assumptions (MW)                 | 4,732 | 5,218 | 6,428 | 8,188  | 13,808 | 21,290 | 57,595  |
| Installed renewables - Solar - Constrained land use assumptions (MW)         | 454   | 1,252 | 4,243 | 5,358  | 8,781  | 14,752 | 55,550  |
| Installed renewables - Wind - Constrained land use assumptions (MW)          | 5,272 | 5,479 | 6,383 | 10,943 | 23,116 | 40,784 | 105,272 |
| Installed renewables - Offshore Wind - Constrained land use assumptions (MW) | 0     | 0     | 0     | 0      | 0      | 0      | 0       |
| Capital invested - Solar PV - Base (billion \$2018)                          |       | 0     | 2.45  | 2.57   | 4.26   | 7.7    | 35.7    |
| Capital invested - Wind - Base (billion \$2018)                              |       | 0.715 | 1.61  | 2.18   | 6.64   | 8.39   | 38.4    |

Table 35: *E+RE+ scenario - PILLAR 2: Clean Electricity - Generation*

| Item  | 2020   | 2025   | 2030   | 2035   | 2040    | 2045    | 2050    |
|---|--------|--------|--------|--------|---------|---------|---------|
| Solar - Base land use assumptions (GWh)               | 1,142  | 1,142  | 5,652  | 10,876 | 19,953  | 37,504  | 123,424 |
| Wind - Base land use assumptions (GWh)                | 16,760 | 18,526 | 22,799 | 28,841 | 47,644  | 72,002  | 183,350 |
| OffshoreWind - Base land use assumptions (GWh)        | 0      | 0      | 0      | 0      | 0       | 0       | 0       |
| Solar - Constrained land use assumptions (GWh)        | 2,284  | 5,770  | 18,873 | 23,815 | 39,015  | 66,004  | 246,102 |
| Wind - Constrained land use assumptions (GWh)         | 33,520 | 34,931 | 40,883 | 68,991 | 140,044 | 236,672 | 541,171 |
| OffshoreWind - Constrained land use assumptions (GWh) | 0      | 0      | 0      | 0      | 0       | 0       | 0       |

Table 36: *E+RE+ scenario - PILLAR 6: Land sinks - Forests*

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050    |
|--|------|------|------|------|------|------|---------|
| Carbon sink potential - Low - Accelerate regeneration (1000 tCO <sub>2</sub> e/y)        |      |      |      |      |      |      | -812    |
| Carbon sink potential - Low - Avoid deforestation (1000 tCO <sub>2</sub> e/y)            |      |      |      |      |      |      | -260    |
| Carbon sink potential - Low - Extend rotation length (1000 tCO <sub>2</sub> e/y)         |      |      |      |      |      |      | -3,547  |
| Carbon sink potential - Low - Improve plantations (1000 tCO <sub>2</sub> e/y)            |      |      |      |      |      |      | -13.7   |
| Carbon sink potential - Low - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)      |      |      |      |      |      |      | -58.1   |
| Carbon sink potential - Low - Increase trees outside forests (1000 tCO <sub>2</sub> e/y) |      |      |      |      |      |      | -446    |
| Carbon sink potential - Low - Reforest cropland (1000 tCO <sub>2</sub> e/y)              |      |      |      |      |      |      | -12,451 |
| Carbon sink potential - Low - Reforest pasture (1000 tCO <sub>2</sub> e/y)               |      |      |      |      |      |      | -245    |
| Carbon sink potential - Low - Restore productivity (1000 tCO <sub>2</sub> e/y)           |      |      |      |      |      |      | -2,063  |
| Carbon sink potential - Low - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)     |      |      |      |      |      |      | -19,895 |

Table 36: E+RE+ scenario - PILLAR 6: Land sinks - Forests (continued)

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050    |
|---|------|------|------|------|------|------|---------|
| Carbon sink potential - Mid - Accelerate regeneration (1000 tCO <sub>2</sub> e/y)                   |      |      |      |      |      |      | -1,216  |
| Carbon sink potential - Mid - Avoid deforestation (1000 tCO <sub>2</sub> e/y)                       |      |      |      |      |      |      | -909    |
| Carbon sink potential - Mid - Extend rotation length (1000 tCO <sub>2</sub> e/y)                    |      |      |      |      |      |      | -6,390  |
| Carbon sink potential - Mid - Improve plantations (1000 tCO <sub>2</sub> e/y)                       |      |      |      |      |      |      | -20     |
| Carbon sink potential - Mid - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)                 |      |      |      |      |      |      | -116    |
| Carbon sink potential - Mid - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)            |      |      |      |      |      |      | -859    |
| Carbon sink potential - Mid - Reforest cropland (1000 tCO <sub>2</sub> e/y)                         |      |      |      |      |      |      | -18,676 |
| Carbon sink potential - Mid - Reforest pasture (1000 tCO <sub>2</sub> e/y)                          |      |      |      |      |      |      | -1,742  |
| Carbon sink potential - Mid - Restore productivity (1000 tCO <sub>2</sub> e/y)                      |      |      |      |      |      |      | -4,092  |
| Carbon sink potential - Mid - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)                |      |      |      |      |      |      | -34,021 |
| Carbon sink potential - High - Accelerate regeneration (1000 tCO <sub>2</sub> e/y)                  |      |      |      |      |      |      | -1,620  |
| Carbon sink potential - High - Avoid deforestation (1000 tCO <sub>2</sub> e/y)                      |      |      |      |      |      |      | -1,559  |
| Carbon sink potential - High - Extend rotation length (1000 tCO <sub>2</sub> e/y)                   |      |      |      |      |      |      | -9,233  |
| Carbon sink potential - High - Improve plantations (1000 tCO <sub>2</sub> e/y)                      |      |      |      |      |      |      | -26.8   |
| Carbon sink potential - High - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)                |      |      |      |      |      |      | -174    |
| Carbon sink potential - High - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)           |      |      |      |      |      |      | -1,273  |
| Carbon sink potential - High - Reforest cropland (1000 tCO <sub>2</sub> e/y)                        |      |      |      |      |      |      | -24,902 |
| Carbon sink potential - High - Reforest pasture (1000 tCO <sub>2</sub> e/y)                         |      |      |      |      |      |      | -3,239  |
| Carbon sink potential - High - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)               |      |      |      |      |      |      | -48,148 |
| Carbon sink potential - High - Restore productivity (1000 tCO <sub>2</sub> e/y)                     |      |      |      |      |      |      | -6,121  |
| Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)             |      |      |      |      |      |      | 133     |
| Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares) |      |      |      |      |      |      | 198     |
| Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)              |      |      |      |      |      |      | 1,804   |
| Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)                 |      |      |      |      |      |      | 4.95    |
| Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)           |      |      |      |      |      |      | 0       |
| Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)      |      |      |      |      |      |      | 63.7    |
| Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)                   |      |      |      |      |      |      | 823     |



Table 36: E+RE+ scenario - PILLAR 6: Land sinks - Forests (continued)

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|--|------|------|------|------|------|------|-------|
| Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)                     |      |      |      |      |      |      | 15.9  |
| Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)                 |      |      |      |      |      |      | 1,228 |
| Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)       |      |      |      |      |      |      | 4,270 |
| Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)              |      |      |      |      |      |      | 199   |
| Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)  |      |      |      |      |      |      | 205   |
| Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)               |      |      |      |      |      |      | 3,256 |
| Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)                  |      |      |      |      |      |      | 7.44  |
| Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)            |      |      |      |      |      |      | 0     |
| Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)       |      |      |      |      |      |      | 92.3  |
| Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)                    |      |      |      |      |      |      | 1,235 |
| Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)                     |      |      |      |      |      |      | 115   |
| Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)                 |      |      |      |      |      |      | 2,472 |
| Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)       |      |      |      |      |      |      | 7,582 |
| Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)             |      |      |      |      |      |      | 265   |
| Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares) |      |      |      |      |      |      | 211   |
| Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)              |      |      |      |      |      |      | 4,708 |
| Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)                 |      |      |      |      |      |      | 9.89  |
| Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)           |      |      |      |      |      |      | 0     |
| Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)      |      |      |      |      |      |      | 121   |
| Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)                   |      |      |      |      |      |      | 1,646 |
| Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)                    |      |      |      |      |      |      | 92    |
| Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)                |      |      |      |      |      |      | 2,029 |

Table 36: *E+RE+ scenario - PILLAR 6: Land sinks - Forests (continued)*

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|---|------|------|------|------|------|------|-------|
| Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares) |      |      |      |      |      |      | 9,083 |

Table 37: *E+RE+ scenario - PILLAR 6: Land sinks - Agriculture*

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050   |
|--|------|------|------|------|------|------|--------|
| Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)            |      |      |      |      |      |      | -173   |
| Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)                         |      |      |      |      |      |      | -1,384 |
| Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)              |      |      |      |      |      |      | -107   |
| Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)                                     |      |      |      |      |      |      | -1,664 |
| Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)          |      |      |      |      |      |      | -173   |
| Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)                       |      |      |      |      |      |      | -2,661 |
| Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)            |      |      |      |      |      |      | -214   |
| Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)                                   |      |      |      |      |      |      | -3,048 |
| Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)   |      |      |      |      |      |      | 172    |
| Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)                |      |      |      |      |      |      | 2,071  |
| Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)     |      |      |      |      |      |      | 164    |
| Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)                            |      |      |      |      |      |      | 2,407  |
| Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares) |      |      |      |      |      |      | 172    |
| Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)              |      |      |      |      |      |      | 3,977  |
| Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)   |      |      |      |      |      |      | 329    |
| Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)                          |      |      |      |      |      |      | 4,478  |

Table 38: *E+RE- scenario - IMPACTS - Health*

| Item  | 2020 | 2025 | 2030 | 2035 | 2040  | 2045  | 2050 |
|---|------|------|------|------|-------|-------|------|
| Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths) |      | 24.8 | 0.03 | 0.03 | 0.022 | 0.014 | 0    |

