# Appendix B
# Annual Results of Fuel-Cycle Energy and Emissions Analysis: High-Market-Share Scenario

## Table B.1 Energy Use from Vehicle Operation

| | Operational Energy Use for the Base Case and for Each PNGV Technology/Fuel Combination (quads) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base Case | CV+RFG | CV+MeOH | CV+EtOH | CV+RFD | CV+DME | CV+HFCV | CV+MFCV | CV+GFC | CV+FTD/RFD | CV+Bio/RFD | CV+LPG | CV+CNG | CV+LNG |
| 2005 | 14.1 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 |
| 2006 | 14.2 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 |
| 2007 | 14.3 | 14.2 | 14.2 | 14.2 | 14.2 | 14.2 | 14.2 | 14.2 | 14.2 | 14.2 | 14.2 | 14.2 | 14.2 | 14.2 |
| 2008 | 14.4 | 14.3 | 14.3 | 14.3 | 14.3 | 14.3 | 14.3 | 14.3 | 14.3 | 14.3 | 14.3 | 14.3 | 14.3 | 14.3 |
| 2009 | 14.6 | 14.6 | 14.6 | 14.6 | 14.6 | 14.6 | 14.6 | 14.6 | 14.6 | 14.6 | 14.6 | 14.6 | 14.6 | 14.6 |
| 2010 | 14.8 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 |
| 2011 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 |
| 2012 | 15.0 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 |
| 2013 | 15.1 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 |
| 2014 | 15.1 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 |
| 2015 | 15.1 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 |
| 2016 | 15.1 | 14.8 | 14.8 | 14.8 | 14.8 | 14.8 | 14.8 | 14.8 | 14.8 | 14.8 | 14.8 | 14.8 | 14.8 | 14.8 |
| 2017 | 15.1 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 |
| 2018 | 15.1 | 14.5 | 14.5 | 14.5 | 14.5 | 14.5 | 14.5 | 14.5 | 14.5 | 14.5 | 14.5 | 14.5 | 14.5 | 14.5 |
| 2019 | 15.1 | 14.3 | 14.3 | 14.3 | 14.3 | 14.3 | 14.3 | 14.3 | 14.3 | 14.3 | 14.3 | 14.3 | 14.3 | 14.3 |
| 2020 | 15.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 |
| 2021 | 15.1 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 |
| 2022 | 15.1 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 |
| 2023 | 15.1 | 13.2 | 13.2 | 13.2 | 13.2 | 13.2 | 13.2 | 13.2 | 13.2 | 13.2 | 13.2 | 13.2 | 13.2 | 13.2 |
| 2024 | 15.1 | 12.9 | 12.9 | 12.9 | 12.9 | 12.9 | 12.9 | 12.9 | 12.9 | 12.9 | 12.9 | 12.9 | 12.9 | 12.9 |
| 2025 | 15.1 | 12.6 | 12.6 | 12.6 | 12.6 | 12.6 | 12.6 | 12.6 | 12.6 | 12.6 | 12.6 | 12.6 | 12.6 | 12.6 |
| 2026 | 15.2 | 12.2 | 12.2 | 12.2 | 12.2 | 12.2 | 12.2 | 12.2 | 12.2 | 12.2 | 12.2 | 12.2 | 12.2 | 12.2 |
| 2027 | 15.2 | 11.9 | 11.9 | 11.9 | 11.9 | 11.9 | 11.9 | 11.9 | 11.9 | 11.9 | 11.9 | 11.9 | 11.9 | 11.9 |
| 2028 | 15.2 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 |
| 2029 | 15.2 | 11.4 | 11.4 | 11.4 | 11.4 | 11.4 | 11.4 | 11.4 | 11.4 | 11.4 | 11.4 | 11.4 | 11.4 | 11.4 |
| 2030 | 15.2 | 11.1 | 11.1 | 11.1 | 11.1 | 11.1 | 11.1 | 11.1 | 11.1 | 11.1 | 11.1 | 11.1 | 11.1 | 11.1 |

## Table B.2 Fossil Energy Use from Vehicle Operation

| | Operational Fossil Energy Use for the Base Case and for Each PNGV Technology/Fuel Combination (quads) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base Case | CV+RFG | CV+MeOH | CV+EtOH | CV+RFD | CV+DME | CV+HFCV | CV+MFCV | CV+GFC | CV+FTD/RFD | CV+Bio/RFD | CV+LPG | CV+CNG | CV+LNG |
| 2005 | 14.1 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 |
| 2006 | 14.2 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 |
| 2007 | 14.3 | 14.2 | 14.2 | 14.2 | 14.2 | 14.2 | 14.2 | 14.2 | 14.2 | 14.2 | 14.2 | 14.2 | 14.2 | 14.2 |
| 2008 | 14.4 | 14.3 | 14.3 | 14.3 | 14.3 | 14.3 | 14.3 | 14.3 | 14.3 | 14.3 | 14.3 | 14.3 | 14.3 | 14.3 |
| 2009 | 14.6 | 14.6 | 14.6 | 14.5 | 14.6 | 14.6 | 14.6 | 14.6 | 14.6 | 14.6 | 14.6 | 14.6 | 14.6 | 14.6 |
| 2010 | 14.8 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 |
| 2011 | 14.9 | 14.9 | 14.9 | 14.8 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 |
| 2012 | 15.0 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 |
| 2013 | 15.1 | 15.0 | 15.0 | 14.9 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 |
| 2014 | 15.1 | 15.0 | 15.0 | 14.9 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 |
| 2015 | 15.1 | 14.9 | 14.9 | 14.8 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 |
| 2016 | 15.1 | 14.8 | 14.8 | 14.6 | 14.8 | 14.8 | 14.8 | 14.8 | 14.8 | 14.8 | 14.8 | 14.8 | 14.8 | 14.8 |
| 2017 | 15.1 | 14.7 | 14.7 | 14.4 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.6 | 14.7 | 14.7 | 14.7 |
| 2018 | 15.1 | 14.5 | 14.5 | 14.1 | 14.5 | 14.5 | 14.5 | 14.5 | 14.5 | 14.5 | 14.4 | 14.5 | 14.5 | 14.5 |
| 2019 | 15.1 | 14.3 | 14.3 | 13.7 | 14.3 | 14.3 | 14.3 | 14.3 | 14.3 | 14.3 | 14.2 | 14.3 | 14.3 | 14.3 |
| 2020 | 15.1 | 14.1 | 14.1 | 13.4 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.0 | 14.1 | 14.1 | 14.1 |
| 2021 | 15.1 | 13.8 | 13.8 | 12.9 | 13.8 | 13.8 | 13.6 | 13.8 | 13.8 | 13.8 | 13.7 | 13.8 | 13.8 | 13.8 |
| 2022 | 15.1 | 13.5 | 13.5 | 12.5 | 13.5 | 13.5 | 13.1 | 13.5 | 13.5 | 13.5 | 13.4 | 13.5 | 13.5 | 13.5 |
| 2023 | 15.1 | 13.2 | 13.2 | 12.0 | 13.2 | 13.2 | 12.5 | 13.2 | 13.2 | 13.2 | 13.1 | 13.2 | 13.2 | 13.2 |
| 2024 | 15.1 | 12.9 | 12.9 | 11.4 | 12.9 | 12.9 | 11.7 | 12.9 | 12.9 | 12.9 | 12.7 | 12.9 | 12.9 | 12.9 |
| 2025 | 15.1 | 12.6 | 12.6 | 10.8 | 12.6 | 12.6 | 10.8 | 12.6 | 12.6 | 12.6 | 12.4 | 12.6 | 12.6 | 12.6 |
| 2026 | 15.2 | 12.2 | 12.2 | 10.2 | 12.2 | 12.2 | 10.2 | 12.2 | 12.2 | 12.2 | 12.0 | 12.2 | 12.2 | 12.2 |
| 2027 | 15.2 | 11.9 | 11.9 | 9.7 | 11.9 | 11.9 | 9.7 | 11.9 | 11.9 | 11.9 | 11.6 | 11.9 | 11.9 | 11.9 |
| 2028 | 15.2 | 11.6 | 11.6 | 9.1 | 11.6 | 11.6 | 9.1 | 11.6 | 11.6 | 11.6 | 11.3 | 11.6 | 11.6 | 11.6 |
| 2029 | 15.2 | 11.4 | 11.4 | 8.7 | 11.4 | 11.4 | 8.7 | 11.4 | 11.4 | 11.4 | 11.0 | 11.4 | 11.4 | 11.4 |
| 2030 | 15.2 | 11.1 | 11.1 | 8.2 | 11.1 | 11.1 | 8.2 | 11.1 | 11.1 | 11.1 | 10.8 | 11.1 | 11.1 | 11.1 |

## Table B.3 Petroleum Use from Vehicle Operation

| | Operational Petroleum Use for the Base Case and for Each PNGV Technology/Fuel Combination (quads) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base Case | CV+RFG | CV+MeOH | CV+EtOH | CV+RFD | CV+DME | CV+HFCV | CV+MFCV | CV+GFC | CV+FTD/RFD | CV+Bio/RFD | CV+LPG | CV+CNG | CV+LNG |
| 2005 | 14.1 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 |
| 2006 | 14.2 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 |
| 2007 | 14.3 | 14.2 | 14.2 | 14.2 | 14.2 | 14.2 | 14.2 | 14.2 | 14.2 | 14.2 | 14.2 | 14.2 | 14.2 | 14.2 |
| 2008 | 14.4 | 14.3 | 14.3 | 14.3 | 14.3 | 14.3 | 14.3 | 14.3 | 14.3 | 14.3 | 14.3 | 14.3 | 14.3 | 14.3 |
| 2009 | 14.6 | 14.6 | 14.5 | 14.5 | 14.6 | 14.5 | 14.5 | 14.5 | 14.6 | 14.6 | 14.6 | 14.6 | 14.5 | 14.5 |
| 2010 | 14.8 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 |
| 2011 | 14.9 | 14.9 | 14.8 | 14.8 | 14.9 | 14.8 | 14.8 | 14.8 | 14.9 | 14.8 | 14.9 | 14.8 | 14.8 | 14.8 |
| 2012 | 15.0 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 |
| 2013 | 15.1 | 15.0 | 14.9 | 14.9 | 15.0 | 14.9 | 14.9 | 14.9 | 15.0 | 14.9 | 15.0 | 14.9 | 14.9 | 14.9 |
| 2014 | 15.1 | 15.0 | 14.9 | 14.9 | 15.0 | 14.9 | 14.9 | 14.9 | 15.0 | 14.9 | 15.0 | 14.9 | 14.9 | 14.9 |
| 2015 | 15.1 | 14.9 | 14.8 | 14.8 | 14.9 | 14.8 | 14.8 | 14.8 | 14.9 | 14.8 | 14.9 | 14.8 | 14.8 | 14.8 |
| 2016 | 15.1 | 14.8 | 14.6 | 14.6 | 14.8 | 14.6 | 14.6 | 14.6 | 14.8 | 14.7 | 14.8 | 14.7 | 14.6 | 14.6 |
| 2017 | 15.1 | 14.7 | 14.4 | 14.4 | 14.7 | 14.4 | 14.4 | 14.4 | 14.7 | 14.5 | 14.6 | 14.5 | 14.4 | 14.4 |
| 2018 | 15.1 | 14.5 | 14.1 | 14.1 | 14.5 | 14.1 | 14.1 | 14.1 | 14.5 | 14.3 | 14.4 | 14.2 | 14.1 | 14.1 |
| 2019 | 15.1 | 14.3 | 13.7 | 13.7 | 14.3 | 13.7 | 13.7 | 13.7 | 14.3 | 14.0 | 14.2 | 14.0 | 13.7 | 13.7 |
| 2020 | 15.1 | 14.1 | 13.4 | 13.4 | 14.1 | 13.4 | 13.4 | 13.4 | 14.1 | 13.7 | 14.0 | 13.6 | 13.4 | 13.4 |
| 2021 | 15.1 | 13.8 | 12.9 | 12.9 | 13.8 | 12.9 | 12.9 | 12.9 | 13.8 | 13.4 | 13.7 | 13.3 | 12.9 | 12.9 |
| 2022 | 15.1 | 13.5 | 12.5 | 12.5 | 13.5 | 12.5 | 12.5 | 12.5 | 13.5 | 13.0 | 13.4 | 12.9 | 12.5 | 12.5 |
| 2023 | 15.1 | 13.2 | 12.0 | 12.0 | 13.2 | 12.0 | 12.0 | 12.0 | 13.2 | 12.6 | 13.1 | 12.5 | 12.0 | 12.0 |
| 2024 | 15.1 | 12.9 | 11.4 | 11.4 | 12.9 | 11.4 | 11.4 | 11.4 | 12.9 | 12.2 | 12.7 | 12.0 | 11.4 | 11.4 |
| 2025 | 15.1 | 12.6 | 10.8 | 10.8 | 12.6 | 10.8 | 10.8 | 10.8 | 12.6 | 11.8 | 12.4 | 11.5 | 10.8 | 10.8 |
| 2026 | 15.2 | 12.2 | 10.2 | 10.2 | 12.2 | 10.2 | 10.2 | 10.2 | 12.2 | 11.3 | 12.0 | 11.0 | 10.2 | 10.2 |
| 2027 | 15.2 | 11.9 | 9.7 | 9.7 | 11.9 | 9.7 | 9.7 | 9.7 | 11.9 | 10.9 | 11.6 | 10.6 | 9.7 | 9.7 |
| 2028 | 15.2 | 11.6 | 9.1 | 9.1 | 11.6 | 9.1 | 9.1 | 9.1 | 11.6 | 10.5 | 11.3 | 10.1 | 9.1 | 9.1 |
| 2029 | 15.2 | 11.4 | 8.7 | 8.7 | 11.4 | 8.7 | 8.7 | 8.7 | 11.4 | 10.1 | 11.0 | 9.7 | 8.7 | 8.7 |
| 2030 | 15.2 | 11.1 | 8.2 | 8.2 | 11.1 | 8.2 | 8.2 | 8.2 | 11.1 | 9.8 | 10.8 | 9.4 | 8.2 | 8.2 |