Table 38: E+RE- scenario - IMPACTS - Health (continued)

| Item   | 2020 | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|--|------|-------|-------|-------|-------|-------|-------|
| Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)         |      | 30.1  | 21    | 21.8  | 41.5  | 19    | 2.18  |
| Premature deaths from air pollution - Mobile - On-Road (deaths)                                      |      | 103   | 101   | 80.7  | 48.7  | 22.8  | 8.74  |
| Premature deaths from air pollution - Gas Stations (deaths)  |      | 10.8  | 10.5  | 8.3   | 5.07  | 2.45  | 1.05  |
| Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)                 |      | 23.1  | 22.4  | 17.7  | 11    | 5.68  | 2.33  |
| Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)                         |      | 0.086 | 0.076 | 0.059 | 0.04  | 0.025 | 0.015 |
| Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)                       |      | 2.34  | 2.41  | 2.09  | 1.5   | 0.868 | 0.412 |
| Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)                 |      | 0.278 | 0.277 | 0.274 | 0.269 | 0.262 | 0.252 |
| Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)          |      | 8.91  | 8.55  | 6.99  | 4.7   | 2.67  | 1.29  |
| Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)                  |      | 1.47  | 1.25  | 1.03  | 0.817 | 0.607 | 0.406 |
| Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)                |      | 1.84  | 1.65  | 1.42  | 1.17  | 0.898 | 0.618 |
| Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)                    |      | 1.34  | 0.196 | 0.186 | 0.167 | 0.159 | 0.04  |
| Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)           |      | 167   | 166   | 169   | 153   | 134   | 104   |
| Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)        |      | 220   | 0.264 | 0.262 | 0.199 | 0.123 | 0.001 |
| Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019) |      | 267   | 186   | 193   | 368   | 169   | 19.3  |
| Monetary damages from air pollution - Mobile - On-Road (million \$2019)                              |      | 914   | 899   | 717   | 433   | 203   | 77.7  |
| Monetary damages from air pollution - Gas Stations (million \$2019)                                  |      | 95.6  | 92.9  | 73.5  | 44.9  | 21.7  | 9.26  |
| Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)         |      | 205   | 199   | 157   | 97.5  | 50.3  | 20.6  |
| Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)                 |      | 0.758 | 0.672 | 0.519 | 0.355 | 0.223 | 0.135 |
| Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)               |      | 20.8  | 21.3  | 18.5  | 13.3  | 7.69  | 3.65  |
| Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)         |      | 2.46  | 2.45  | 2.42  | 2.38  | 2.32  | 2.23  |
| Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)  |      | 78.9  | 75.7  | 61.8  | 41.6  | 23.7  | 11.4  |
| Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)          |      | 13    | 11    | 9.15  | 7.24  | 5.38  | 3.6   |

Table 38: E+RE- scenario - IMPACTS - Health (continued)

| Item   | 2020 | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|--|------|-------|-------|-------|-------|-------|-------|
| Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)      |      | 16.3  | 14.6  | 12.6  | 10.3  | 7.95  | 5.47  |
| Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)          |      | 11.8  | 1.73  | 1.64  | 1.48  | 1.4   | 0.354 |
| Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019) |      | 1,481 | 1,477 | 1,499 | 1,363 | 1,188 | 925   |

Table 39: E+RE- scenario - IMPACTS - Jobs

| Item  | 2020 | 2025   | 2030   | 2035   | 2040   | 2045   | 2050   |
|---|------|--------|--------|--------|--------|--------|--------|
| By economic sector - Agriculture (jobs)                                     |      | 229    | 234    | 215    | 174    | 284    | 316    |
| By economic sector - Construction (jobs)                                    |      | 13,194 | 14,170 | 14,779 | 16,741 | 16,985 | 20,199 |
| By economic sector - Manufacturing (jobs)                                   |      | 12,923 | 12,656 | 13,851 | 12,510 | 9,658  | 9,729  |
| By economic sector - Mining (jobs)  |      | 14,581 | 11,465 | 9,278  | 6,399  | 4,486  | 2,853  |
| By economic sector - Other (jobs)   |      | 1,118  | 1,240  | 1,426  | 1,968  | 2,113  | 3,405  |
| By economic sector - Pipeline (jobs)  |      | 1,312  | 1,421  | 1,199  | 1,042  | 905    | 815    |
| By economic sector - Professional (jobs)                                    |      | 7,913  | 8,165  | 8,721  | 9,849  | 10,604 | 12,301 |
| By economic sector - Trade (jobs)   |      | 7,919  | 7,426  | 7,362  | 7,361  | 7,286  | 8,291  |
| By economic sector - Utilities (jobs)                                       |      | 8,507  | 9,231  | 10,574 | 12,465 | 13,654 | 15,184 |
| By resource sector - Biomass (jobs)   |      | 549    | 538    | 485    | 492    | 1,119  | 1,349  |
| By resource sector - CO2 (jobs)   |      | 18.9   | 1,658  | 378    | 638    | 1,008  | 1,885  |
| By resource sector - Coal (jobs)  |      | 1,844  | 481    | 82.1   | 68.1   | 59.3   | 38     |
| By resource sector - Grid (jobs)  |      | 9,127  | 10,286 | 14,696 | 18,524 | 20,740 | 23,540 |
| By resource sector - Natural Gas (jobs)                                     |      | 14,844 | 12,730 | 11,947 | 10,564 | 9,264  | 7,614  |
| By resource sector - Nuclear (jobs)   |      | 0      | 0.005  | 0.02   | 0.02   | 0.045  | 0.182  |
| By resource sector - Oil (jobs)   |      | 25,198 | 22,582 | 20,059 | 14,538 | 11,082 | 7,609  |
| By resource sector - Solar (jobs)   |      | 8,850  | 7,830  | 7,958  | 10,228 | 9,303  | 17,801 |
| By resource sector - Wind (jobs)  |      | 7,264  | 9,903  | 11,800 | 13,456 | 13,400 | 13,256 |
| By education level - All sectors - High school diploma or less (jobs)       |      | 27,753 | 27,161 | 27,871 | 28,377 | 27,206 | 30,268 |
| By education level - All sectors - Associates degree or some college (jobs) |      | 20,072 | 19,841 | 20,492 | 21,274 | 20,691 | 23,255 |
| By education level - All sectors - Bachelors degree (jobs)                  |      | 15,631 | 14,937 | 14,959 | 14,748 | 14,055 | 15,167 |
| By education level - All sectors - Masters or professional degree (jobs)    |      | 3,704  | 3,552  | 3,566  | 3,580  | 3,494  | 3,816  |
| By education level - All sectors - Doctoral degree (jobs)                   |      | 535    | 517    | 517    | 529    | 529    | 586    |
| Related work experience - All sectors - None (jobs)                         |      | 9,462  | 9,294  | 9,528  | 9,763  | 9,461  | 10,561 |
| Related work experience - All sectors - Up to 1 year (jobs)                 |      | 13,056 | 12,736 | 13,080 | 13,366 | 12,832 | 14,430 |
| Related work experience - All sectors - 1 to 4 years (jobs)                 |      | 24,926 | 24,220 | 24,661 | 24,946 | 24,013 | 26,445 |
| Related work experience - All sectors - 4 to 10 years (jobs)                |      | 15,851 | 15,496 | 15,798 | 16,091 | 15,547 | 17,162 |
| Related work experience - All sectors - Over 10 years (jobs)                |      | 4,400  | 4,262  | 4,339  | 4,343  | 4,121  | 4,495  |
| On-the-Job Training - All sectors - None (jobs)                             |      | 3,804  | 3,661  | 3,687  | 3,712  | 3,555  | 3,969  |
| On-the-Job Training - All sectors - Up to 1 year (jobs)                     |      | 45,644 | 44,241 | 45,124 | 45,429 | 43,470 | 47,895 |
| On-the-Job Training - All sectors - 1 to 4 years (jobs)                     |      | 13,655 | 13,475 | 13,828 | 14,288 | 13,890 | 15,486 |
| On-the-Job Training - All sectors - 4 to 10 years (jobs)                    |      | 3,920  | 3,972  | 4,099  | 4,410  | 4,435  | 5,048  |

Table 39: E+RE- scenario - IMPACTS - Jobs (continued)

| Item  | 2020 | 2025   | 2030   | 2035   | 2040   | 2045   | 2050   |
|---|------|--------|--------|--------|--------|--------|--------|
| On-the-Job Training - All sectors - Over 10 years (jobs)          |      | 673    | 658    | 667    | 670    | 625    | 694    |
| On-Site or In-Plant Training - All sectors - None (jobs)          |      | 10,957 | 10,670 | 10,864 | 11,057 | 10,645 | 11,875 |
| On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)  |      | 41,299 | 40,042 | 40,845 | 41,166 | 39,418 | 43,451 |
| On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)  |      | 10,703 | 10,537 | 10,810 | 11,120 | 10,773 | 11,990 |
| On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs) |      | 4,223  | 4,238  | 4,342  | 4,588  | 4,567  | 5,131  |
| On-Site or In-Plant Training - All sectors - Over 10 years (jobs) |      | 512    | 520    | 544    | 578    | 572    | 645    |
| Wage income - All (million \$2019)                                |      | 4,164  | 4,090  | 4,197  | 4,278  | 4,176  | 4,615  |

Table 40: E+RE- scenario - PILLAR 1: Efficiency/Electrification - Overview

| Item                                   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--|------|------|------|------|------|------|------|
| Final energy use - Transportation (PJ) | 472  | 443  | 394  | 334  | 279  | 243  | 226  |
| Final energy use - Residential (PJ)    | 237  | 229  | 221  | 199  | 170  | 148  | 133  |
| Final energy use - Commercial (PJ)     | 162  | 162  | 159  | 152  | 144  | 138  | 135  |
| Final energy use - Industry (PJ)       | 171  | 180  | 187  | 200  | 221  | 233  | 246  |

Table 41: E+RE- scenario - PILLAR 1: Efficiency/Electrification - Electricity demand

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--|------|------|------|------|------|------|------|
| Electricity distribution capital invested - Cumulative 5-yr (billion \$2018) |      | 2.81 | 2.93 | 5.73 | 6.16 | 6.1  | 6.47 |

Table 42: E+RE- scenario - PILLAR 1: Efficiency/Electrification - Transportation

| Item  | 2020  | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|---|-------|-------|-------|-------|-------|-------|-------|
| Vehicle stocks - LDV – EV (1000 units)                                      | 111   | 542   | 974   | 2,485 | 3,997 | 5,204 | 6,412 |
| Vehicle stocks - LDV – All others (1000 units)                              | 5,347 | 5,091 | 4,835 | 3,524 | 2,212 | 1,251 | 291   |
| Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018) |       | 1,014 | 2,644 | 4,211 | 6,408 | 6,943 | 6,637 |
| Public EV charging plugs - DC Fast (1000 units)                             | 0.303 |       | 1.77  |       | 7.25  |       | 11.6  |
| Public EV charging plugs - L2 (1000 units)                                  | 2.12  |       | 42.5  |       | 174   |       | 280   |

Table 43: E+RE- scenario - PILLAR 1: Efficiency/Electrification - Residential

| Item   | 2020 | 2025 | 2030 | 2035  | 2040  | 2045 | 2050 |
|--|------|------|------|-------|-------|------|------|
| Sales of space heating units - Electric Heat Pump (%)  | 5.62 | 14.5 | 37.2 | 82.6  | 92    | 92.7 | 92.7 |
| Sales of space heating units - Electric Resistance (%) | 7.65 | 13.8 | 11   | 4.91  | 3.67  | 3.58 | 3.63 |
| Sales of space heating units - Gas (%)                 | 83.5 | 66   | 47.3 | 10.4  | 2.8   | 2.21 | 2.19 |
| Sales of space heating units - Fossil (%)              | 3.24 | 5.67 | 4.53 | 2.12  | 1.56  | 1.5  | 1.52 |
| Sales of water heating units - Electric Heat Pump (%)  | 0    | 0.93 | 12.1 | 36.4  | 41.4  | 41.7 | 41.8 |
| Sales of water heating units - Electric Resistance (%) | 13.2 | 25.9 | 34.2 | 52.7  | 56.7  | 57   | 57   |
| Sales of water heating units - Gas Furnace (%)         | 85.7 | 72   | 52.4 | 9.64  | 0.728 | 0.02 | 0    |
| Sales of water heating units - Other (%)               | 1.07 | 1.23 | 1.23 | 1.23  | 1.21  | 1.21 | 1.21 |
| Sales of cooking units - Electric Resistance (%)       | 50.5 | 61   | 93.3 | 99.7  | 100   | 100  | 100  |
| Sales of cooking units - Gas (%)                       | 49.5 | 39   | 6.67 | 0.336 | 0     | 0    | 0    |

Table 43: E+RE- scenario - PILLAR 1: Efficiency/Electrification - Residential (continued)

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|------|------|------|------|------|------|------|
| Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018) |      | 4.42 | 4.7  |      |      |      |      |

Table 44: E+RE- scenario - PILLAR 1: Efficiency/Electrification - Commercial

| Item   | 2020  | 2025   | 2030   | 2035  | 2040  | 2045  | 2050  |
|--|-------|--------|--------|-------|-------|-------|-------|
| Sales of space heating units - Electric Heat Pump (%)                  | 2.64  | 8.18   | 30.6   | 79.8  | 90    | 90.8  | 90.8  |
| Sales of space heating units - Electric Resistance (%)                 | 2.48  | 3.49   | 4.92   | 8.08  | 8.66  | 8.7   | 8.7   |
| Sales of space heating units - Gas Furnace (%)                         | 94.9  | 88.1   | 64.4   | 12.2  | 1.37  | 0.522 | 0.498 |
| Sales of space heating units - Fossil (%)                              | 0     | 0.208  | 0.04   | 0.002 | 0     | 0     | 0     |
| Sales of water heating units - Electric Heat Pump (%)                  | 0.022 | 1.12   | 14.3   | 42.9  | 48.9  | 49.4  | 49.4  |
| Sales of water heating units - Electric Resistance (%)                 | 1.1   | 2.5    | 15.4   | 43.8  | 49.7  | 50.2  | 50.2  |
| Sales of water heating units - Gas Furnace (%)                         | 98.6  | 96     | 69.9   | 12.9  | 0.972 | 0.027 | 0     |
| Sales of water heating units - Other (%)                               | 0.269 | 0.383  | 0.382  | 0.383 | 0.382 | 0.383 | 0.383 |
| Sales of cooking units - Electric Resistance (%)                       | 41.9  | 54.6   | 83     | 88.6  | 88.9  | 88.9  | 88.9  |
| Sales of cooking units - Gas (%)                                       | 58.1  | 45.4   | 17     | 11.4  | 11.1  | 11.1  | 11.1  |
| Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018) |       | 14,374 | 15,990 |       |       |       |       |

Table 45: E+RE- scenario - PILLAR 2: Clean Electricity - Generating capacity

| Item   | 2020  | 2025  | 2030  | 2035  | 2040  | 2045   | 2050   |
|--|-------|-------|-------|-------|-------|--------|--------|
| Installed thermal - Coal (MW)  | 4,905 | 2,891 | 0     | 0     | 0     | 0      | 0      |
| Installed thermal - Natural gas (MW)   | 5,462 | 4,826 | 5,372 | 7,837 | 5,920 | 9,185  | 13,172 |
| Installed thermal - Nuclear (MW)   | 0     | 0     | 0.002 | 0.01  | 0.017 | 0.033  | 0.106  |
| Installed renewables - Rooftop PV (MW)                                       | 895   | 1,362 | 1,825 | 2,410 | 3,134 | 4,018  | 5,120  |
| Installed renewables - Solar - Base land use assumptions (MW)                | 1,405 | 2,712 | 3,769 | 4,105 | 6,353 | 6,891  | 9,581  |
| Installed renewables - Wind - Base land use assumptions (MW)                 | 4,732 | 4,847 | 5,862 | 6,307 | 7,187 | 8,342  | 8,706  |
| Installed renewables - Solar - Constrained land use assumptions (MW)         | 820   | 2,262 | 3,666 | 4,656 | 6,810 | 8,724  | 11,272 |
| Installed renewables - Wind - Constrained land use assumptions (MW)          | 4,732 | 4,905 | 5,233 | 5,667 | 8,180 | 10,809 | 11,780 |
| Installed renewables - Offshore Wind - Constrained land use assumptions (MW) | 0     | 0     | 0     | 0     | 0     | 0      | 0      |
| Capital invested - Solar PV - Base (billion \$2018)                          |       | 1.75  | 1.27  | 0.371 | 2.34  | 0.528  | 2.49   |
| Capital invested - Wind - Base (billion \$2018)                              |       | 0.169 | 1.35  | 0.606 | 1.04  | 1.29   | 0.427  |
| Capital invested - Solar PV - Constrained (billion \$2018)                   |       | 1.93  | 1.68  | 1.09  | 2.24  | 1.88   | 2.36   |
| Capital invested - Wind - Constrained (billion \$2018)                       |       | 0.254 | 0.437 | 0.539 | 2.97  | 2.95   | 1.03   |

Table 46: E+RE- scenario - PILLAR 2: Clean Electricity - Generation

| Item  | 2020   | 2025   | 2030   | 2035   | 2040   | 2045   | 2050   |
|---|--------|--------|--------|--------|--------|--------|--------|
| Solar - Base land use assumptions (GWh)         | 3,250  | 6,134  | 8,488  | 9,238  | 14,326 | 15,554 | 21,505 |
| Wind - Base land use assumptions (GWh)          | 16,760 | 17,191 | 20,850 | 22,536 | 25,565 | 29,515 | 30,892 |
| Offshore Wind - Base land use assumptions (GWh) | 0      | 0      | 0      | 0      | 0      | 0      | 0      |

Table 46: E+RE- scenario - PILLAR 2: Clean Electricity - Generation (continued)

| Item  | 2020   | 2025   | 2030   | 2035   | 2040   | 2045   | 2050   |
|---|--------|--------|--------|--------|--------|--------|--------|
| Solar - Constrained land use assumptions (GWh)        | 1,939  | 5,073  | 8,204  | 10,399 | 15,190 | 19,483 | 25,119 |
| Wind - Constrained land use assumptions (GWh)         | 16,760 | 17,346 | 18,438 | 19,845 | 27,647 | 35,817 | 38,773 |
| OffshoreWind - Constrained land use assumptions (GWh) | 0      | 0      | 0      | 0      | 0      | 0      | 0      |

Table 47: E+RE- scenario - PILLAR 6: Land sinks - Forests

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050    |
|---|------|------|------|------|------|------|---------|
| Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)        |      |      |      |      |      |      | -812    |
| Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)            |      |      |      |      |      |      | -260    |
| Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)         |      |      |      |      |      |      | -3,547  |
| Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)            |      |      |      |      |      |      | -13.7   |
| Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)      |      |      |      |      |      |      | -58.1   |
| Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y) |      |      |      |      |      |      | -446    |
| Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)              |      |      |      |      |      |      | -12,451 |
| Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)               |      |      |      |      |      |      | -245    |
| Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)           |      |      |      |      |      |      | -2,063  |
| Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)     |      |      |      |      |      |      | -19,895 |
| Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)        |      |      |      |      |      |      | -1,216  |
| Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)            |      |      |      |      |      |      | -909    |
| Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)         |      |      |      |      |      |      | -6,390  |
| Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)            |      |      |      |      |      |      | -20     |
| Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)      |      |      |      |      |      |      | -116    |
| Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y) |      |      |      |      |      |      | -859    |
| Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)              |      |      |      |      |      |      | -18,676 |
| Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)               |      |      |      |      |      |      | -1,742  |
| Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)           |      |      |      |      |      |      | -4,092  |
| Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)     |      |      |      |      |      |      | -34,021 |
| Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)       |      |      |      |      |      |      | -1,620  |
| Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)           |      |      |      |      |      |      | -1,559  |
| Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)        |      |      |      |      |      |      | -9,233  |
| Carbon sink potential - High - Improve plantations (1000 tCO2e/y)           |      |      |      |      |      |      | -26.8   |
| Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)     |      |      |      |      |      |      | -174    |

Table 47: E+RE- scenario - PILLAR 6: Land sinks - Forests (continued)

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050    |
|---|------|------|------|------|------|------|---------|
| Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)                        |      |      |      |      |      |      | -1,273  |
| Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)                                     |      |      |      |      |      |      | -24,902 |
| Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)                                      |      |      |      |      |      |      | -3,239  |
| Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)                            |      |      |      |      |      |      | -48,148 |
| Carbon sink potential - High - Restore productivity (1000 tCO2e/y)                                  |      |      |      |      |      |      | -6,121  |
| Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)             |      |      |      |      |      |      | 133     |
| Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares) |      |      |      |      |      |      | 198     |
| Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)              |      |      |      |      |      |      | 1,804   |
| Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)                 |      |      |      |      |      |      | 4.95    |
| Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)           |      |      |      |      |      |      | 0       |
| Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)      |      |      |      |      |      |      | 63.7    |
| Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)                   |      |      |      |      |      |      | 823     |
| Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)                    |      |      |      |      |      |      | 15.9    |
| Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)                |      |      |      |      |      |      | 1,228   |
| Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)      |      |      |      |      |      |      | 4,270   |
| Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)             |      |      |      |      |      |      | 199     |
| Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares) |      |      |      |      |      |      | 205     |
| Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)              |      |      |      |      |      |      | 3,256   |
| Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)                 |      |      |      |      |      |      | 7.44    |
| Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)           |      |      |      |      |      |      | 0       |
| Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)      |      |      |      |      |      |      | 92.3    |
| Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)                   |      |      |      |      |      |      | 1,235   |
| Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)                    |      |      |      |      |      |      | 115     |