## Table B.4 $NO_X$ Emissions from Urban Vehicle Operation

| | Operational Emissions of $NO_x$ for the Base Case and for Each PNGV Technology/FuelCombination ($10^3$ tonnes) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base Case | CV+RFG | CV+MeOH | CV+EtOH | CV+RFD | CV+DME | CV+HFCV | CV+MFCV | CV+GFCV | CV+FTD/RFD | CV+Bio/RFD | CV+LPG | CV+CNG | CV+LNG |
| 2005 | 1,712 | 1,616 | 1,616 | 1,616 | 1,616 | 1,616 | 1,616 | 1,616 | 1,616 | 1,616 | 1,616 | 1,616 | 1,616 | 1,616 |
| 2006 | 1,684 | 1,626 | 1,626 | 1,626 | 1,626 | 1,626 | 1,626 | 1,626 | 1,626 | 1,626 | 1,626 | 1,626 | 1,626 | 1,626 |
| 2007 | 1,650 | 1,617 | 1,617 | 1,617 | 1,617 | 1,617 | 1,617 | 1,617 | 1,617 | 1,617 | 1,617 | 1,617 | 1,617 | 1,617 |
| 2008 | 1,600 | 1,584 | 1,584 | 1,584 | 1,584 | 1,584 | 1,584 | 1,584 | 1,584 | 1,584 | 1,584 | 1,584 | 1,584 | 1,584 |
| 2009 | 1,574 | 1,568 | 1,568 | 1,568 | 1,568 | 1,568 | 1,567 | 1,567 | 1,567 | 1,568 | 1,568 | 1,568 | 1,568 | 1,568 |
| 2010 | 1,537 | 1,537 | 1,537 | 1,537 | 1,537 | 1,537 | 1,536 | 1,536 | 1,536 | 1,537 | 1,537 | 1,537 | 1,537 | 1,537 |
| 2011 | 1,493 | 1,493 | 1,493 | 1,493 | 1,493 | 1,493 | 1,491 | 1,491 | 1,491 | 1,493 | 1,493 | 1,493 | 1,493 | 1,493 |
| 2012 | 1,444 | 1,444 | 1,444 | 1,444 | 1,444 | 1,444 | 1,442 | 1,442 | 1,442 | 1,444 | 1,444 | 1,444 | 1,444 | 1,444 |
| 2013 | 1,390 | 1,390 | 1,390 | 1,390 | 1,390 | 1,390 | 1,387 | 1,387 | 1,387 | 1,390 | 1,390 | 1,390 | 1,390 | 1,390 |
| 2014 | 1,340 | 1,340 | 1,340 | 1,340 | 1,340 | 1,340 | 1,334 | 1,334 | 1,334 | 1,340 | 1,340 | 1,340 | 1,340 | 1,340 |
| 2015 | 1,295 | 1,295 | 1,295 | 1,295 | 1,295 | 1,295 | 1,286 | 1,286 | 1,286 | 1,295 | 1,295 | 1,295 | 1,295 | 1,295 |
| 2016 | 1,258 | 1,258 | 1,258 | 1,258 | 1,258 | 1,258 | 1,243 | 1,243 | 1,243 | 1,258 | 1,258 | 1,258 | 1,258 | 1,258 |
| 2017 | 1,229 | 1,229 | 1,229 | 1,229 | 1,229 | 1,229 | 1,207 | 1,207 | 1,207 | 1,229 | 1,229 | 1,229 | 1,229 | 1,229 |
| 2018 | 1,208 | 1,208 | 1,208 | 1,208 | 1,208 | 1,208 | 1,176 | 1,176 | 1,176 | 1,208 | 1,208 | 1,208 | 1,208 | 1,208 |
| 2019 | 1,193 | 1,193 | 1,193 | 1,193 | 1,193 | 1,193 | 1,149 | 1,149 | 1,149 | 1,193 | 1,193 | 1,193 | 1,193 | 1,193 |
| 2020 | 1,185 | 1,185 | 1,185 | 1,185 | 1,185 | 1,185 | 1,124 | 1,124 | 1,124 | 1,185 | 1,185 | 1,185 | 1,185 | 1,185 |
| 2021 | 1,181 | 1,181 | 1,181 | 1,181 | 1,181 | 1,181 | 1,099 | 1,100 | 1,100 | 1,181 | 1,181 | 1,181 | 1,181 | 1,181 |
| 2022 | 1,179 | 1,179 | 1,179 | 1,179 | 1,179 | 1,179 | 1,074 | 1,075 | 1,075 | 1,179 | 1,179 | 1,179 | 1,179 | 1,179 |
| 2023 | 1,181 | 1,181 | 1,181 | 1,181 | 1,181 | 1,181 | 1,047 | 1,048 | 1,048 | 1,181 | 1,181 | 1,181 | 1,181 | 1,181 |
| 2024 | 1,186 | 1,186 | 1,186 | 1,186 | 1,186 | 1,186 | 1,019 | 1,021 | 1,021 | 1,186 | 1,186 | 1,186 | 1,186 | 1,186 |
| 2025 | 1,191 | 1,191 | 1,191 | 1,191 | 1,191 | 1,191 | 988 | 990 | 990 | 1,191 | 1,191 | 1,191 | 1,191 | 1,191 |
| 2026 | 1,196 | 1,196 | 1,196 | 1,196 | 1,196 | 1,196 | 952 | 955 | 955 | 1,196 | 1,196 | 1,196 | 1,196 | 1,196 |
| 2027 | 1,201 | 1,201 | 1,201 | 1,201 | 1,201 | 1,201 | 914 | 917 | 917 | 1,201 | 1,201 | 1,201 | 1,201 | 1,201 |
| 2028 | 1,206 | 1,206 | 1,206 | 1,206 | 1,206 | 1,206 | 874 | 877 | 877 | 1,206 | 1,206 | 1,206 | 1,206 | 1,206 |
| 2029 | 1,212 | 1,212 | 1,212 | 1,212 | 1,212 | 1,212 | 833 | 836 | 836 | 1,212 | 1,212 | 1,212 | 1,212 | 1,212 |
| 2030 | 1,217 | 1,217 | 1,217 | 1,217 | 1,217 | 1,217 | 791 | 795 | 795 | 1,217 | 1,217 | 1,217 | 1,217 | 1,217 |

## Table B.5 CO Emissions from Urban Vehicle Operation

| | Operational Emissions of CO for the Base Case and for Each PNGV Technology/Fuel Combination ($10^3$ tonnes) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base Case | CV+RFG | CV+MeOH | CV+EtOH | CV+RFD | CV+DME | CV+HFCV | CV+MFCV | CV+GFC | CV+FTD/RFD | CV+Bio/RFD | CV+LPG | CV+CNG | CV+LNG |
| 2005 | 26,663 | 25,093 | 25,093 | 25,093 | 25,093 | 25,093 | 25,093 | 25,093 | 25,093 | 25,093 | 25,093 | 25,093 | 25,093 | 25,093 |
| 2006 | 26,273 | 25,321 | 25,321 | 25,321 | 25,321 | 25,321 | 25,321 | 25,321 | 25,321 | 25,321 | 25,321 | 25,321 | 25,321 | 25,321 |
| 2007 | 25,797 | 25,265 | 25,265 | 25,265 | 25,265 | 25,265 | 25,264 | 25,264 | 25,264 | 25,265 | 25,265 | 25,265 | 25,265 | 25,265 |
| 2008 | 25,049 | 24,787 | 24,787 | 24,787 | 24,787 | 24,787 | 24,786 | 24,786 | 24,786 | 24,787 | 24,787 | 24,787 | 24,787 | 24,787 |
| 2009 | 24,662 | 24,565 | 24,565 | 24,565 | 24,563 | 24,563 | 24,561 | 24,561 | 24,561 | 24,563 | 24,563 | 24,565 | 24,565 | 24,565 |
| 2010 | 24,099 | 24,099 | 24,099 | 24,099 | 24,096 | 24,096 | 24,091 | 24,091 | 24,091 | 24,096 | 24,096 | 24,099 | 24,099 | 24,099 |
| 2011 | 23,407 | 23,407 | 23,407 | 23,407 | 23,400 | 23,400 | 23,392 | 23,392 | 23,392 | 23,400 | 23,400 | 23,407 | 23,407 | 23,407 |
| 2012 | 22,639 | 22,639 | 22,639 | 22,639 | 22,624 | 22,624 | 22,611 | 22,612 | 22,612 | 22,624 | 22,624 | 22,639 | 22,639 | 22,639 |
| 2013 | 21,787 | 21,787 | 21,787 | 21,787 | 21,761 | 21,761 | 21,740 | 21,741 | 21,741 | 21,761 | 21,761 | 21,787 | 21,787 | 21,787 |
| 2014 | 20,977 | 20,977 | 20,977 | 20,977 | 20,931 | 20,931 | 20,898 | 20,899 | 20,899 | 20,931 | 20,931 | 20,977 | 20,977 | 20,977 |
| 2015 | 20,255 | 20,255 | 20,255 | 20,255 | 20,179 | 20,179 | 20,126 | 20,127 | 20,127 | 20,179 | 20,179 | 20,255 | 20,255 | 20,255 |
| 2016 | 19,651 | 19,651 | 19,651 | 19,651 | 19,528 | 19,528 | 19,446 | 19,448 | 19,448 | 19,528 | 19,528 | 19,651 | 19,651 | 19,651 |
| 2017 | 19,180 | 19,180 | 19,180 | 19,180 | 18,988 | 18,988 | 18,870 | 18,873 | 18,873 | 18,988 | 18,988 | 19,180 | 19,180 | 19,180 |
| 2018 | 18,835 | 18,835 | 18,835 | 18,835 | 18,545 | 18,545 | 18,381 | 18,385 | 18,385 | 18,545 | 18,545 | 18,835 | 18,835 | 18,835 |
| 2019 | 18,597 | 18,597 | 18,597 | 18,597 | 18,173 | 18,173 | 17,955 | 17,961 | 17,961 | 18,173 | 18,173 | 18,597 | 18,597 | 18,597 |
| 2020 | 18,447 | 18,447 | 18,447 | 18,447 | 17,845 | 17,845 | 17,564 | 17,573 | 17,573 | 17,845 | 17,845 | 18,447 | 18,447 | 18,447 |
| 2021 | 18,366 | 18,366 | 18,366 | 18,366 | 17,536 | 17,536 | 17,183 | 17,195 | 17,195 | 17,536 | 17,536 | 18,366 | 18,366 | 18,366 |
| 2022 | 18,343 | 18,343 | 18,343 | 18,343 | 17,229 | 17,229 | 16,796 | 16,811 | 16,811 | 17,229 | 17,229 | 18,343 | 18,343 | 18,343 |
| 2023 | 18,357 | 18,357 | 18,357 | 18,357 | 16,903 | 16,903 | 16,380 | 16,399 | 16,399 | 16,903 | 16,903 | 18,357 | 18,357 | 18,357 |
| 2024 | 18,442 | 18,442 | 18,442 | 18,442 | 16,588 | 16,588 | 15,968 | 15,992 | 15,992 | 16,588 | 16,588 | 18,442 | 18,442 | 18,442 |
| 2025 | 18,524 | 18,524 | 18,524 | 18,524 | 16,213 | 16,213 | 15,488 | 15,519 | 15,519 | 16,213 | 16,213 | 18,524 | 18,524 | 18,524 |
| 2026 | 18,604 | 18,604 | 18,604 | 18,604 | 15,783 | 15,783 | 14,948 | 14,985 | 14,985 | 15,783 | 15,783 | 18,604 | 18,604 | 18,604 |
| 2027 | 18,685 | 18,685 | 18,685 | 18,685 | 15,306 | 15,306 | 14,361 | 14,405 | 14,405 | 15,306 | 15,306 | 18,685 | 18,685 | 18,685 |
| 2028 | 18,767 | 18,767 | 18,767 | 18,767 | 14,790 | 14,790 | 13,740 | 13,790 | 13,790 | 14,790 | 14,790 | 18,767 | 18,767 | 18,767 |
| 2029 | 18,850 | 18,850 | 18,850 | 18,850 | 14,248 | 14,248 | 13,098 | 13,155 | 13,155 | 14,248 | 14,248 | 18,850 | 18,850 | 18,850 |
| 2030 | 18,934 | 18,935 | 18,935 | 18,935 | 13,692 | 13,692 | 12,449 | 12,513 | 12,513 | 13,692 | 13,692 | 18,935 | 18,935 | 18,935 |

## Table B.6 VOC Emissions from Urban Vehicle Operation

| | Operational Emissions of VOC for the Base Case and for Each PNGV Technology/Fuel Combination ($10^3$ tonnes) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base Case | CV+RFG | CV+MeOH | CV+EtOH | CV+RFD | CV+DME | CV+HFCV | CV+MFCV | CV+GFC | CV+FTD/RFD | CV+Bio/RFD | CV+LPG | CV+CNG | CV+LNG |
| 2005 | 1,174 | 1,090 | 1,090 | 1,090 | 1,090 | 1,090 | 1,090 | 1,090 | 1,090 | 1,090 | 1,090 | 1,090 | 1,090 | 1,090 |
| 2006 | 1,172 | 1,127 | 1,127 | 1,127 | 1,127 | 1,127 | 1,127 | 1,127 | 1,127 | 1,127 | 1,127 | 1,127 | 1,127 | 1,127 |
| 2007 | 1,179 | 1,157 | 1,157 | 1,157 | 1,157 | 1,157 | 1,157 | 1,157 | 1,157 | 1,157 | 1,157 | 1,157 | 1,157 | 1,157 |
| 2008 | 1,192 | 1,184 | 1,184 | 1,184 | 1,184 | 1,184 | 1,183 | 1,183 | 1,183 | 1,184 | 1,184 | 1,184 | 1,184 | 1,184 |
| 2009 | 1,231 | 1,228 | 1,228 | 1,228 | 1,228 | 1,228 | 1,227 | 1,227 | 1,227 | 1,228 | 1,228 | 1,228 | 1,228 | 1,228 |
| 2010 | 1,269 | 1,269 | 1,269 | 1,269 | 1,268 | 1,268 | 1,267 | 1,267 | 1,268 | 1,268 | 1,268 | 1,268 | 1,268 | 1,268 |
| 2011 | 1,304 | 1,304 | 1,304 | 1,304 | 1,303 | 1,303 | 1,301 | 1,302 | 1,302 | 1,303 | 1,303 | 1,303 | 1,303 | 1,303 |
| 2012 | 1,336 | 1,336 | 1,336 | 1,336 | 1,334 | 1,334 | 1,332 | 1,332 | 1,333 | 1,334 | 1,334 | 1,334 | 1,334 | 1,334 |
| 2013 | 1,365 | 1,365 | 1,365 | 1,365 | 1,362 | 1,362 | 1,358 | 1,359 | 1,360 | 1,362 | 1,362 | 1,362 | 1,362 | 1,362 |
| 2014 | 1,390 | 1,390 | 1,390 | 1,390 | 1,385 | 1,385 | 1,380 | 1,381 | 1,382 | 1,385 | 1,385 | 1,385 | 1,385 | 1,385 |
| 2015 | 1,411 | 1,411 | 1,411 | 1,411 | 1,404 | 1,404 | 1,395 | 1,397 | 1,399 | 1,404 | 1,404 | 1,403 | 1,403 | 1,403 |
| 2016 | 1,429 | 1,429 | 1,429 | 1,429 | 1,418 | 1,418 | 1,404 | 1,407 | 1,410 | 1,418 | 1,418 | 1,417 | 1,417 | 1,417 |
| 2017 | 1,444 | 1,444 | 1,444 | 1,444 | 1,428 | 1,428 | 1,407 | 1,411 | 1,417 | 1,428 | 1,428 | 1,426 | 1,426 | 1,426 |
| 2018 | 1,457 | 1,457 | 1,457 | 1,457 | 1,434 | 1,434 | 1,405 | 1,410 | 1,418 | 1,434 | 1,434 | 1,431 | 1,431 | 1,431 |
| 2019 | 1,468 | 1,468 | 1,468 | 1,468 | 1,436 | 1,436 | 1,396 | 1,404 | 1,414 | 1,436 | 1,436 | 1,432 | 1,432 | 1,432 |
| 2020 | 1,477 | 1,477 | 1,477 | 1,477 | 1,434 | 1,434 | 1,382 | 1,392 | 1,406 | 1,434 | 1,434 | 1,430 | 1,430 | 1,430 |
| 2021 | 1,485 | 1,485 | 1,485 | 1,485 | 1,429 | 1,429 | 1,362 | 1,375 | 1,393 | 1,429 | 1,429 | 1,424 | 1,424 | 1,424 |
| 2022 | 1,492 | 1,492 | 1,492 | 1,492 | 1,420 | 1,420 | 1,336 | 1,352 | 1,375 | 1,420 | 1,420 | 1,414 | 1,414 | 1,414 |
| 2023 | 1,499 | 1,499 | 1,499 | 1,499 | 1,407 | 1,407 | 1,304 | 1,324 | 1,353 | 1,407 | 1,407 | 1,401 | 1,401 | 1,401 |
| 2024 | 1,505 | 1,505 | 1,505 | 1,505 | 1,390 | 1,390 | 1,267 | 1,291 | 1,327 | 1,390 | 1,390 | 1,386 | 1,386 | 1,386 |
| 2025 | 1,511 | 1,511 | 1,511 | 1,511 | 1,371 | 1,371 | 1,224 | 1,253 | 1,296 | 1,371 | 1,371 | 1,367 | 1,367 | 1,367 |
| 2026 | 1,517 | 1,517 | 1,517 | 1,517 | 1,349 | 1,349 | 1,177 | 1,212 | 1,263 | 1,349 | 1,349 | 1,347 | 1,347 | 1,347 |
| 2027 | 1,523 | 1,523 | 1,523 | 1,523 | 1,325 | 1,325 | 1,128 | 1,168 | 1,227 | 1,325 | 1,325 | 1,325 | 1,325 | 1,325 |
| 2028 | 1,529 | 1,529 | 1,529 | 1,529 | 1,299 | 1,299 | 1,077 | 1,123 | 1,191 | 1,299 | 1,299 | 1,303 | 1,303 | 1,303 |
| 2029 | 1,535 | 1,535 | 1,535 | 1,535 | 1,273 | 1,273 | 1,026 | 1,078 | 1,154 | 1,273 | 1,273 | 1,280 | 1,280 | 1,280 |
| 2030 | 1,541 | 1,541 | 1,541 | 1,541 | 1,247 | 1,247 | 976 | 1,033 | 1,118 | 1,247 | 1,247 | 1,258 | 1,258 | 1,258 |

## Table B.7 $SO_X$ Emissions from Urban Vehicle Operation

| | Operational Emissions of $SO_x$ for the Base Case and for Each PNGV Technology/FuelCombination ($10^3$ tonnes) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base Case | CV+RFG | CV+MeOH | CV+EtOH | CV+RFD | CV+DME | CV+HFCV | CV+MFCV | CV+GFC | CV+FTD/RFD | CV+Bio/RFD | CV+LPG | CV+CNG | CV+LNG |
| 2005 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 |
| 2006 | 43 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 |
| 2007 | 43 | 43 | 43 | 43 | 43 | 43 | 43 | 43 | 43 | 43 | 43 | 43 | 43 | 43 |
| 2008 | 43 | 43 | 43 | 43 | 43 | 43 | 43 | 43 | 43 | 43 | 43 | 43 | 43 | 43 |
| 2009 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 |
| 2010 | 45 | 45 | 44 | 44 | 45 | 44 | 44 | 44 | 45 | 44 | 45 | 44 | 44 | 44 |
| 2011 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 |
| 2012 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 |
| 2013 | 46 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 |
| 2014 | 46 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 |
| 2015 | 46 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 |
| 2016 | 46 | 45 | 44 | 44 | 45 | 44 | 44 | 44 | 45 | 45 | 45 | 44 | 44 | 44 |
| 2017 | 46 | 44 | 44 | 44 | 45 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 |
| 2018 | 46 | 44 | 43 | 43 | 44 | 43 | 43 | 43 | 44 | 43 | 44 | 43 | 43 | 43 |
| 2019 | 46 | 43 | 42 | 42 | 43 | 42 | 42 | 42 | 43 | 43 | 43 | 42 | 42 | 42 |
| 2020 | 46 | 43 | 41 | 41 | 43 | 41 | 41 | 41 | 43 | 42 | 42 | 41 | 41 | 41 |
| 2021 | 46 | 42 | 40 | 40 | 42 | 39 | 39 | 40 | 42 | 41 | 42 | 39 | 40 | 39 |
| 2022 | 46 | 41 | 38 | 38 | 41 | 38 | 38 | 38 | 41 | 40 | 41 | 38 | 38 | 38 |
| 2023 | 46 | 40 | 37 | 37 | 40 | 36 | 36 | 37 | 40 | 39 | 40 | 36 | 37 | 36 |
| 2024 | 46 | 39 | 36 | 35 | 39 | 35 | 35 | 36 | 39 | 37 | 39 | 35 | 35 | 35 |
| 2025 | 46 | 38 | 34 | 34 | 39 | 33 | 33 | 34 | 38 | 36 | 38 | 33 | 33 | 33 |
| 2026 | 46 | 37 | 32 | 32 | 38 | 31 | 31 | 32 | 37 | 35 | 37 | 31 | 32 | 31 |
| 2027 | 46 | 36 | 31 | 30 | 37 | 30 | 30 | 31 | 36 | 33 | 35 | 30 | 30 | 30 |
| 2028 | 46 | 35 | 29 | 29 | 36 | 28 | 28 | 29 | 35 | 32 | 34 | 28 | 28 | 28 |
| 2029 | 46 | 35 | 28 | 27 | 35 | 27 | 27 | 28 | 35 | 31 | 34 | 27 | 27 | 27 |
| 2030 | 46 | 34 | 27 | 26 | 34 | 25 | 25 | 27 | 34 | 30 | 33 | 25 | 26 | 25 |