Table 47: *E+RE- scenario - PILLAR 6: Land sinks - Forests (continued)*

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|--|------|------|------|------|------|------|-------|
| Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)                 |      |      |      |      |      |      | 2,472 |
| Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)       |      |      |      |      |      |      | 7,582 |
| Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)             |      |      |      |      |      |      | 265   |
| Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares) |      |      |      |      |      |      | 211   |
| Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)              |      |      |      |      |      |      | 4,708 |
| Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)                 |      |      |      |      |      |      | 9.89  |
| Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)           |      |      |      |      |      |      | 0     |
| Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)      |      |      |      |      |      |      | 121   |
| Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)                   |      |      |      |      |      |      | 1,646 |
| Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)                    |      |      |      |      |      |      | 92    |
| Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)                |      |      |      |      |      |      | 2,029 |
| Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)      |      |      |      |      |      |      | 9,083 |

Table 48: *E+RE- scenario - PILLAR 6: Land sinks - Agriculture*

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050   |
|--|------|------|------|------|------|------|--------|
| Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO <sub>2</sub> e/y)   |      |      |      |      |      |      | -173   |
| Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO <sub>2</sub> e/y)                |      |      |      |      |      |      | -1,384 |
| Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO <sub>2</sub> e/y)     |      |      |      |      |      |      | -107   |
| Carbon sink potential - Moderate deployment - Total (1000 tCO <sub>2</sub> e/y)                            |      |      |      |      |      |      | -1,664 |
| Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO <sub>2</sub> e/y) |      |      |      |      |      |      | -173   |
| Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO <sub>2</sub> e/y)              |      |      |      |      |      |      | -2,661 |
| Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO <sub>2</sub> e/y)   |      |      |      |      |      |      | -214   |
| Carbon sink potential - Aggressive deployment - Total (1000 tCO <sub>2</sub> e/y)                          |      |      |      |      |      |      | -3,048 |

Table 48: E+RE- scenario - PILLAR 6: Land sinks - Agriculture (continued)

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|--|------|------|------|------|------|------|-------|
| Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)   |      |      |      |      |      |      | 172   |
| Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)                |      |      |      |      |      |      | 2,071 |
| Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)     |      |      |      |      |      |      | 164   |
| Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)                            |      |      |      |      |      |      | 2,407 |
| Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares) |      |      |      |      |      |      | 172   |
| Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)              |      |      |      |      |      |      | 3,977 |
| Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)   |      |      |      |      |      |      | 329   |
| Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)                          |      |      |      |      |      |      | 4,478 |

Table 49: E-B+ scenario - IMPACTS - Health

| Item   | 2020 | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|--|------|-------|-------|-------|-------|-------|-------|
| Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)        |      | 24.8  | 0.03  | 0.03  | 0.022 | 0.014 | 0     |
| Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths) |      | 30.5  | 22.1  | 19.2  | 16.7  | 9.32  | 2.28  |
| Premature deaths from air pollution - Mobile - On-Road (deaths)                              |      | 104   | 111   | 113   | 106   | 88    | 62.5  |
| Premature deaths from air pollution - Gas Stations (deaths)                                  |      | 11    | 11.7  | 11.8  | 11.1  | 9.14  | 6.5   |
| Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)         |      | 23.2  | 23.6  | 23.5  | 22.1  | 18.7  | 13.6  |
| Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)                 |      | 0.088 | 0.087 | 0.083 | 0.076 | 0.065 | 0.054 |
| Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)               |      | 2.36  | 2.57  | 2.76  | 2.77  | 2.41  | 1.84  |
| Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)         |      | 0.278 | 0.277 | 0.274 | 0.269 | 0.262 | 0.252 |
| Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)  |      | 8.93  | 9.18  | 9.25  | 8.79  | 7.62  | 5.92  |
| Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)          |      | 1.47  | 1.34  | 1.22  | 1.09  | 0.964 | 0.834 |
| Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)        |      | 1.84  | 1.77  | 1.67  | 1.54  | 1.41  | 1.26  |
| Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)            |      | 1.55  | 0.201 | 0.201 | 0.195 | 0.184 | 0.171 |

Table 49: E-B+ scenario - IMPACTS - Health (continued)

| Item   | 2020 | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|--|------|-------|-------|-------|-------|-------|-------|
| Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)           |      | 163   | 148   | 125   | 106   | 92.6  | 69    |
| Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)        |      | 220   | 0.264 | 0.262 | 0.199 | 0.123 | 0.001 |
| Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019) |      | 270   | 196   | 170   | 148   | 82.5  | 20.2  |
| Monetary damages from air pollution - Mobile - On-Road (million \$2019)                              |      | 929   | 987   | 1,006 | 945   | 783   | 556   |
| Monetary damages from air pollution - Gas Stations (million \$2019)                                  |      | 97.5  | 104   | 105   | 98    | 80.9  | 57.6  |
| Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)         |      | 205   | 209   | 208   | 196   | 165   | 120   |
| Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)                 |      | 0.78  | 0.774 | 0.74  | 0.67  | 0.578 | 0.477 |
| Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)               |      | 20.9  | 22.7  | 24.5  | 24.6  | 21.3  | 16.3  |
| Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)         |      | 2.46  | 2.45  | 2.42  | 2.38  | 2.32  | 2.23  |
| Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)  |      | 79    | 81.3  | 81.9  | 77.8  | 67.4  | 52.4  |
| Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)          |      | 13    | 11.9  | 10.8  | 9.69  | 8.53  | 7.39  |
| Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)        |      | 16.3  | 15.6  | 14.8  | 13.7  | 12.5  | 11.1  |
| Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)            |      | 13.7  | 1.77  | 1.77  | 1.72  | 1.63  | 1.51  |
| Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)   |      | 1,451 | 1,317 | 1,108 | 942   | 822   | 613   |

Table 50: E-B+ scenario - IMPACTS - Jobs

| Item                                      | 2020 | 2025   | 2030   | 2035   | 2040   | 2045   | 2050   |
|---|------|--------|--------|--------|--------|--------|--------|
| By economic sector - Agriculture (jobs)   |      | 228    | 233    | 215    | 230    | 401    | 359    |
| By economic sector - Construction (jobs)  |      | 12,853 | 15,717 | 17,718 | 19,012 | 23,537 | 27,987 |
| By economic sector - Manufacturing (jobs) |      | 12,280 | 15,406 | 14,021 | 11,774 | 12,940 | 13,791 |
| By economic sector - Mining (jobs)        |      | 14,389 | 10,963 | 8,454  | 6,516  | 4,951  | 2,795  |
| By economic sector - Other (jobs)         |      | 1,036  | 1,353  | 1,869  | 2,253  | 3,026  | 4,439  |
| By economic sector - Pipeline (jobs)      |      | 1,281  | 1,315  | 1,028  | 942    | 857    | 701    |
| By economic sector - Professional (jobs)  |      | 7,918  | 9,554  | 11,197 | 12,443 | 15,872 | 19,386 |
| By economic sector - Trade (jobs)         |      | 7,845  | 8,027  | 8,568  | 8,910  | 10,443 | 12,189 |
| By economic sector - Utilities (jobs)     |      | 8,217  | 10,279 | 11,218 | 12,440 | 17,742 | 20,520 |
| By resource sector - Biomass (jobs)       |      | 554    | 538    | 486    | 756    | 1,847  | 1,730  |
| By resource sector - CO2 (jobs)           |      | 18.8   | 1,498  | 337    | 595    | 931    | 1,696  |
| By resource sector - Coal (jobs)          |      | 1,732  | 396    | 84.9   | 72.6   | 62.9   | 53.8   |
| By resource sector - Grid (jobs)          |      | 8,878  | 12,745 | 16,953 | 19,560 | 29,933 | 35,500 |
| By resource sector - Natural Gas (jobs)   |      | 14,122 | 11,092 | 8,158  | 6,493  | 5,669  | 3,967  |
| By resource sector - Nuclear (jobs)       |      | 0      | 0.004  | 0.008  | 0.009  | 0.02   | 0.037  |
| By resource sector - Oil (jobs)           |      | 25,245 | 22,812 | 20,662 | 18,424 | 16,009 | 9,779  |

Table 50: E-B+ scenario - IMPACTS - Jobs (continued)