## Table B.8 $PM_{10}$ Emissions from Urban Vehicle Operation

| | Operational Emissions of $PM_{10}$ for the Base Case and for Each PNGV Technology/Fuel Combination ($10^3$ tonnes) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base Case | CV+RFG | CV+MeOH | CV+EtOH | CV+RFD | CV+DME | CV+HFCV | CV+MFCV | CV+GFC | CV+FTD/RFD | CV+Bio/RFD | CV+LPG | CV+CNG | CV+LNG |
| 2005 | 52 | 51 | 51 | 51 | 51 | 51 | 51 | 51 | 51 | 51 | 51 | 51 | 51 | 51 |
| 2006 | 52 | 52 | 52 | 52 | 52 | 52 | 52 | 52 | 52 | 52 | 52 | 52 | 52 | 52 |
| 2007 | 53 | 53 | 53 | 53 | 53 | 53 | 53 | 53 | 53 | 53 | 53 | 53 | 53 | 53 |
| 2008 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 |
| 2009 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 |
| 2010 | 56 | 56 | 56 | 56 | 56 | 56 | 56 | 56 | 56 | 56 | 56 | 56 | 56 | 56 |
| 2011 | 57 | 57 | 57 | 57 | 57 | 57 | 57 | 57 | 57 | 57 | 57 | 57 | 57 | 57 |
| 2012 | 58 | 58 | 57 | 57 | 58 | 58 | 57 | 57 | 57 | 58 | 58 | 57 | 57 | 57 |
| 2013 | 58 | 58 | 58 | 58 | 59 | 58 | 58 | 58 | 58 | 59 | 59 | 58 | 58 | 58 |
| 2014 | 59 | 59 | 59 | 59 | 60 | 59 | 58 | 58 | 58 | 60 | 60 | 58 | 58 | 58 |
| 2015 | 59 | 59 | 59 | 59 | 60 | 59 | 59 | 59 | 59 | 60 | 60 | 59 | 59 | 59 |
| 2016 | 60 | 60 | 59 | 59 | 61 | 60 | 59 | 59 | 59 | 61 | 61 | 59 | 59 | 59 |
| 2017 | 60 | 60 | 59 | 59 | 63 | 60 | 59 | 59 | 59 | 63 | 63 | 59 | 59 | 59 |
| 2018 | 60 | 60 | 59 | 59 | 64 | 60 | 59 | 59 | 59 | 64 | 64 | 59 | 59 | 59 |
| 2019 | 61 | 61 | 59 | 59 | 65 | 61 | 59 | 59 | 59 | 65 | 65 | 59 | 59 | 59 |
| 2020 | 61 | 61 | 58 | 58 | 67 | 61 | 58 | 58 | 58 | 67 | 67 | 58 | 58 | 58 |
| 2021 | 61 | 61 | 58 | 58 | 68 | 61 | 58 | 58 | 58 | 68 | 68 | 58 | 58 | 58 |
| 2022 | 61 | 61 | 58 | 58 | 70 | 61 | 57 | 57 | 57 | 70 | 70 | 57 | 57 | 57 |
| 2023 | 62 | 62 | 57 | 57 | 72 | 62 | 57 | 57 | 57 | 72 | 72 | 57 | 57 | 57 |
| 2024 | 62 | 62 | 57 | 57 | 74 | 62 | 56 | 56 | 56 | 74 | 74 | 56 | 56 | 56 |
| 2025 | 62 | 62 | 56 | 56 | 76 | 62 | 55 | 55 | 55 | 76 | 76 | 55 | 55 | 55 |
| 2026 | 62 | 62 | 55 | 55 | 78 | 62 | 55 | 55 | 55 | 78 | 78 | 55 | 55 | 55 |
| 2027 | 63 | 63 | 55 | 55 | 80 | 63 | 54 | 54 | 54 | 80 | 80 | 54 | 54 | 54 |
| 2028 | 63 | 63 | 54 | 54 | 82 | 63 | 53 | 53 | 53 | 82 | 82 | 53 | 53 | 53 |
| 2029 | 63 | 63 | 54 | 54 | 84 | 63 | 53 | 53 | 53 | 84 | 84 | 53 | 53 | 53 |
| 2030 | 63 | 63 | 53 | 53 | 86 | 63 | 52 | 52 | 52 | 86 | 86 | 52 | 52 | 52 |

## Table B.9 $CO_2$ Emissions from Urban Vehicle Operation

| | Operational Emissions of $CO_2$ for the Base Case and for Each PNGV Technology/Fuel Combination ($10^3$ tonnes) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base Case | CV+RFG | CV+MeOH | CV+EtOH | CV+RFD | CV+DME | CV+HFCV | CV+MFCV | CV+GFC | CV+FTD/RFD | CV+Bio/RFD | CV+LPG | CV+CNG | CV+LNG | |
| 2005 | 1,040,251 | 1,022,550 | 1,022,550 | 1,022,550 | 1,022,550 | 1,022,550 | 1,022,550 | 1,022,550 | 1,022,550 | 1,022,550 | 1,022,550 | 1,022,550 | 1,022,550 | 1,022,550 | 2005 |
| 2006 | 1,048,658 | 1,038,020 | 1,038,020 | 1,038,020 | 1,038,020 | 1,038,020 | 1,038,020 | 1,038,020 | 1,038,020 | 1,038,020 | 1,038,020 | 1,038,020 | 1,038,020 | 1,038,020 | 2006 |
| 2007 | 1,057,116 | 1,051,015 | 1,051,014 | 1,050,972 | 1,051,019 | 1,051,013 | 1,050,972 | 1,051,014 | 1,051,015 | 1,051,018 | 1,051,019 | 1,051,014 | 1,051,007 | 1,051,006 | 2007 |
| 2008 | 1,063,712 | 1,060,253 | 1,060,249 | 1,060,081 | 1,060,268 | 1,060,246 | 1,060,081 | 1,060,249 | 1,060,253 | 1,060,265 | 1,060,268 | 1,060,247 | 1,060,220 | 1,060,219 | 2008 |
| 2009 | 1,079,681 | 1,077,540 | 1,077,530 | 1,077,115 | 1,077,577 | 1,077,522 | 1,077,115 | 1,077,530 | 1,077,540 | 1,077,568 | 1,077,576 | 1,077,526 | 1,077,458 | 1,077,455 | 2009 |
| 2010 | 1,092,771 | 1,090,968 | 1,090,948 | 1,090,127 | 1,091,041 | 1,090,933 | 1,090,127 | 1,090,948 | 1,090,968 | 1,091,024 | 1,091,040 | 1,090,940 | 1,090,806 | 1,090,799 | 2010 |
| 2011 | 1,102,514 | 1,099,773 | 1,099,737 | 1,098,267 | 1,099,903 | 1,099,710 | 1,098,267 | 1,099,737 | 1,099,773 | 1,099,872 | 1,099,900 | 1,099,723 | 1,099,483 | 1,099,470 | 2011 |
| 2012 | 1,109,642 | 1,105,428 | 1,105,368 | 1,102,931 | 1,105,643 | 1,105,324 | 1,102,931 | 1,105,368 | 1,105,428 | 1,105,593 | 1,105,639 | 1,105,345 | 1,104,947 | 1,104,925 | 2012 |
| 2013 | 1,115,078 | 1,108,514 | 1,108,418 | 1,104,487 | 1,108,861 | 1,108,347 | 1,104,487 | 1,108,418 | 1,108,514 | 1,108,780 | 1,108,855 | 1,108,380 | 1,107,738 | 1,107,704 | 2013 |
| 2014 | 1,118,632 | 1,108,385 | 1,108,232 | 1,101,951 | 1,108,941 | 1,108,119 | 1,101,951 | 1,108,232 | 1,108,385 | 1,108,811 | 1,108,930 | 1,108,172 | 1,107,146 | 1,107,091 | 2014 |
| 2015 | 1,120,000 | 1,104,093 | 1,103,851 | 1,093,942 | 1,104,970 | 1,103,673 | 1,093,942 | 1,103,851 | 1,104,093 | 1,104,765 | 1,104,953 | 1,103,758 | 1,102,138 | 1,102,051 | 2015 |
| 2016 | 1,120,559 | 1,096,537 | 1,096,167 | 1,081,034 | 1,097,876 | 1,095,895 | 1,081,034 | 1,096,167 | 1,096,537 | 1,097,563 | 1,097,850 | 1,096,024 | 1,093,551 | 1,093,418 | 2016 |
| 2017 | 1,120,630 | 1,086,174 | 1,085,639 | 1,063,749 | 1,088,111 | 1,085,245 | 1,063,749 | 1,085,639 | 1,086,174 | 1,087,659 | 1,088,074 | 1,085,432 | 1,081,855 | 1,081,663 | 2017 |
| 2018 | 1,120,405 | 1,073,340 | 1,072,605 | 1,042,491 | 1,076,005 | 1,072,063 | 1,042,491 | 1,072,605 | 1,073,340 | 1,075,383 | 1,075,954 | 1,072,319 | 1,067,398 | 1,067,134 | 2018 |
| 2019 | 1,120,034 | 1,058,334 | 1,057,364 | 1,017,632 | 1,061,850 | 1,056,648 | 1,017,632 | 1,057,364 | 1,058,334 | 1,061,029 | 1,061,782 | 1,056,987 | 1,050,494 | 1,050,146 | 2019 |
| 2020 | 1,119,667 | 1,041,462 | 1,040,225 | 989,559 | 1,045,946 | 1,039,313 | 989,559 | 1,040,225 | 1,041,462 | 1,044,899 | 1,045,860 | 1,039,745 | 1,031,465 | 1,031,020 | 2020 |
| 2021 | 1,119,448 | 1,022,563 | 1,021,022 | 957,876 | 1,028,152 | 1,019,885 | 957,876 | 1,021,022 | 1,022,563 | 1,026,847 | 1,028,044 | 1,020,424 | 1,010,105 | 1,009,550 | 2021 |
| 2022 | 1,119,454 | 1,001,915 | 1,000,033 | 922,966 | 1,008,735 | 998,646 | 922,966 | 1,000,033 | 1,001,915 | 1,007,143 | 1,008,604 | 999,303 | 986,709 | 986,033 | 2022 |
| 2023 | 1,119,709 | 979,748 | 977,494 | 885,175 | 987,919 | 975,833 | 885,175 | 977,494 | 979,748 | 986,011 | 987,762 | 976,620 | 961,533 | 960,723 | 2023 |
| 2024 | 1,120,213 | 956,277 | 953,621 | 844,834 | 965,904 | 951,662 | 844,834 | 953,621 | 956,277 | 963,656 | 965,719 | 952,590 | 934,812 | 933,857 | 2024 |
| 2025 | 1,120,988 | 931,736 | 928,651 | 802,299 | 942,918 | 926,377 | 802,299 | 928,651 | 931,736 | 940,307 | 942,703 | 927,454 | 906,806 | 905,697 | 2025 |
| 2026 | 1,121,989 | 906,689 | 903,158 | 758,538 | 919,488 | 900,555 | 758,538 | 903,158 | 906,689 | 916,499 | 919,242 | 901,788 | 878,155 | 876,886 | 2026 |
| 2027 | 1,123,194 | 882,629 | 878,660 | 716,098 | 897,016 | 875,734 | 716,098 | 878,660 | 882,629 | 893,657 | 896,740 | 877,120 | 850,555 | 849,128 | 2027 |
| 2028 | 1,124,571 | 860,490 | 856,107 | 676,597 | 876,377 | 852,876 | 676,597 | 856,107 | 860,490 | 872,666 | 876,071 | 854,406 | 825,072 | 823,496 | 2028 |
| 2029 | 1,126,099 | 840,623 | 835,857 | 640,664 | 857,898 | 832,344 | 640,664 | 835,857 | 840,623 | 853,864 | 857,566 | 834,008 | 802,111 | 800,397 | 2029 |
| 2030 | 1,127,736 | 823,061 | 817,945 | 608,394 | 841,606 | 814,173 | 608,394 | 817,945 | 823,061 | 837,275 | 841,250 | 815,960 | 781,716 | 779,876 | 2030 |