| Item  | 2020 | 2025   | 2030   | 2035   | 2040   | 2045   | 2050   |
|---|------|--------|--------|--------|--------|--------|--------|
| By resource sector - Solar (jobs)   |      | 6,968  | 7,374  | 9,393  | 10,139 | 12,409 | 19,816 |
| By resource sector - Wind (jobs)  |      | 8,527  | 16,392 | 18,211 | 18,482 | 22,908 | 29,627 |
| By education level - All sectors - High school diploma or less (jobs)       |      | 27,012 | 29,968 | 30,563 | 30,564 | 36,843 | 41,764 |
| By education level - All sectors - Associates degree or some college (jobs) |      | 19,538 | 22,031 | 22,666 | 22,942 | 28,035 | 32,449 |
| By education level - All sectors - Bachelors degree (jobs)                  |      | 15,325 | 16,377 | 16,457 | 16,341 | 19,287 | 21,567 |
| By education level - All sectors - Masters or professional degree (jobs)    |      | 3,643  | 3,899  | 3,995  | 4,045  | 4,848  | 5,512  |
| By education level - All sectors - Doctoral degree (jobs)                   |      | 529    | 572    | 606    | 629    | 756    | 876    |
| Related work experience - All sectors - None (jobs)                         |      | 9,220  | 10,232 | 10,472 | 10,561 | 12,811 | 14,630 |
| Related work experience - All sectors - Up to 1 year (jobs)                 |      | 12,714 | 14,177 | 14,537 | 14,554 | 17,603 | 20,211 |
| Related work experience - All sectors - 1 to 4 years (jobs)                 |      | 24,343 | 26,637 | 27,112 | 27,194 | 32,646 | 36,961 |
| Related work experience - All sectors - 4 to 10 years (jobs)                |      | 15,478 | 17,089 | 17,431 | 17,531 | 21,125 | 24,063 |
| Related work experience - All sectors - Over 10 years (jobs)                |      | 4,292  | 4,710  | 4,734  | 4,682  | 5,584  | 6,303  |
| On-the-Job Training - All sectors - None (jobs)                             |      | 3,717  | 4,027  | 4,098  | 4,098  | 4,887  | 5,577  |
| On-the-Job Training - All sectors - Up to 1 year (jobs)                     |      | 44,542 | 48,862 | 49,580 | 49,446 | 59,280 | 67,084 |
| On-the-Job Training - All sectors - 1 to 4 years (jobs)                     |      | 13,308 | 14,868 | 15,257 | 15,433 | 18,765 | 21,542 |
| On-the-Job Training - All sectors - 4 to 10 years (jobs)                    |      | 3,825  | 4,355  | 4,615  | 4,823  | 5,988  | 6,997  |
| On-the-Job Training - All sectors - Over 10 years (jobs)                    |      | 654    | 733    | 736    | 722    | 849    | 968    |
| On-Site or In-Plant Training - All sectors - None (jobs)                    |      | 10,693 | 11,836 | 12,076 | 12,110 | 14,580 | 16,735 |
| On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)            |      | 40,299 | 44,182 | 44,852 | 44,761 | 53,695 | 60,767 |
| On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)            |      | 10,431 | 11,622 | 11,906 | 12,012 | 14,565 | 16,662 |
| On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)           |      | 4,125  | 4,628  | 4,847  | 5,017  | 6,158  | 7,107  |
| On-Site or In-Plant Training - All sectors - Over 10 years (jobs)           |      | 498    | 578    | 605    | 622    | 772    | 898    |
| Wage income - All (million \$2019)  |      | 4,071  | 4,470  | 4,588  | 4,657  | 5,649  | 6,435  |

Table 51: E-B+ scenario - PILLAR 1: Efficiency/Electrification - Overview

| Item                                   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--|------|------|------|------|------|------|------|
| Final energy use - Transportation (PJ) | 472  | 446  | 410  | 379  | 355  | 326  | 292  |
| Final energy use - Residential (PJ)    | 237  | 229  | 225  | 220  | 212  | 196  | 175  |
| Final energy use - Commercial (PJ)     | 162  | 162  | 161  | 160  | 158  | 155  | 151  |
| Final energy use - Industry (PJ)       | 171  | 181  | 188  | 203  | 226  | 238  | 250  |

Table 52: E-B+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--|------|------|------|------|------|------|------|
| Electricity distribution capital invested - Cumulative 5-yr (billion \$2018) |      | 2.32 | 2.38 | 3.28 | 3.43 | 5.13 | 5.47 |

Table 53: E-B+ scenario - PILLAR 1: Efficiency/Electrification - Transportation

| Item  | 2020  | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|---|-------|-------|-------|-------|-------|-------|-------|
| Vehicle stocks - LDV – EV (1000 units)                                      | 85.6  | 212   | 339   | 925   | 1,511 | 2,809 | 4,107 |
| Vehicle stocks - LDV – All others (1000 units)                              | 5,368 | 5,368 | 5,368 | 5,092 | 4,816 | 3,711 | 2,606 |
| Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018) |       | 0     | 172   | 344   | 1,178 | 3,652 | 5,339 |
| Public EV charging plugs - DC Fast (1000 units)                             | 0.303 |       | 0.614 |       | 2.74  |       | 7.45  |
| Public EV charging plugs - L2 (1000 units)                                  | 2.12  |       | 14.8  |       | 65.9  |       | 179   |

Table 54: E-B+ scenario - PILLAR 1: Efficiency/Electrification - Residential

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|------|------|------|------|------|------|------|
| Sales of space heating units - Electric Heat Pump (%)                           | 5.62 | 13.3 | 15.8 | 24.3 | 44   | 68.4 | 82.7 |
| Sales of space heating units - Electric Resistance (%)                          | 7.65 | 13.9 | 13.5 | 12.5 | 10.1 | 6.84 | 4.95 |
| Sales of space heating units - Gas (%)  | 83.5 | 67.1 | 65   | 58.1 | 42   | 22.1 | 10.3 |
| Sales of space heating units - Fossil (%)                                       | 3.24 | 5.74 | 5.68 | 5.1  | 3.9  | 2.66 | 2.01 |
| Sales of water heating units - Electric Heat Pump (%)                           | 0    | 0.46 | 1.74 | 5.96 | 16.1 | 28.9 | 36.5 |
| Sales of water heating units - Electric Resistance (%)                          | 13.2 | 25.6 | 26.5 | 29.7 | 37.4 | 47.1 | 52.9 |
| Sales of water heating units - Gas Furnace (%)                                  | 85.7 | 72.7 | 70.5 | 63.1 | 45.3 | 22.7 | 9.32 |
| Sales of water heating units - Other (%)  | 1.07 | 1.23 | 1.23 | 1.23 | 1.22 | 1.22 | 1.21 |
| Sales of cooking units - Electric Resistance (%)                                | 50.3 | 51.6 | 56.1 | 68.1 | 84.8 | 95.1 | 98.7 |
| Sales of cooking units - Gas (%)  | 49.7 | 48.4 | 43.9 | 31.9 | 15.2 | 4.9  | 1.32 |
| Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018) |      | 4.41 | 4.7  |      |      |      |      |

Table 55: E-B+ scenario - PILLAR 1: Efficiency/Electrification - Commercial

| Item   | 2020  | 2025   | 2030   | 2035  | 2040  | 2045  | 2050  |
|--|-------|--------|--------|-------|-------|-------|-------|
| Sales of space heating units - Electric Heat Pump (%)                  | 2.64  | 7.26   | 9.83   | 18.3  | 38.7  | 64.6  | 80    |
| Sales of space heating units - Electric Resistance (%)                 | 2.48  | 3.43   | 3.58   | 4.11  | 5.42  | 7.07  | 8.03  |
| Sales of space heating units - Gas Furnace (%)                         | 94.9  | 89.1   | 86.4   | 77.4  | 55.8  | 28.3  | 12    |
| Sales of space heating units - Fossil (%)                              | 0     | 0.241  | 0.225  | 0.171 | 0.089 | 0.035 | 0.016 |
| Sales of water heating units - Electric Heat Pump (%)                  | 0.022 | 0.571  | 2.07   | 7.05  | 19    | 34.1  | 43.1  |
| Sales of water heating units - Electric Resistance (%)                 | 1.1   | 2      | 3.47   | 8.35  | 20.1  | 35.1  | 44    |
| Sales of water heating units - Gas Furnace (%)                         | 98.6  | 97     | 94.1   | 84.2  | 60.5  | 30.4  | 12.5  |
| Sales of water heating units - Other (%)                               | 0.269 | 0.383  | 0.382  | 0.383 | 0.382 | 0.383 | 0.383 |
| Sales of cooking units - Electric Resistance (%)                       | 41.9  | 46.2   | 50.2   | 60.8  | 75.4  | 84.6  | 87.8  |
| Sales of cooking units - Gas (%)                                       | 58.1  | 53.8   | 49.8   | 39.2  | 24.6  | 15.4  | 12.2  |
| Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018) |       | 14,373 | 15,986 |       |       |       |       |

Table 56: E-B+ scenario - PILLAR 2: Clean Electricity - Generating capacity

| Item                                 | 2020  | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|--------------------------------------|-------|-------|-------|-------|-------|-------|-------|
| Installed thermal - Coal (MW)        | 4,905 | 2,238 | 0     | 0     | 0     | 0     | 0     |
| Installed thermal - Natural gas (MW) | 5,482 | 5,268 | 6,832 | 6,476 | 5,115 | 9,206 | 9,024 |
| Installed thermal - Nuclear (MW)     | 0     | 0     | 0.002 | 0.005 | 0.007 | 0.014 | 0.028 |

Table 56: E-B+ scenario - PILLAR 2: Clean Electricity - Generating capacity (continued)

| Item  | 2020 | 2025 | 2030 | 2035 | 2040  | 2045 | 2050  |
|---|------|------|------|------|-------|------|-------|
| Capital invested - Biomass power plant (billion \$2018)             | 0    | 0    | 0    | 0    | 0     | 0    | 0     |
| Capital invested - Biomass w/ccu allam power plant (billion \$2018) | 0    | 0    | 0    | 0    | 0.009 | 0    | 0.042 |
| Capital invested - Biomass w/ccu power plant (billion \$2018)       | 0    | 0    | 0    | 0    | 0.139 | 0    | 0.584 |

Table 57: 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 power plant (GWh)       | 0    | 0    | 0    | 0    | 156  | 156  | 812  |
| Biomass w/ccu allam power plant (GWh) | 0    | 0    | 0    | 0    | 9    | 9    | 51   |

Table 58: E-B+ scenario - PILLAR 3: Clean fuels - Bioenergy

| Item   | 2020 | 2025 | 2030 | 2035 | 2040  | 2045  | 2050 |
|--|------|------|------|------|-------|-------|------|
| Number of facilities - Power (quantity)                          | 0    | 0    | 0    | 0    | 0     | 0     | 0    |
| Number of facilities - Power ccu (quantity)                      | 0    | 0    | 0    | 0    | 1     | 1     | 2    |
| Number of facilities - Allam power w ccu (quantity)              | 0    | 0    | 0    | 0    | 1     | 1     | 2    |
| Number of facilities - Beccs hydrogen (quantity)                 | 0    | 0    | 0    | 0    | 1     | 5     | 5    |
| Number of facilities - Diesel (quantity)                         | 0    | 0    | 0    | 0    | 0     | 0     | 0    |
| Number of facilities - Diesel ccu (quantity)                     | 0    | 0    | 0    | 0    | 1     | 1     | 1    |
| Number of facilities - Pyrolysis (quantity)                      | 0    | 0    | 0    | 0    | 0     | 0     | 0    |
| Number of facilities - Pyrolysis ccu (quantity)                  | 0    | 0    | 0    | 0    | 1     | 1     | 1    |
| Number of facilities - Sng (quantity)                            | 0    | 0    | 0    | 0    | 0     | 0     | 0    |
| Number of facilities - Sng ccu (quantity)                        | 0    | 0    | 0    | 0    | 0     | 0     | 0    |
| Conversion capital investment - Cumulative 5-yr (million \$2018) |      | 0    | 0    | 0    | 1,360 | 3,889 | 588  |
| Biomass purchases (million \$2018/y)                             |      | 0    | 0    | 0    | 117   | 458   | 500  |

Table 59: E-B+ scenario - PILLAR 4: CCUS - CO2 capture

| Item                               | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|------------------------------------|------|------|------|------|------|------|------|
| Annual - All (MMT)                 |      | 0    | 0    | 3.38 | 5.08 | 10.2 | 11   |
| Annual - BECCS (MMT)               |      | 0    | 0    | 0    | 1.72 | 6.72 | 7.4  |
| Annual - NGCC (MMT)                |      | 0    | 0    | 0.03 | 0.04 | 0.04 | 0.04 |
| Annual - Cement and lime (MMT)     |      | 0    | 0    | 3.35 | 3.32 | 3.42 | 3.53 |
| Cumulative - All (MMT)             |      | 0    | 0    | 3.38 | 8.46 | 18.6 | 29.6 |
| Cumulative - BECCS (MMT)           |      | 0    | 0    | 0    | 1.72 | 8.44 | 15.8 |
| Cumulative - NGCC (MMT)            |      | 0    | 0    | 0.03 | 0.07 | 0.11 | 0.15 |
| Cumulative - Cement and lime (MMT) |      | 0    | 0    | 3.35 | 6.67 | 10.1 | 13.6 |

Table 60: E-B+ scenario - PILLAR 4: CCUS - CO2 pipelines

| Item   | 2020 | 2025 | 2030  | 2035  | 2040  | 2045  | 2050  |
|--|------|------|-------|-------|-------|-------|-------|
| Trunk (km)                                     |      | 0    | 255   | 255   | 255   | 255   | 255   |
| Spur (km)                                      |      | 0    | 0.5   | 441   | 747   | 1,442 | 1,874 |
| All (km)                                       |      | 0    | 256   | 696   | 1,003 | 1,698 | 2,129 |
| Cumulative investment - Trunk (million \$2018) |      | 0    | 1,225 | 1,339 | 1,339 | 1,339 | 1,339 |
| Cumulative investment - Spur (million \$2018)  |      | 0    | 0.299 | 360   | 674   | 1,236 | 1,497 |
| Cumulative investment - All (million \$2018)   |      | 0    | 1,225 | 1,699 | 2,013 | 2,575 | 2,836 |

Table 61: E-B+ scenario - PILLAR 4: CCUS - CO2 storage

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|------|------|------|------|------|------|------|
| Annual (MMT)  |      | 0    | 0    | 2.14 | 3.56 | 4.92 | 5.02 |
| Injection wells (wells)   |      | 0    | 1    | 3    | 6    | 9    | 12   |
| Resource characterization, appraisal, permitting costs (million \$2020) |      | 36   | 101  | 129  | 129  | 129  | 129  |
| Wells and facilities construction costs (million \$2020)                |      | 0    | 24   | 93.3 | 166  | 278  | 345  |

Table 62: E-B+ scenario - PILLAR 6: Land sinks - Forests

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050    |
|---|------|------|------|------|------|------|---------|
| Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)        |      |      |      |      |      |      | -812    |
| Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)            |      |      |      |      |      |      | -260    |
| Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)         |      |      |      |      |      |      | -3,547  |
| Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)            |      |      |      |      |      |      | -13.7   |
| Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)      |      |      |      |      |      |      | -58.1   |
| Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y) |      |      |      |      |      |      | -446    |
| Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)              |      |      |      |      |      |      | -12,451 |
| Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)               |      |      |      |      |      |      | -245    |
| Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)           |      |      |      |      |      |      | -2,063  |
| Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)     |      |      |      |      |      |      | -19,895 |
| Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)        |      |      |      |      |      |      | -1,216  |
| Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)            |      |      |      |      |      |      | -909    |
| Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)         |      |      |      |      |      |      | -6,390  |
| Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)            |      |      |      |      |      |      | -20     |
| Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)      |      |      |      |      |      |      | -116    |
| Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y) |      |      |      |      |      |      | -859    |
| Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)              |      |      |      |      |      |      | -18,676 |
| Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)               |      |      |      |      |      |      | -1,742  |
| Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)           |      |      |      |      |      |      | -4,092  |
| Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)     |      |      |      |      |      |      | -34,021 |
| Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)       |      |      |      |      |      |      | -1,620  |
| Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)           |      |      |      |      |      |      | -1,559  |
| Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)        |      |      |      |      |      |      | -9,233  |
| Carbon sink potential - High - Improve plantations (1000 tCO2e/y)           |      |      |      |      |      |      | -26.8   |

Table 62: E-B+ scenario - PILLAR 6: Land sinks - Forests (continued)

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050    |
|---|------|------|------|------|------|------|---------|
| Carbon sink potential - High - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)                |      |      |      |      |      |      | -174    |
| Carbon sink potential - High - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)           |      |      |      |      |      |      | -1,273  |
| Carbon sink potential - High - Reforest cropland (1000 tCO <sub>2</sub> e/y)                        |      |      |      |      |      |      | -24,902 |
| Carbon sink potential - High - Reforest pasture (1000 tCO <sub>2</sub> e/y)                         |      |      |      |      |      |      | -3,239  |
| Carbon sink potential - High - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)               |      |      |      |      |      |      | -48,148 |
| Carbon sink potential - High - Restore productivity (1000 tCO <sub>2</sub> e/y)                     |      |      |      |      |      |      | -6,121  |
| Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)             |      |      |      |      |      |      | 133     |
| Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares) |      |      |      |      |      |      | 198     |
| Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)              |      |      |      |      |      |      | 1,804   |
| Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)                 |      |      |      |      |      |      | 4.95    |
| Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)           |      |      |      |      |      |      | 0       |
| Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)      |      |      |      |      |      |      | 63.7    |
| Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)                   |      |      |      |      |      |      | 823     |
| Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)                    |      |      |      |      |      |      | 15.9    |
| Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)                |      |      |      |      |      |      | 1,228   |
| Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)      |      |      |      |      |      |      | 4,270   |
| Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)             |      |      |      |      |      |      | 199     |
| Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares) |      |      |      |      |      |      | 205     |
| Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)              |      |      |      |      |      |      | 3,256   |
| Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)                 |      |      |      |      |      |      | 7.44    |
| Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)           |      |      |      |      |      |      | 0       |
| Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)      |      |      |      |      |      |      | 92.3    |
| Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)                   |      |      |      |      |      |      | 1,235   |
| Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)                    |      |      |      |      |      |      | 115     |



Table 62: E-B+ scenario - PILLAR 6: Land sinks - Forests (continued)

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|--|------|------|------|------|------|------|-------|
| Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)                 |      |      |      |      |      |      | 2,472 |
| Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)       |      |      |      |      |      |      | 7,582 |
| Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)             |      |      |      |      |      |      | 265   |
| Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares) |      |      |      |      |      |      | 211   |
| Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)              |      |      |      |      |      |      | 4,708 |
| Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)                 |      |      |      |      |      |      | 9.89  |
| Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)           |      |      |      |      |      |      | 0     |
| Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)      |      |      |      |      |      |      | 121   |
| Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)                   |      |      |      |      |      |      | 1,646 |
| Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)                    |      |      |      |      |      |      | 92    |
| Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)                |      |      |      |      |      |      | 2,029 |
| Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)      |      |      |      |      |      |      | 9,083 |

Table 63: E-B+ scenario - PILLAR 6: Land sinks - Agriculture

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050   |
|---|------|------|------|------|------|------|--------|
| Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)   |      |      |      |      |      |      | -376   |
| Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)                |      |      |      |      |      |      | -1,338 |
| Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)     |      |      |      |      |      |      | -102   |
| Carbon sink potential - Moderate deployment - Cropland to woody energy crops (1000 tCO2e/y)   |      |      |      |      |      |      | 0      |
| Carbon sink potential - Moderate deployment - Pasture to energy crops (1000 tCO2e/y)          |      |      |      |      |      |      | 0      |
| Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)                            |      |      |      |      |      |      | -1,815 |
| Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y) |      |      |      |      |      |      | -376   |
| Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)              |      |      |      |      |      |      | -2,573 |

Table 63: E-B+ scenario - PILLAR 6: Land sinks - Agriculture (continued)

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050   |
|--|------|------|------|------|------|------|--------|
| Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)            |      |      |      |      |      |      | -205   |
| Carbon sink potential - Aggressive deployment - Cropland to woody energy crops (1000 tCO2e/y)          |      |      |      |      |      |      | 0      |
| Carbon sink potential - Aggressive deployment - Pasture to energy crops (1000 tCO2e/y)                 |      |      |      |      |      |      | 0      |
| Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)                                   |      |      |      |      |      |      | -3,153 |
| Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)   |      |      |      |      |      |      | 313    |
| Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)                |      |      |      |      |      |      | 2,000  |
| Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)     |      |      |      |      |      |      | 157    |
| Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)   |      |      |      |      |      |      | 8.67   |
| Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)          |      |      |      |      |      |      | 0.404  |
| Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)                            |      |      |      |      |      |      | 2,479  |
| Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares) |      |      |      |      |      |      | 313    |
| Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)              |      |      |      |      |      |      | 9,486  |
| Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)   |      |      |      |      |      |      | 314    |
| Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares) |      |      |      |      |      |      | 8.67   |
| Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)        |      |      |      |      |      |      | 0.404  |
| Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)                          |      |      |      |      |      |      | 10,123 |

Table 64: REF scenario - IMPACTS - Health

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--|------|------|------|------|------|------|------|
| Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)        |      | 56.9 | 27.7 | 15.7 | 12.3 | 10.8 | 10.4 |
| Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths) |      | 33.6 | 35.3 | 34.3 | 25.5 | 21.1 | 8.35 |
| Premature deaths from air pollution - Mobile - On-Road (deaths)                              |      | 104  | 112  | 120  | 129  | 137  | 145  |
| Premature deaths from air pollution - Gas Stations (deaths)                                  |      | 11   | 11.8 | 12.6 | 13.4 | 14.2 | 15   |