## Table B.10 $CH_4$ Emissions from Urban Vehicle Operation

| | Operational Emissions of $CH_4$ for the Base Case and for Each PNGV Technology/Fuel Combination ($10^3$ tonnes) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base Case | CV+RFG | CV+MeOH | CV+EtOH | CV+RFD | CV+DME | CV+HFCV | CV+MFCV | CV+GFC | CV+FTD/RFD | CV+Bio/RFD | CV+LPG | CV+CNG | CV+LNG |
| 2005 | 117 | 115 | 115 | 115 | 115 | 115 | 115 | 115 | 115 | 115 | 115 | 115 | 115 | 115 |
| 2006 | 119 | 118 | 118 | 118 | 118 | 118 | 118 | 118 | 118 | 118 | 118 | 118 | 118 | 118 |
| 2007 | 121 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 |
| 2008 | 122 | 122 | 122 | 122 | 122 | 122 | 122 | 122 | 122 | 122 | 122 | 122 | 123 | 123 |
| 2009 | 125 | 125 | 125 | 125 | 125 | 125 | 125 | 125 | 125 | 125 | 125 | 125 | 126 | 126 |
| 2010 | 128 | 128 | 128 | 128 | 128 | 128 | 128 | 128 | 128 | 128 | 128 | 128 | 130 | 130 |
| 2011 | 130 | 130 | 130 | 130 | 130 | 130 | 130 | 130 | 130 | 130 | 130 | 130 | 135 | 135 |
| 2012 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 140 | 140 |
| 2013 | 134 | 134 | 134 | 134 | 133 | 133 | 133 | 133 | 133 | 133 | 133 | 134 | 146 | 146 |
| 2014 | 136 | 136 | 135 | 135 | 134 | 134 | 134 | 134 | 134 | 134 | 134 | 136 | 154 | 154 |
| 2015 | 138 | 138 | 136 | 136 | 135 | 135 | 134 | 134 | 134 | 135 | 135 | 138 | 167 | 167 |
| 2016 | 139 | 139 | 137 | 137 | 135 | 135 | 134 | 134 | 134 | 135 | 135 | 139 | 183 | 183 |
| 2017 | 140 | 140 | 138 | 138 | 134 | 134 | 133 | 133 | 133 | 134 | 134 | 140 | 204 | 204 |
| 2018 | 141 | 141 | 138 | 138 | 132 | 132 | 131 | 131 | 131 | 132 | 132 | 141 | 229 | 229 |
| 2019 | 142 | 142 | 138 | 138 | 131 | 131 | 129 | 129 | 129 | 131 | 131 | 142 | 259 | 259 |
| 2020 | 143 | 143 | 137 | 137 | 128 | 128 | 127 | 127 | 127 | 128 | 128 | 143 | 292 | 292 |
| 2021 | 144 | 144 | 137 | 137 | 126 | 126 | 123 | 123 | 123 | 126 | 126 | 144 | 330 | 330 |
| 2022 | 145 | 145 | 136 | 136 | 122 | 122 | 120 | 120 | 120 | 122 | 122 | 145 | 372 | 372 |
| 2023 | 146 | 146 | 135 | 135 | 119 | 119 | 116 | 116 | 116 | 119 | 119 | 146 | 419 | 419 |
| 2024 | 147 | 147 | 134 | 134 | 115 | 115 | 111 | 111 | 111 | 115 | 115 | 147 | 469 | 469 |
| 2025 | 148 | 148 | 133 | 133 | 111 | 111 | 106 | 106 | 106 | 111 | 111 | 148 | 522 | 522 |
| 2026 | 149 | 149 | 132 | 132 | 106 | 106 | 101 | 101 | 101 | 106 | 106 | 149 | 578 | 578 |
| 2027 | 149 | 149 | 131 | 131 | 102 | 102 | 96 | 96 | 96 | 102 | 102 | 149 | 633 | 633 |
| 2028 | 150 | 150 | 130 | 130 | 97 | 97 | 91 | 91 | 91 | 97 | 97 | 150 | 686 | 686 |
| 2029 | 151 | 151 | 129 | 129 | 93 | 93 | 86 | 86 | 86 | 93 | 93 | 151 | 734 | 734 |
| 2030 | 152 | 152 | 128 | 128 | 90 | 90 | 83 | 83 | 83 | 90 | 90 | 152 | 779 | 779 |

## Table B.11 $N_2O$ Emissions from Urban Vehicle Operation

| | Operational Emissions of $N_2O$ for the Base Case and for Each PNGV Technology/Fuel Combination ($10^3$ tonnes) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base Case | CV+RFG | CV+MeOH | CV+EtOH | CV+RFD | CV+DME | CV+HFCV | CV+MFCV | CV+GFC | CV+FTD/RFD | CV+Bio/RFD | CV+LPG | CV+CNG | CV+LNG |
| 2005 | 7.9 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 |
| 2006 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| 2007 | 8.2 | 8.1 | 8.1 | 8.1 | 8.1 | 8.1 | 8.1 | 8.1 | 8.1 | 8.1 | 8.1 | 8.1 | 8.1 | 8.1 |
| 2008 | 8.3 | 8.2 | 8.2 | 8.2 | 8.2 | 8.2 | 8.2 | 8.2 | 8.2 | 8.2 | 8.2 | 8.2 | 8.2 | 8.2 |
| 2009 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.4 | 8.4 | 8.4 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 |
| 2010 | 8.6 | 8.6 | 8.6 | 8.6 | 8.6 | 8.6 | 8.6 | 8.6 | 8.6 | 8.6 | 8.6 | 8.6 | 8.6 | 8.6 |
| 2011 | 8.8 | 8.8 | 8.8 | 8.8 | 8.8 | 8.8 | 8.8 | 8.8 | 8.8 | 8.8 | 8.8 | 8.8 | 8.8 | 8.8 |
| 2012 | 8.9 | 8.9 | 8.9 | 8.9 | 8.9 | 8.9 | 8.9 | 8.9 | 8.9 | 8.9 | 8.9 | 8.9 | 8.9 | 8.9 |
| 2013 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.0 | 9.0 | 9.0 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 |
| 2014 | 9.2 | 9.2 | 9.2 | 9.2 | 9.2 | 9.2 | 9.1 | 9.1 | 9.1 | 9.2 | 9.2 | 9.2 | 9.2 | 9.2 |
| 2015 | 9.3 | 9.3 | 9.3 | 9.3 | 9.3 | 9.3 | 9.1 | 9.1 | 9.1 | 9.3 | 9.3 | 9.3 | 9.3 | 9.3 |
| 2016 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.1 | 9.1 | 9.1 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 |
| 2017 | 9.5 | 9.5 | 9.5 | 9.5 | 9.5 | 9.5 | 9.0 | 9.0 | 9.0 | 9.5 | 9.5 | 9.5 | 9.5 | 9.5 |
| 2018 | 9.5 | 9.5 | 9.5 | 9.5 | 9.5 | 9.5 | 8.9 | 8.9 | 8.9 | 9.5 | 9.5 | 9.5 | 9.5 | 9.5 |
| 2019 | 9.6 | 9.6 | 9.6 | 9.6 | 9.6 | 9.6 | 8.7 | 8.7 | 8.7 | 9.6 | 9.6 | 9.6 | 9.6 | 9.6 |
| 2020 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 8.6 | 8.6 | 8.6 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 |
| 2021 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 8.3 | 8.3 | 8.3 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 |
| 2022 | 9.8 | 9.8 | 9.8 | 9.8 | 9.8 | 9.8 | 8.1 | 8.1 | 8.1 | 9.8 | 9.8 | 9.8 | 9.8 | 9.8 |
| 2023 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 7.8 | 7.8 | 7.8 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 |
| 2024 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 7.5 | 7.5 | 7.5 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 |
| 2025 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 7.2 | 7.2 | 7.2 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 |
| 2026 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 6.8 | 6.8 | 6.8 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 |
| 2027 | 10.1 | 10.1 | 10.1 | 10.1 | 10.1 | 10.1 | 6.5 | 6.5 | 6.5 | 10.1 | 10.1 | 10.1 | 10.1 | 10.1 |
| 2028 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 6.1 | 6.1 | 6.1 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 |
| 2029 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 5.8 | 5.8 | 5.8 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 |
| 2030 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 5.6 | 5.6 | 5.6 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 |

## Table B.12 Upstream Energy Use (all vehicles)

| | Upstream Energy Use for the Base Case and for Each PNGV Technology/Fuel Combination (quads) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base Case | CV+RFG | CV+MeOH | CV+EtOH | CV+RFD | CV+DME | CV+HFCV | CV+MFCV | CV+GFC | CV+FTD/RFD | CV+Bio/RFD | CV+LPG | CV+CNG | CV+LNG |
| 2005 | 4.2 | 4.1 | 4.1 | 4.1 | 4.1 | 4.1 | 4.1 | 4.1 | 4.1 | 4.1 | 4.1 | 4.1 | 4.1 | 4.1 |
| 2006 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 |
| 2007 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 |
| 2008 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 |
| 2009 | 4.4 | 4.4 | 4.4 | 4.4 | 4.4 | 4.4 | 4.4 | 4.4 | 4.4 | 4.4 | 4.4 | 4.4 | 4.4 | 4.4 |
| 2010 | 4.4 | 4.4 | 4.4 | 4.4 | 4.4 | 4.4 | 4.4 | 4.4 | 4.4 | 4.4 | 4.4 | 4.4 | 4.4 | 4.4 |
| 2011 | 4.5 | 4.4 | 4.4 | 4.4 | 4.4 | 4.4 | 4.5 | 4.4 | 4.4 | 4.4 | 4.4 | 4.4 | 4.4 | 4.4 |
| 2012 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 |
| 2013 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 |
| 2014 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 |
| 2015 | 4.5 | 4.4 | 4.5 | 4.5 | 4.4 | 4.5 | 4.5 | 4.5 | 4.4 | 4.5 | 4.4 | 4.4 | 4.4 | 4.5 |
| 2016 | 4.5 | 4.4 | 4.5 | 4.5 | 4.4 | 4.5 | 4.6 | 4.5 | 4.4 | 4.5 | 4.4 | 4.4 | 4.4 | 4.4 |
| 2017 | 4.5 | 4.4 | 4.5 | 4.5 | 4.3 | 4.5 | 4.6 | 4.5 | 4.4 | 4.4 | 4.3 | 4.3 | 4.4 | 4.4 |
| 2018 | 4.5 | 4.3 | 4.5 | 4.5 | 4.3 | 4.5 | 4.6 | 4.5 | 4.3 | 4.4 | 4.3 | 4.3 | 4.3 | 4.3 |
| 2019 | 4.5 | 4.3 | 4.4 | 4.5 | 4.2 | 4.4 | 4.6 | 4.4 | 4.3 | 4.4 | 4.2 | 4.2 | 4.2 | 4.3 |
| 2020 | 4.5 | 4.2 | 4.4 | 4.5 | 4.1 | 4.4 | 4.6 | 4.4 | 4.2 | 4.3 | 4.1 | 4.1 | 4.2 | 4.2 |
| 2021 | 4.5 | 4.1 | 4.4 | 4.6 | 4.0 | 4.4 | 4.7 | 4.4 | 4.1 | 4.3 | 4.0 | 4.0 | 4.1 | 4.1 |
| 2022 | 4.5 | 4.0 | 4.3 | 4.6 | 3.9 | 4.3 | 4.7 | 4.3 | 4.0 | 4.3 | 3.9 | 3.9 | 4.0 | 4.0 |
| 2023 | 4.5 | 3.9 | 4.3 | 4.6 | 3.8 | 4.3 | 4.6 | 4.3 | 3.9 | 4.2 | 3.8 | 3.7 | 3.9 | 4.0 |
| 2024 | 4.5 | 3.8 | 4.3 | 4.7 | 3.7 | 4.3 | 4.6 | 4.3 | 3.8 | 4.2 | 3.7 | 3.6 | 3.8 | 3.9 |
| 2025 | 4.5 | 3.7 | 4.2 | 4.7 | 3.5 | 4.2 | 4.5 | 4.2 | 3.7 | 4.1 | 3.6 | 3.5 | 3.7 | 3.8 |
| 2026 | 4.5 | 3.6 | 4.2 | 4.8 | 3.4 | 4.2 | 4.4 | 4.2 | 3.6 | 4.0 | 3.5 | 3.3 | 3.6 | 3.7 |
| 2027 | 4.5 | 3.5 | 4.2 | 4.8 | 3.3 | 4.1 | 4.4 | 4.2 | 3.5 | 4.0 | 3.3 | 3.2 | 3.4 | 3.6 |
| 2028 | 4.5 | 3.4 | 4.1 | 4.9 | 3.2 | 4.1 | 4.3 | 4.1 | 3.4 | 3.9 | 3.2 | 3.1 | 3.3 | 3.5 |
| 2029 | 4.5 | 3.4 | 4.1 | 4.9 | 3.1 | 4.1 | 4.2 | 4.1 | 3.4 | 3.9 | 3.1 | 2.9 | 3.3 | 3.4 |
| 2030 | 4.5 | 3.3 | 4.1 | 5.0 | 3.0 | 4.0 | 4.2 | 4.1 | 3.3 | 3.9 | 3.0 | 2.8 | 3.2 | 3.4 |