Table 64: REF scenario - IMPACTS - Health (continued)

| Item   | 2020 | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|--|------|-------|-------|-------|-------|-------|-------|
| Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)                 |      | 23.1  | 23.7  | 24.4  | 25.4  | 26.8  | 28.2  |
| Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)                         |      | 0.09  | 0.088 | 0.077 | 0.064 | 0.054 | 0.049 |
| Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)                       |      | 2.31  | 2.53  | 2.81  | 3.09  | 3.27  | 3.43  |
| Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)                 |      | 0.29  | 0.303 | 0.314 | 0.324 | 0.333 | 0.34  |
| Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)          |      | 9.02  | 9.38  | 9.12  | 8.63  | 8.44  | 8.73  |
| Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)                  |      | 1.54  | 1.58  | 1.64  | 1.7   | 1.75  | 1.81  |
| Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)                |      | 1.93  | 2.09  | 2.27  | 2.43  | 2.6   | 2.77  |
| Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)                    |      | 4.2   | 2.82  | 2.22  | 2.14  | 2.08  | 1.96  |
| Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)           |      | 165   | 185   | 201   | 199   | 208   | 207   |
| Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)        |      | 504   | 246   | 139   | 109   | 95.6  | 91.8  |
| Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019) |      | 298   | 312   | 304   | 226   | 187   | 74    |
| Monetary damages from air pollution - Mobile - On-Road (million \$2019)                              |      | 927   | 999   | 1,069 | 1,143 | 1,217 | 1,293 |
| Monetary damages from air pollution - Gas Stations (million \$2019)                                  |      | 97.2  | 104   | 111   | 119   | 126   | 133   |
| Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)         |      | 205   | 210   | 216   | 225   | 237   | 250   |
| Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)                 |      | 0.799 | 0.775 | 0.68  | 0.567 | 0.483 | 0.436 |
| Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)               |      | 20.5  | 22.4  | 24.9  | 27.4  | 29    | 30.4  |
| Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)         |      | 2.57  | 2.68  | 2.78  | 2.87  | 2.95  | 3.01  |
| Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)  |      | 79.8  | 83    | 80.8  | 76.4  | 74.7  | 77.3  |
| Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)          |      | 13.6  | 14    | 14.5  | 15    | 15.5  | 16    |
| Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)        |      | 17.1  | 18.5  | 20.1  | 21.5  | 23    | 24.6  |
| Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)            |      | 37    | 24.9  | 19.6  | 18.9  | 18.4  | 17.3  |

Table 64: REF scenario - IMPACTS - Health (continued)

| Item   | 2020 | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|--|------|-------|-------|-------|-------|-------|-------|
| Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019) |      | 1,463 | 1,647 | 1,781 | 1,771 | 1,847 | 1,842 |

Table 65: REF scenario - IMPACTS - Jobs

| Item  | 2020 | 2025   | 2030   | 2035   | 2040   | 2045   | 2050   |
|---|------|--------|--------|--------|--------|--------|--------|
| By economic sector - Agriculture (jobs)                                     |      | 228    | 227    | 227    | 225    | 225    | 225    |
| By economic sector - Construction (jobs)                                    |      | 8,505  | 10,987 | 11,700 | 12,936 | 13,830 | 15,600 |
| By economic sector - Manufacturing (jobs)                                   |      | 7,857  | 10,159 | 12,078 | 11,817 | 9,696  | 9,782  |
| By economic sector - Mining (jobs)  |      | 15,059 | 12,562 | 10,470 | 8,429  | 6,961  | 5,413  |
| By economic sector - Other (jobs)   |      | 329    | 832    | 993    | 1,253  | 1,488  | 2,361  |
| By economic sector - Pipeline (jobs)  |      | 1,308  | 1,362  | 1,383  | 1,321  | 1,322  | 1,261  |
| By economic sector - Professional (jobs)                                    |      | 5,975  | 6,688  | 6,879  | 7,675  | 8,232  | 9,265  |
| By economic sector - Trade (jobs)   |      | 6,953  | 6,920  | 6,698  | 6,824  | 6,940  | 7,524  |
| By economic sector - Utilities (jobs)                                       |      | 7,148  | 7,643  | 8,084  | 9,121  | 9,967  | 9,847  |
| By resource sector - Biomass (jobs)   |      | 550    | 534    | 518    | 503    | 493    | 484    |
| By resource sector - CO2 (jobs)   |      | 0      | 0.021  | 0.027  | 0.029  | 0.032  | 0.034  |
| By resource sector - Coal (jobs)  |      | 2,796  | 1,570  | 881    | 675    | 434    | 269    |
| By resource sector - Grid (jobs)  |      | 6,630  | 7,432  | 8,543  | 10,808 | 12,198 | 12,606 |
| By resource sector - Natural Gas (jobs)                                     |      | 14,815 | 15,206 | 14,948 | 13,749 | 13,725 | 12,594 |
| By resource sector - Nuclear (jobs)   |      | 0      | 0.002  | 0.004  | 0.005  | 0.01   | 0.018  |
| By resource sector - Oil (jobs)   |      | 25,283 | 22,911 | 20,887 | 18,881 | 17,273 | 14,602 |
| By resource sector - Solar (jobs)   |      |        | 4,628  | 5,982  | 6,346  | 6,748  | 12,523 |
| By resource sector - Wind (jobs)  |      | 3,290  | 5,099  | 6,753  | 8,641  | 7,790  | 8,199  |
| By education level - All sectors - High school diploma or less (jobs)       |      | 21,609 | 23,531 | 24,190 | 24,705 | 24,289 | 25,462 |
| By education level - All sectors - Associates degree or some college (jobs) |      | 15,431 | 16,957 | 17,513 | 18,063 | 17,937 | 18,963 |
| By education level - All sectors - Bachelors degree (jobs)                  |      | 12,827 | 13,284 | 13,241 | 13,229 | 12,861 | 13,149 |
| By education level - All sectors - Masters or professional degree (jobs)    |      | 3,059  | 3,152  | 3,120  | 3,147  | 3,110  | 3,213  |
| By education level - All sectors - Doctoral degree (jobs)                   |      | 437    | 455    | 448    | 459    | 463    | 491    |
| Related work experience - All sectors - None (jobs)                         |      | 7,421  | 8,051  | 8,252  | 8,454  | 8,380  | 8,802  |
| Related work experience - All sectors - Up to 1 year (jobs)                 |      | 9,998  | 10,926 | 11,232 | 11,484 | 11,250 | 11,917 |
| Related work experience - All sectors - 1 to 4 years (jobs)                 |      | 19,932 | 21,227 | 21,541 | 21,879 | 21,533 | 22,379 |
| Related work experience - All sectors - 4 to 10 years (jobs)                |      | 12,537 | 13,457 | 13,698 | 13,966 | 13,789 | 14,355 |
| Related work experience - All sectors - Over 10 years (jobs)                |      | 3,476  | 3,717  | 3,788  | 3,820  | 3,709  | 3,825  |
| On-the-Job Training - All sectors - None (jobs)                             |      | 3,005  | 3,195  | 3,213  | 3,244  | 3,176  | 3,340  |
| On-the-Job Training - All sectors - Up to 1 year (jobs)                     |      | 36,191 | 38,673 | 39,383 | 39,918 | 39,017 | 40,596 |
| On-the-Job Training - All sectors - 1 to 4 years (jobs)                     |      | 10,644 | 11,591 | 11,884 | 12,213 | 12,147 | 12,736 |
| On-the-Job Training - All sectors - 4 to 10 years (jobs)                    |      | 3,023  | 3,363  | 3,455  | 3,644  | 3,761  | 4,016  |
| On-the-Job Training - All sectors - Over 10 years (jobs)                    |      | 499    | 557    | 577    | 583    | 561    | 591    |
| On-Site or In-Plant Training - All sectors - None (jobs)                    |      | 8,505  | 9,192  | 9,372  | 9,539  | 9,355  | 9,843  |
| On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)            |      | 32,789 | 35,022 | 35,649 | 36,150 | 35,376 | 36,805 |

Table 65: REF scenario - IMPACTS - Jobs (continued)

| Item  | 2020 | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|---|------|-------|-------|-------|-------|-------|-------|
| On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)  |      | 8,362 | 9,090 | 9,318 | 9,556 | 9,478 | 9,927 |
| On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs) |      | 3,318 | 3,637 | 3,713 | 3,875 | 3,962 | 4,183 |
| On-Site or In-Plant Training - All sectors - Over 10 years (jobs) |      | 388   | 438   | 459   | 483   | 490   | 520   |
| Wage income - All (million \$2019)                                |      | 3,380 | 3,613 | 3,692 | 3,784 | 3,781 | 3,946 |

Table 66: REF scenario - PILLAR 1: Efficiency/Electrification - Overview

| Item                                   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--|------|------|------|------|------|------|------|
| Final energy use - Transportation (PJ) | 472  | 451  | 423  | 407  | 409  | 422  | 438  |
| Final energy use - Residential (PJ)    | 237  | 231  | 230  | 232  | 235  | 240  | 244  |
| Final energy use - Commercial (PJ)     | 162  | 165  | 169  | 170  | 172  | 177  | 185  |
| Final energy use - Industry (PJ)       | 171  | 186  | 198  | 211  | 225  | 243  | 262  |

Table 67: REF scenario - PILLAR 1: Efficiency/Electrification - Electricity demand

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--|------|------|------|------|------|------|------|
| Electricity distribution capital invested - Cumulative 5-yr (billion \$2018) |      | 2.52 | 2.6  | 3.5  | 3.68 | 4    | 4.2  |

Table 68: REF scenario - PILLAR 1: Efficiency/Electrification - Residential

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|------|------|------|------|------|------|------|
| Sales of space heating units - Electric Heat Pump (%)                           | 5.05 | 16.1 | 16.5 | 17   | 17.5 | 17.9 | 18.5 |
| Sales of space heating units - Electric Resistance (%)                          | 7.73 | 13.4 | 13.3 | 13.2 | 13.1 | 12.7 | 12.1 |
| Sales of space heating units - Gas (%)  | 83.9 | 65   | 64.8 | 64.4 | 64.3 | 64.4 | 64.2 |
| Sales of space heating units - Fossil (%)                                       | 3.28 | 5.42 | 5.49 | 5.36 | 5.12 | 5.04 | 5.13 |
| Sales of water heating units - Electric Heat Pump (%)                           | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| Sales of water heating units - Electric Resistance (%)                          | 13.2 | 25.2 | 25.3 | 25.3 | 25.4 | 25.4 | 25.4 |
| Sales of water heating units - Gas Furnace (%)                                  | 85.7 | 73.5 | 73.5 | 73.5 | 73.4 | 73.4 | 73.4 |
| Sales of water heating units - Other (%)  | 1.07 | 1.23 | 1.23 | 1.23 | 1.22 | 1.22 | 1.22 |
| Sales of cooking units - Electric Resistance (%)                                | 49.8 | 49.8 | 49.8 | 49.8 | 49.8 | 49.8 | 49.8 |
| Sales of cooking units - Gas (%)  | 50.2 | 50.2 | 50.2 | 50.2 | 50.2 | 50.2 | 50.2 |
| Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018) |      | 4.33 | 4.39 |      |      |      |      |