## Table B.13 Upstream Fossil Energy Use (all vehicles)

| | Upstream Fossil Energy Use for the Base Case and for Each PNGV Technology/Fuel Combination (quads) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base Case | CV+RFG | CV+MeOH | CV+EtOH | CV+RFD | CV+DME | CV+HFCV | CV+MFCV | CV+GFC | CV+FTD/RFD | CV+Bio/RFD | CV+LPG | CV+CNG | CV+LNG |
| 2005 | 4.0 | 3.9 | 3.9 | 3.9 | 3.9 | 3.9 | 3.9 | 3.9 | 3.9 | 3.9 | 3.9 | 3.9 | 3.9 | 3.9 |
| 2006 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| 2007 | 4.1 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| 2008 | 4.1 | 4.1 | 4.1 | 4.1 | 4.1 | 4.1 | 4.1 | 4.1 | 4.1 | 4.1 | 4.1 | 4.1 | 4.1 | 4.1 |
| 2009 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 |
| 2010 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 |
| 2011 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.3 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 |
| 2012 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 |
| 2013 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 |
| 2014 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 |
| 2015 | 4.3 | 4.3 | 4.3 | 4.3 | 4.2 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.2 | 4.2 | 4.2 | 4.3 |
| 2016 | 4.3 | 4.2 | 4.3 | 4.3 | 4.2 | 4.3 | 4.4 | 4.3 | 4.2 | 4.3 | 4.2 | 4.2 | 4.2 | 4.2 |
| 2017 | 4.3 | 4.2 | 4.3 | 4.3 | 4.2 | 4.3 | 4.4 | 4.3 | 4.2 | 4.3 | 4.2 | 4.1 | 4.2 | 4.2 |
| 2018 | 4.3 | 4.1 | 4.3 | 4.2 | 4.1 | 4.3 | 4.4 | 4.3 | 4.1 | 4.2 | 4.1 | 4.1 | 4.1 | 4.2 |
| 2019 | 4.3 | 4.1 | 4.3 | 4.0 | 4.0 | 4.3 | 4.4 | 4.3 | 4.1 | 4.2 | 4.0 | 4.0 | 4.0 | 4.1 |
| 2020 | 4.3 | 4.0 | 4.2 | 3.9 | 3.9 | 4.2 | 4.4 | 4.2 | 4.0 | 4.2 | 4.0 | 3.9 | 4.0 | 4.0 |
| 2021 | 4.3 | 3.9 | 4.2 | 3.8 | 3.8 | 4.2 | 4.4 | 4.2 | 3.9 | 4.1 | 3.9 | 3.8 | 3.9 | 4.0 |
| 2022 | 4.3 | 3.9 | 4.2 | 3.6 | 3.7 | 4.2 | 4.4 | 4.2 | 3.9 | 4.1 | 3.8 | 3.7 | 3.8 | 3.9 |
| 2023 | 4.3 | 3.8 | 4.2 | 3.4 | 3.6 | 4.2 | 4.4 | 4.2 | 3.8 | 4.1 | 3.7 | 3.6 | 3.7 | 3.8 |
| 2024 | 4.3 | 3.7 | 4.1 | 3.3 | 3.5 | 4.1 | 4.3 | 4.1 | 3.7 | 4.0 | 3.6 | 3.5 | 3.6 | 3.7 |
| 2025 | 4.3 | 3.6 | 4.1 | 3.1 | 3.4 | 4.1 | 4.3 | 4.1 | 3.6 | 4.0 | 3.5 | 3.3 | 3.5 | 3.6 |
| 2026 | 4.3 | 3.5 | 4.1 | 2.9 | 3.3 | 4.1 | 4.2 | 4.1 | 3.5 | 3.9 | 3.3 | 3.2 | 3.4 | 3.6 |
| 2027 | 4.3 | 3.4 | 4.0 | 2.7 | 3.2 | 4.0 | 4.1 | 4.0 | 3.4 | 3.9 | 3.2 | 3.1 | 3.3 | 3.5 |
| 2028 | 4.3 | 3.3 | 4.0 | 2.6 | 3.0 | 4.0 | 4.0 | 4.0 | 3.3 | 3.8 | 3.1 | 2.9 | 3.2 | 3.4 |
| 2029 | 4.3 | 3.2 | 4.0 | 2.4 | 2.9 | 4.0 | 3.9 | 4.0 | 3.2 | 3.8 | 3.0 | 2.8 | 3.1 | 3.3 |
| 2030 | 4.4 | 3.2 | 4.0 | 2.3 | 2.9 | 3.9 | 3.9 | 4.0 | 3.2 | 3.8 | 2.9 | 2.7 | 3.0 | 3.3 |

## Table B.14 Upstream Petroleum Use (all vehicles)

| | Upstream Petroleum Use for the Base Case and for Each PNGV Technology/Fuel Combination (quads) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base Case | CV+RFG | CV+MeOH | CV+EtOH | CV+RFD | CV+DME | CV+HFCV | CV+MFCV | CV+GFC | CV+FTD/RFD | CV+Bio/RFD | CV+LPG | CV+CNG | CV+LNG |
| 2005 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 |
| 2006 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 |
| 2007 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 |
| 2008 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 |
| 2009 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 |
| 2010 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 |
| 2011 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 |
| 2012 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 |
| 2013 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 |
| 2014 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 |
| 2015 | 2.1 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 |
| 2016 | 2.1 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 |
| 2017 | 2.1 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 |
| 2018 | 2.1 | 2.0 | 1.9 | 2.0 | 1.9 | 1.9 | 1.9 | 1.9 | 2.0 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 |
| 2019 | 2.1 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 |
| 2020 | 2.1 | 1.9 | 1.8 | 1.9 | 1.9 | 1.8 | 1.8 | 1.8 | 1.9 | 1.9 | 1.9 | 1.8 | 1.8 | 1.9 |
| 2021 | 2.1 | 1.9 | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 | 1.9 | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 |
| 2022 | 2.1 | 1.8 | 1.7 | 1.8 | 1.8 | 1.7 | 1.7 | 1.7 | 1.8 | 1.8 | 1.8 | 1.7 | 1.7 | 1.8 |
| 2023 | 2.1 | 1.8 | 1.7 | 1.7 | 1.7 | 1.7 | 1.6 | 1.7 | 1.8 | 1.7 | 1.7 | 1.7 | 1.6 | 1.7 |
| 2024 | 2.1 | 1.8 | 1.6 | 1.7 | 1.7 | 1.6 | 1.6 | 1.6 | 1.8 | 1.6 | 1.7 | 1.6 | 1.6 | 1.6 |
| 2025 | 2.1 | 1.7 | 1.5 | 1.6 | 1.6 | 1.5 | 1.5 | 1.5 | 1.7 | 1.6 | 1.6 | 1.5 | 1.5 | 1.6 |
| 2026 | 2.1 | 1.7 | 1.5 | 1.6 | 1.5 | 1.5 | 1.4 | 1.5 | 1.7 | 1.5 | 1.6 | 1.4 | 1.4 | 1.5 |
| 2027 | 2.1 | 1.6 | 1.4 | 1.5 | 1.5 | 1.4 | 1.3 | 1.4 | 1.6 | 1.4 | 1.5 | 1.4 | 1.3 | 1.5 |
| 2028 | 2.1 | 1.6 | 1.3 | 1.5 | 1.4 | 1.3 | 1.3 | 1.3 | 1.6 | 1.4 | 1.4 | 1.3 | 1.3 | 1.4 |
| 2029 | 2.1 | 1.5 | 1.3 | 1.4 | 1.4 | 1.3 | 1.2 | 1.3 | 1.5 | 1.3 | 1.4 | 1.3 | 1.2 | 1.3 |
| 2030 | 2.1 | 1.5 | 1.2 | 1.4 | 1.3 | 1.2 | 1.1 | 1.2 | 1.5 | 1.3 | 1.4 | 1.2 | 1.1 | 1.3 |

## Table B.15 Upstream $NO_x$ Emissions (urban locations)

| | Upstream Emissions of $NO_x$ for the Base Case and for Each PNGV Technology/Fuel Combination ($10^3$ tonnes) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base Case | CV+RFG | CV+MeOH | CV+EtOH | CV+RFD | CV+DME | CV+HFCV | CV+MFCV | CV+GFC | CV+FTD/RFD | CV+Bio/RFD | CV+LPG | CV+CNG | CV+LNG |
| 2005 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 |
| 2006 | 31 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 |
| 2007 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 |
| 2008 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 |
| 2009 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 |
| 2010 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 |
| 2011 | 32 | 32 | 32 | 32 | 32 | 32 | 33 | 32 | 32 | 32 | 32 | 32 | 32 | 32 |
| 2012 | 33 | 32 | 32 | 33 | 32 | 32 | 33 | 32 | 32 | 32 | 32 | 33 | 33 | 33 |
| 2013 | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 |
| 2014 | 33 | 33 | 33 | 33 | 33 | 33 | 34 | 33 | 33 | 33 | 33 | 33 | 33 | 33 |
| 2015 | 33 | 33 | 33 | 33 | 33 | 32 | 34 | 33 | 33 | 33 | 33 | 33 | 33 | 33 |
| 2016 | 33 | 32 | 32 | 34 | 32 | 32 | 35 | 32 | 32 | 32 | 32 | 32 | 33 | 33 |
| 2017 | 33 | 32 | 32 | 34 | 32 | 32 | 36 | 32 | 32 | 32 | 32 | 32 | 33 | 33 |
| 2018 | 33 | 32 | 32 | 34 | 32 | 31 | 38 | 32 | 32 | 32 | 32 | 32 | 32 | 33 |
| 2019 | 33 | 31 | 31 | 34 | 31 | 31 | 39 | 31 | 31 | 31 | 31 | 32 | 32 | 33 |
| 2020 | 33 | 31 | 31 | 34 | 31 | 30 | 41 | 31 | 31 | 31 | 31 | 31 | 32 | 32 |
| 2021 | 33 | 30 | 30 | 34 | 30 | 30 | 42 | 30 | 30 | 30 | 31 | 31 | 31 | 32 |
| 2022 | 33 | 30 | 29 | 34 | 30 | 29 | 44 | 29 | 30 | 29 | 30 | 30 | 31 | 32 |
| 2023 | 33 | 29 | 28 | 34 | 29 | 28 | 47 | 28 | 29 | 28 | 29 | 29 | 31 | 32 |
| 2024 | 34 | 29 | 28 | 34 | 28 | 27 | 49 | 28 | 29 | 28 | 29 | 29 | 30 | 32 |
| 2025 | 34 | 28 | 27 | 35 | 27 | 26 | 52 | 27 | 28 | 27 | 28 | 28 | 30 | 31 |
| 2026 | 34 | 27 | 26 | 35 | 27 | 25 | 55 | 26 | 27 | 26 | 27 | 27 | 29 | 31 |
| 2027 | 34 | 26 | 25 | 35 | 26 | 25 | 57 | 25 | 26 | 25 | 27 | 27 | 29 | 31 |
| 2028 | 34 | 26 | 24 | 35 | 25 | 24 | 60 | 24 | 26 | 24 | 26 | 26 | 29 | 31 |
| 2029 | 34 | 25 | 24 | 35 | 25 | 23 | 62 | 24 | 25 | 23 | 25 | 26 | 28 | 30 |
| 2030 | 34 | 25 | 23 | 35 | 24 | 22 | 64 | 23 | 25 | 23 | 25 | 25 | 28 | 30 |

## Table B.16 Upstream CO Emissions (urban locations)

| | Upstream Emissions of CO for the Base Case and for Each PNGV Technology/Fuel Combination ($10^3$ tonnes) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base Case | CV+RFG | CV+MeOH | CV+EtOH | CV+RFD | CV+DME | CV+HFCV | CV+MFCV | CV+GFC | CV+FTD/RFD | CV+Bio/RFD | CV+LPG | CV+CNG | CV+LNG |
| 2005 | 21 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| 2006 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 |
| 2007 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 |
| 2008 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 |
| 2009 | 22 | 21 | 21 | 21 | 21 | 21 | 22 | 21 | 21 | 21 | 21 | 21 | 21 | 21 |
| 2010 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 |
| 2011 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 |
| 2012 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 |
| 2013 | 22 | 22 | 22 | 22 | 22 | 22 | 23 | 22 | 22 | 22 | 22 | 22 | 22 | 22 |
| 2014 | 22 | 22 | 22 | 22 | 22 | 22 | 23 | 22 | 22 | 22 | 22 | 22 | 22 | 22 |
| 2015 | 23 | 22 | 22 | 23 | 22 | 22 | 23 | 22 | 22 | 22 | 22 | 22 | 22 | 23 |
| 2016 | 23 | 22 | 22 | 23 | 22 | 22 | 23 | 22 | 22 | 22 | 22 | 22 | 22 | 23 |
| 2017 | 23 | 22 | 22 | 23 | 22 | 22 | 23 | 22 | 22 | 22 | 22 | 22 | 22 | 23 |
| 2018 | 23 | 22 | 22 | 23 | 22 | 21 | 24 | 22 | 22 | 22 | 22 | 22 | 22 | 23 |
| 2019 | 23 | 21 | 21 | 22 | 21 | 21 | 24 | 21 | 21 | 21 | 22 | 22 | 21 | 23 |
| 2020 | 23 | 21 | 21 | 22 | 21 | 21 | 25 | 21 | 21 | 21 | 21 | 21 | 21 | 23 |
| 2021 | 23 | 21 | 20 | 22 | 21 | 20 | 25 | 20 | 21 | 20 | 21 | 21 | 21 | 23 |
| 2022 | 23 | 20 | 20 | 22 | 20 | 20 | 26 | 20 | 20 | 20 | 21 | 21 | 20 | 23 |
| 2023 | 23 | 20 | 20 | 22 | 20 | 19 | 26 | 20 | 20 | 19 | 20 | 20 | 20 | 23 |
| 2024 | 23 | 19 | 19 | 22 | 19 | 19 | 27 | 19 | 19 | 19 | 20 | 20 | 19 | 23 |
| 2025 | 23 | 19 | 18 | 22 | 19 | 18 | 28 | 18 | 19 | 18 | 20 | 20 | 19 | 23 |
| 2026 | 23 | 18 | 18 | 22 | 18 | 18 | 28 | 18 | 18 | 18 | 19 | 19 | 18 | 24 |
| 2027 | 23 | 18 | 17 | 21 | 18 | 17 | 29 | 17 | 18 | 17 | 19 | 19 | 18 | 24 |
| 2028 | 23 | 18 | 17 | 21 | 17 | 16 | 30 | 17 | 18 | 17 | 19 | 19 | 17 | 24 |
| 2029 | 23 | 17 | 16 | 21 | 17 | 16 | 31 | 16 | 17 | 16 | 18 | 18 | 17 | 24 |
| 2030 | 23 | 17 | 16 | 21 | 17 | 15 | 31 | 16 | 17 | 16 | 18 | 18 | 17 | 24 |

## Table B.17 Upstream VOC Emission (urban locations)

| | Upstream Emissions of VOC for the Base Case and for Each PNGV Technology/Fuel Combination ($10^3$ tonnes) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base Case | CV+RFG | CV+MeOH | CV+EtOH | CV+RFD | CV+DME | CV+HFCV | CV+MFCV | CV+GFC | CV+FTD/RFD | CV+Bio/RFD | CV+LPG | CV+CNG | CV+LNG |
| 2005 | 68 | 67 | 67 | 67 | 67 | 67 | 67 | 67 | 67 | 67 | 67 | 67 | 67 | 67 |
| 2006 | 69 | 68 | 68 | 68 | 68 | 68 | 68 | 68 | 68 | 68 | 68 | 68 | 68 | 68 |
| 2007 | 70 | 69 | 69 | 69 | 69 | 69 | 69 | 69 | 69 | 69 | 69 | 69 | 69 | 69 |
| 2008 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 |
| 2009 | 71 | 71 | 71 | 71 | 71 | 71 | 71 | 71 | 71 | 71 | 71 | 71 | 71 | 71 |
| 2010 | 72 | 72 | 72 | 72 | 72 | 72 | 72 | 72 | 72 | 72 | 72 | 72 | 72 | 72 |
| 2011 | 72 | 72 | 72 | 72 | 72 | 72 | 72 | 72 | 72 | 72 | 72 | 72 | 72 | 72 |
| 2012 | 73 | 72 | 72 | 72 | 72 | 72 | 72 | 72 | 72 | 72 | 72 | 72 | 72 | 72 |
| 2013 | 73 | 73 | 73 | 73 | 72 | 72 | 73 | 73 | 73 | 72 | 72 | 73 | 72 | 73 |
| 2014 | 73 | 73 | 72 | 73 | 72 | 72 | 72 | 72 | 73 | 72 | 72 | 72 | 72 | 73 |
| 2015 | 73 | 72 | 72 | 72 | 72 | 72 | 72 | 72 | 72 | 72 | 72 | 72 | 72 | 72 |
| 2016 | 73 | 72 | 71 | 72 | 71 | 71 | 71 | 71 | 72 | 71 | 71 | 71 | 71 | 72 |
| 2017 | 73 | 71 | 71 | 71 | 70 | 70 | 70 | 71 | 71 | 70 | 70 | 70 | 70 | 71 |
| 2018 | 73 | 70 | 69 | 70 | 69 | 69 | 69 | 69 | 70 | 69 | 69 | 69 | 68 | 70 |
| 2019 | 73 | 69 | 68 | 68 | 67 | 67 | 68 | 68 | 69 | 67 | 67 | 68 | 67 | 69 |
| 2020 | 73 | 68 | 67 | 67 | 66 | 66 | 66 | 67 | 68 | 65 | 66 | 67 | 65 | 67 |
| 2021 | 73 | 67 | 65 | 66 | 64 | 64 | 65 | 65 | 67 | 63 | 64 | 65 | 63 | 66 |
| 2022 | 73 | 65 | 64 | 64 | 62 | 62 | 63 | 64 | 65 | 61 | 62 | 63 | 61 | 64 |
| 2023 | 73 | 64 | 62 | 62 | 60 | 60 | 61 | 62 | 64 | 59 | 60 | 61 | 58 | 63 |
| 2024 | 73 | 62 | 60 | 60 | 58 | 57 | 59 | 60 | 62 | 56 | 58 | 59 | 56 | 61 |
| 2025 | 73 | 61 | 58 | 58 | 55 | 55 | 56 | 58 | 61 | 54 | 55 | 57 | 53 | 59 |
| 2026 | 73 | 59 | 56 | 57 | 53 | 52 | 54 | 56 | 59 | 51 | 53 | 55 | 50 | 57 |
| 2027 | 73 | 58 | 54 | 55 | 50 | 50 | 52 | 54 | 58 | 49 | 51 | 53 | 48 | 56 |
| 2028 | 73 | 56 | 52 | 53 | 48 | 48 | 50 | 52 | 56 | 46 | 49 | 51 | 45 | 54 |
| 2029 | 73 | 55 | 50 | 51 | 46 | 46 | 48 | 50 | 55 | 44 | 47 | 49 | 43 | 52 |
| 2030 | 73 | 54 | 49 | 50 | 45 | 44 | 46 | 49 | 54 | 42 | 45 | 47 | 41 | 51 |

## Table B.18 Upstream $SO_x$ Emissions (urban locations)

| | Upstream Emissions of $SO_x$ for the Base Case and for Each PNGV Technology/Fuel Combination ($10^3$ tonnes) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base Case | CV+RFG | CV+MeOH | CV+EtOH | CV+RFD | CV+DME | CV+HFCV | CV+MFCV | CV+GFC | CV+FTD/RFD | CV+Bio/RFD | CV+LPG | CV+CNG | CV+LNG |
| 2005 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 2006 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 2007 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 2008 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 2009 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 2010 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 2011 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 2012 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 2013 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 2014 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 4 |
| 2015 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 4 |
| 2016 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 4 |
| 2017 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 4 |
| 2018 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 5 |
| 2019 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 5 |
| 2020 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 5 |
| 2021 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 6 |
| 2022 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 7 |
| 2023 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 7 |
| 2024 | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 8 |
| 2025 | 3 | 2 | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 2 | 9 |
| 2026 | 3 | 2 | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 2 | 10 |
| 2027 | 3 | 2 | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 2 | 11 |
| 2028 | 3 | 2 | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 2 | 11 |
| 2029 | 3 | 2 | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 2 | 12 |
| 2030 | 3 | 2 | 4 | 2 | 2 | 3 | 2 | 4 | 2 | 3 | 2 | 2 | 2 | 13 |

## Table B.19 Upstream $PM_{10}$ Emissions (urban locations)

| | Upstream Emissions of $PM_{10}$ for the Base Case and for Each PNGV Technology/Fuel Combination ($10^3$ tonnes) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base Case | CV+RFG | CV+MeOH | CV+EtOH | CV+RFD | CV+DME | CV+HFCV | CV+MFCV | CV+GFC | CV+FTD/RFD | CV+Bio/RFD | CV+LPG | CV+CNG | CV+LNG |
| 2005 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 2006 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 2007 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 2008 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 2009 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 2010 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 2011 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 2012 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 2013 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 2014 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 2015 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 |
| 2016 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 |
| 2017 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 |
| 2018 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 4 |
| 2019 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 4 |
| 2020 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 5 |
| 2021 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 5 |
| 2022 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 6 |
| 2023 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 7 |
| 2024 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 8 |
| 2025 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 8 |
| 2026 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 9 |
| 2027 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 10 |
| 2028 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 11 |
| 2029 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 12 |
| 2030 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 13 |