Table 69: REF scenario - PILLAR 1: Efficiency/Electrification - Commercial

| Item   | 2020  | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|--|-------|-------|-------|-------|-------|-------|-------|
| Sales of space heating units - Electric Heat Pump (%)  | 2.64  | 13.8  | 46.2  | 73.2  | 77.9  | 78.5  | 78.5  |
| Sales of space heating units - Electric Resistance (%) | 2.48  | 4.35  | 8.94  | 16    | 20.3  | 21    | 21    |
| Sales of space heating units - Gas Furnace (%)         | 94.9  | 81.6  | 44.8  | 10.8  | 1.79  | 0.573 | 0.499 |
| Sales of space heating units - Fossil (%)              | 0     | 0.226 | 0.135 | 0.038 | 0.005 | 0     | 0     |
| Sales of water heating units - Electric Heat Pump (%)  | 0.022 | 0.03  | 0.03  | 0.03  | 0.03  | 0.03  | 0.03  |
| Sales of water heating units - Electric Resistance (%) | 1.1   | 1.47  | 1.47  | 1.48  | 1.46  | 1.48  | 1.47  |
| Sales of water heating units - Gas Furnace (%)         | 98.6  | 98.1  | 98.1  | 98.1  | 98.1  | 98.1  | 98.1  |

Table 69: REF scenario - PILLAR 1: Efficiency/Electrification - Commercial (continued)

| Item   | 2020  | 2025   | 2030   | 2035  | 2040  | 2045  | 2050  |
|--|-------|--------|--------|-------|-------|-------|-------|
| Sales of water heating units - Other (%)                               | 0.269 | 0.383  | 0.382  | 0.383 | 0.382 | 0.383 | 0.383 |
| Sales of cooking units - Electric Resistance (%)                       | 41.9  | 44.7   | 44.7   | 44.6  | 44.4  | 44.5  | 44.6  |
| Sales of cooking units - Gas (%)                                       | 58.1  | 55.3   | 55.3   | 55.4  | 55.6  | 55.5  | 55.4  |
| Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018) |       | 14,192 | 14,841 |       |       |       |       |

Table 70: REF scenario - PILLAR 2: Clean Electricity - Generating capacity

| Item  | 2020  | 2025  | 2030  | 2035  | 2040  | 2045  | 2050  |
|---|-------|-------|-------|-------|-------|-------|-------|
| Installed thermal - Coal (MW)                                 | 4,905 | 3,567 | 1,685 | 857   | 857   | 0     | 0     |
| Installed thermal - Natural gas (MW)                          | 5,482 | 4,370 | 6,784 | 7,114 | 6,700 | 8,304 | 7,394 |
| Installed thermal - Nuclear (MW)                              | 0     | 0     | 0.001 | 0.003 | 0.004 | 0.008 | 0.014 |
| Installed renewables - Rooftop PV (MW)                        | 895   | 1,362 | 1,825 | 2,410 | 3,134 | 4,018 | 5,120 |
| Installed renewables - Solar - Base land use assumptions (MW) | 454   | 454   | 454   | 454   | 454   | 454   | 454   |
| Installed renewables - Wind - Base land use assumptions (MW)  | 4,732 | 4,732 | 4,732 | 4,732 | 5,862 | 6,384 | 6,384 |

Table 71: REF scenario - PILLAR 2: Clean Electricity - Generation

| Item   | 2020   | 2025   | 2030   | 2035   | 2040   | 2045   | 2050   |
|--|--------|--------|--------|--------|--------|--------|--------|
| Solar - Base land use assumptions (GWh)        | 1,142  | 1,142  | 1,142  | 1,142  | 1,142  | 1,142  | 1,142  |
| Wind - Base land use assumptions (GWh)         | 16,760 | 16,760 | 16,760 | 16,760 | 20,850 | 22,799 | 22,799 |
| OffshoreWind - Base land use assumptions (GWh) | 0      | 0      | 0      | 0      | 0      | 0      | 0      |

Table 72: 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)                | 6.25   |      | 4.02   |      |      |      | 1.15   |
| Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y) | -0.047 |      | -0.099 |      |      |      | -0.104 |
| Business-as-usual carbon sink - Total (Mt CO2e/y)                         | 6.2    |      | 3.93   |      |      |      | 1.05   |

Table 73: REF scenario - PILLAR 6: Land sinks - Forests

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050    |
|---|------|------|------|------|------|------|---------|
| Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)        |      |      |      |      |      |      | -812    |
| Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)            |      |      |      |      |      |      | -260    |
| Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)         |      |      |      |      |      |      | -3,547  |
| Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)            |      |      |      |      |      |      | -13.7   |
| Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)      |      |      |      |      |      |      | -58.1   |
| Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y) |      |      |      |      |      |      | -446    |
| Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)              |      |      |      |      |      |      | -12,451 |
| Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)               |      |      |      |      |      |      | -245    |
| Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)           |      |      |      |      |      |      | -2,063  |
| Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)     |      |      |      |      |      |      | -19,895 |

Table 73: REF scenario - PILLAR 6: Land sinks - Forests (continued)

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050    |
|---|------|------|------|------|------|------|---------|
| Carbon sink potential - Mid - Accelerate regeneration (1000 tCO <sub>2</sub> e/y)                   |      |      |      |      |      |      | -1,216  |
| Carbon sink potential - Mid - Avoid deforestation (1000 tCO <sub>2</sub> e/y)                       |      |      |      |      |      |      | -909    |
| Carbon sink potential - Mid - Extend rotation length (1000 tCO <sub>2</sub> e/y)                    |      |      |      |      |      |      | -6,390  |
| Carbon sink potential - Mid - Improve plantations (1000 tCO <sub>2</sub> e/y)                       |      |      |      |      |      |      | -20     |
| Carbon sink potential - Mid - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)                 |      |      |      |      |      |      | -116    |
| Carbon sink potential - Mid - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)            |      |      |      |      |      |      | -859    |
| Carbon sink potential - Mid - Reforest cropland (1000 tCO <sub>2</sub> e/y)                         |      |      |      |      |      |      | -18,676 |
| Carbon sink potential - Mid - Reforest pasture (1000 tCO <sub>2</sub> e/y)                          |      |      |      |      |      |      | -1,742  |
| Carbon sink potential - Mid - Restore productivity (1000 tCO <sub>2</sub> e/y)                      |      |      |      |      |      |      | -4,092  |
| Carbon sink potential - Mid - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)                |      |      |      |      |      |      | -34,021 |
| Carbon sink potential - High - Accelerate regeneration (1000 tCO <sub>2</sub> e/y)                  |      |      |      |      |      |      | -1,620  |
| Carbon sink potential - High - Avoid deforestation (1000 tCO <sub>2</sub> e/y)                      |      |      |      |      |      |      | -1,559  |
| Carbon sink potential - High - Extend rotation length (1000 tCO <sub>2</sub> e/y)                   |      |      |      |      |      |      | -9,233  |
| Carbon sink potential - High - Improve plantations (1000 tCO <sub>2</sub> e/y)                      |      |      |      |      |      |      | -26.8   |
| Carbon sink potential - High - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)                |      |      |      |      |      |      | -174    |
| Carbon sink potential - High - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)           |      |      |      |      |      |      | -1,273  |
| Carbon sink potential - High - Reforest cropland (1000 tCO <sub>2</sub> e/y)                        |      |      |      |      |      |      | -24,902 |
| Carbon sink potential - High - Reforest pasture (1000 tCO <sub>2</sub> e/y)                         |      |      |      |      |      |      | -3,239  |
| Carbon sink potential - High - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)               |      |      |      |      |      |      | -48,148 |
| Carbon sink potential - High - Restore productivity (1000 tCO <sub>2</sub> e/y)                     |      |      |      |      |      |      | -6,121  |
| Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)             |      |      |      |      |      |      | 133     |
| Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares) |      |      |      |      |      |      | 198     |
| Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)              |      |      |      |      |      |      | 1,804   |
| Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)                 |      |      |      |      |      |      | 4.95    |
| Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)           |      |      |      |      |      |      | 0       |
| Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)      |      |      |      |      |      |      | 63.7    |
| Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)                   |      |      |      |      |      |      | 823     |

Table 73: REF scenario - PILLAR 6: Land sinks - Forests (continued)

| Item   | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|--|------|------|------|------|------|------|-------|
| Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)                     |      |      |      |      |      |      | 15.9  |
| Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)                 |      |      |      |      |      |      | 1,228 |
| Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)       |      |      |      |      |      |      | 4,270 |
| Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)              |      |      |      |      |      |      | 199   |
| Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)  |      |      |      |      |      |      | 205   |
| Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)               |      |      |      |      |      |      | 3,256 |
| Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)                  |      |      |      |      |      |      | 7.44  |
| Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)            |      |      |      |      |      |      | 0     |
| Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)       |      |      |      |      |      |      | 92.3  |
| Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)                    |      |      |      |      |      |      | 1,235 |
| Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)                     |      |      |      |      |      |      | 115   |
| Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)                 |      |      |      |      |      |      | 2,472 |
| Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)       |      |      |      |      |      |      | 7,582 |
| Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)             |      |      |      |      |      |      | 265   |
| Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares) |      |      |      |      |      |      | 211   |
| Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)              |      |      |      |      |      |      | 4,708 |
| Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)                 |      |      |      |      |      |      | 9.89  |
| Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)           |      |      |      |      |      |      | 0     |
| Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)      |      |      |      |      |      |      | 121   |
| Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)                   |      |      |      |      |      |      | 1,646 |
| Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)                    |      |      |      |      |      |      | 92    |
| Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)                |      |      |      |      |      |      | 2,029 |



Table 73: REF scenario - PILLAR 6: Land sinks - Forests (continued)

| Item  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050  |
|---|------|------|------|------|------|------|-------|
| Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares) |      |      |      |      |      |      | 9,083 |