## Table B.20 Upstream $CO_2$ Emissions (all vehicles)

Upstream Emissions of $CO_2$ for the Base Case and for Each PNGV Technology/Fuel Combination ($10^3$ tonnes)

| | Base Case | CV+RFG | CV+MeOH | CV+EtOH | CV+RFD | CV+DME | CV+HFCV | CV+MFCV | CV+GFC | CV+FTD/RFD | CV+Bio/RFD | CV+LPG | CV+CNG | CV+LNG |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2005 | 298,672 | 293,590 | 293,590 | 293,590 | 293,590 | 293,590 | 293,590 | 293,590 | 293,590 | 293,590 | 293,590 | 293,590 | 293,590 | 293,590 |
| 2006 | 301,086 | 298,031 | 298,031 | 298,031 | 298,031 | 298,031 | 298,031 | 298,031 | 298,031 | 298,031 | 298,031 | 298,031 | 298,031 | 298,031 |
| 2007 | 303,514 | 301,762 | 301,768 | 301,779 | 301,758 | 301,768 | 301,815 | 301,768 | 301,762 | 301,771 | 301,759 | 301,756 | 301,760 | 301,760 |
| 2008 | 305,404 | 304,411 | 304,433 | 304,476 | 304,393 | 304,435 | 304,619 | 304,433 | 304,411 | 304,446 | 304,396 | 304,386 | 304,403 | 304,403 |
| 2009 | 309,985 | 309,371 | 309,424 | 309,530 | 309,325 | 309,429 | 309,883 | 309,424 | 309,371 | 309,456 | 309,334 | 309,308 | 309,351 | 309,350 |
| 2010 | 313,740 | 313,222 | 313,329 | 313,539 | 313,132 | 313,338 | 314,238 | 313,329 | 313,222 | 313,391 | 313,150 | 313,098 | 313,183 | 313,181 |
| 2011 | 316,533 | 315,746 | 315,936 | 316,310 | 315,585 | 315,953 | 317,564 | 315,936 | 315,746 | 316,049 | 315,618 | 315,525 | 315,676 | 315,672 |
| 2012 | 318,575 | 317,366 | 317,681 | 318,262 | 317,099 | 317,709 | 320,379 | 317,681 | 317,366 | 317,868 | 317,153 | 316,999 | 317,250 | 317,243 |
| 2013 | 320,132 | 318,248 | 318,757 | 319,659 | 317,818 | 318,801 | 323,107 | 318,757 | 318,248 | 319,058 | 317,905 | 317,656 | 318,062 | 318,050 |
| 2014 | 321,149 | 318,207 | 319,021 | 320,434 | 317,520 | 319,091 | 325,973 | 319,021 | 318,207 | 319,502 | 317,659 | 317,262 | 317,910 | 317,891 |
| 2015 | 321,537 | 316,971 | 318,255 | 320,454 | 315,887 | 318,366 | 329,223 | 318,255 | 316,971 | 319,014 | 316,106 | 315,479 | 316,502 | 316,472 |
| 2016 | 321,694 | 314,798 | 316,759 | 320,101 | 313,142 | 316,928 | 333,510 | 316,759 | 314,798 | 317,918 | 313,477 | 312,520 | 314,082 | 314,036 |
| 2017 | 321,710 | 311,820 | 314,656 | 319,481 | 309,424 | 314,901 | 338,886 | 314,656 | 311,820 | 316,333 | 309,909 | 308,524 | 310,783 | 310,717 |
| 2018 | 321,642 | 308,132 | 312,034 | 313,163 | 304,836 | 312,371 | 345,366 | 312,034 | 308,132 | 314,340 | 305,503 | 303,598 | 306,706 | 306,615 |
| 2019 | 321,531 | 303,821 | 308,970 | 300,985 | 299,473 | 309,413 | 352,946 | 308,970 | 303,821 | 312,012 | 300,352 | 297,839 | 301,940 | 301,819 |
| 2020 | 321,422 | 298,974 | 305,540 | 289,421 | 293,430 | 306,106 | 361,619 | 305,540 | 298,974 | 309,420 | 294,551 | 291,347 | 296,576 | 296,422 |
| 2021 | 321,355 | 293,546 | 301,729 | 279,197 | 286,636 | 302,435 | 368,685 | 301,729 | 293,546 | 306,565 | 288,034 | 284,040 | 290,557 | 290,365 |
| 2022 | 321,353 | 287,616 | 297,604 | 267,890 | 279,182 | 298,464 | 373,945 | 297,604 | 287,616 | 303,505 | 280,889 | 276,014 | 283,968 | 283,734 |
| 2023 | 321,422 | 281,251 | 293,215 | 255,658 | 271,148 | 294,246 | 377,152 | 293,215 | 281,251 | 300,284 | 273,192 | 267,353 | 276,881 | 276,600 |
| 2024 | 321,563 | 274,511 | 288,609 | 242,565 | 262,606 | 289,824 | 376,137 | 288,609 | 274,511 | 296,939 | 265,014 | 258,134 | 269,361 | 269,030 |
| 2025 | 321,782 | 267,465 | 283,839 | 228,739 | 253,637 | 285,250 | 372,280 | 283,839 | 267,465 | 293,514 | 256,435 | 248,443 | 261,484 | 261,099 |
| 2026 | 322,065 | 260,273 | 279,015 | 214,499 | 244,447 | 280,630 | 365,113 | 279,015 | 260,273 | 290,089 | 247,649 | 238,502 | 253,428 | 252,988 |
| 2027 | 322,407 | 253,366 | 274,433 | 200,677 | 235,576 | 276,248 | 359,873 | 274,433 | 253,366 | 286,881 | 239,175 | 228,893 | 245,671 | 245,176 |
| 2028 | 322,798 | 247,010 | 270,273 | 187,782 | 227,365 | 272,277 | 354,187 | 270,273 | 247,010 | 284,018 | 231,339 | 219,986 | 238,512 | 237,966 |
| 2029 | 323,233 | 241,306 | 266,602 | 176,021 | 219,945 | 268,781 | 351,039 | 266,602 | 241,306 | 281,548 | 224,267 | 211,921 | 232,067 | 231,472 |
| 2030 | 323,699 | 236,264 | 263,420 | 165,447 | 213,332 | 265,760 | 346,761 | 263,420 | 236,264 | 279,466 | 217,971 | 204,718 | 226,345 | 225,707 |

## Table B.21 Upstream $CH_4$ Emissions (all vehicles)

| | Upstream Emissions of $CH_4$ for the Base Case and for Each PNGV Technology/Fuel Combination ($10^3$ tonnes) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base Case | CV+RFG | CV+MeOH | CV+EtOH | CV+RFD | CV+DME | CV+HFCV | CV+MFCV | CV+GFC | CV+FTD/RFD | CV+Bio/RFD | CV+LPG | CV+CNG | CV+LNG |
| 2005 | 1,259 | 1,237 | 1,237 | 1,237 | 1,237 | 1,237 | 1,237 | 1,237 | 1,237 | 1,237 | 1,237 | 1,237 | 1,237 | 1,237 |
| 2006 | 1,269 | 1,256 | 1,256 | 1,256 | 1,256 | 1,256 | 1,256 | 1,256 | 1,256 | 1,256 | 1,256 | 1,256 | 1,256 | 1,256 |
| 2007 | 1,279 | 1,272 | 1,272 | 1,272 | 1,272 | 1,272 | 1,272 | 1,272 | 1,272 | 1,272 | 1,272 | 1,272 | 1,272 | 1,272 |
| 2008 | 1,287 | 1,283 | 1,283 | 1,283 | 1,283 | 1,283 | 1,283 | 1,283 | 1,283 | 1,283 | 1,283 | 1,283 | 1,283 | 1,283 |
| 2009 | 1,306 | 1,304 | 1,304 | 1,304 | 1,304 | 1,304 | 1,304 | 1,304 | 1,304 | 1,304 | 1,304 | 1,304 | 1,304 | 1,304 |
| 2010 | 1,322 | 1,320 | 1,321 | 1,320 | 1,320 | 1,321 | 1,321 | 1,321 | 1,320 | 1,320 | 1,320 | 1,320 | 1,322 | 1,322 |
| 2011 | 1,334 | 1,331 | 1,332 | 1,331 | 1,331 | 1,332 | 1,333 | 1,332 | 1,331 | 1,331 | 1,330 | 1,331 | 1,333 | 1,333 |
| 2012 | 1,343 | 1,338 | 1,340 | 1,338 | 1,337 | 1,340 | 1,342 | 1,340 | 1,338 | 1,338 | 1,337 | 1,338 | 1,342 | 1,342 |
| 2013 | 1,349 | 1,341 | 1,345 | 1,343 | 1,341 | 1,345 | 1,348 | 1,345 | 1,341 | 1,342 | 1,341 | 1,342 | 1,349 | 1,349 |
| 2014 | 1,354 | 1,341 | 1,347 | 1,343 | 1,340 | 1,347 | 1,352 | 1,347 | 1,341 | 1,342 | 1,340 | 1,342 | 1,353 | 1,353 |
| 2015 | 1,355 | 1,336 | 1,345 | 1,339 | 1,335 | 1,344 | 1,352 | 1,345 | 1,336 | 1,337 | 1,334 | 1,338 | 1,354 | 1,354 |
| 2016 | 1,356 | 1,327 | 1,340 | 1,331 | 1,325 | 1,340 | 1,352 | 1,340 | 1,327 | 1,328 | 1,324 | 1,330 | 1,355 | 1,355 |
| 2017 | 1,356 | 1,315 | 1,333 | 1,320 | 1,311 | 1,333 | 1,350 | 1,333 | 1,315 | 1,316 | 1,310 | 1,318 | 1,354 | 1,355 |
| 2018 | 1,356 | 1,299 | 1,325 | 1,294 | 1,294 | 1,324 | 1,348 | 1,325 | 1,299 | 1,301 | 1,292 | 1,304 | 1,354 | 1,354 |
| 2019 | 1,356 | 1,281 | 1,315 | 1,252 | 1,275 | 1,314 | 1,346 | 1,315 | 1,281 | 1,284 | 1,272 | 1,288 | 1,353 | 1,353 |
| 2020 | 1,355 | 1,261 | 1,304 | 1,209 | 1,253 | 1,303 | 1,343 | 1,304 | 1,261 | 1,264 | 1,250 | 1,270 | 1,353 | 1,353 |
| 2021 | 1,355 | 1,238 | 1,291 | 1,168 | 1,228 | 1,291 | 1,336 | 1,291 | 1,238 | 1,242 | 1,224 | 1,249 | 1,352 | 1,353 |
| 2022 | 1,355 | 1,213 | 1,278 | 1,122 | 1,201 | 1,278 | 1,324 | 1,278 | 1,213 | 1,218 | 1,196 | 1,226 | 1,353 | 1,353 |
| 2023 | 1,355 | 1,186 | 1,264 | 1,073 | 1,172 | 1,264 | 1,306 | 1,264 | 1,186 | 1,192 | 1,166 | 1,202 | 1,354 | 1,355 |
| 2024 | 1,356 | 1,158 | 1,250 | 1,020 | 1,141 | 1,249 | 1,280 | 1,250 | 1,158 | 1,165 | 1,134 | 1,177 | 1,355 | 1,356 |
| 2025 | 1,357 | 1,128 | 1,235 | 965 | 1,108 | 1,234 | 1,248 | 1,235 | 1,128 | 1,137 | 1,100 | 1,150 | 1,357 | 1,359 |
| 2026 | 1,358 | 1,098 | 1,220 | 907 | 1,075 | 1,219 | 1,209 | 1,220 | 1,098 | 1,108 | 1,066 | 1,123 | 1,360 | 1,362 |
| 2027 | 1,360 | 1,068 | 1,206 | 852 | 1,043 | 1,205 | 1,175 | 1,206 | 1,068 | 1,080 | 1,033 | 1,097 | 1,364 | 1,365 |
| 2028 | 1,362 | 1,042 | 1,194 | 800 | 1,014 | 1,192 | 1,141 | 1,194 | 1,042 | 1,054 | 1,003 | 1,074 | 1,367 | 1,369 |
| 2029 | 1,363 | 1,018 | 1,183 | 753 | 988 | 1,182 | 1,115 | 1,183 | 1,018 | 1,031 | 975 | 1,052 | 1,372 | 1,374 |
| 2030 | 1,366 | 996 | 1,174 | 710 | 964 | 1,172 | 1,088 | 1,174 | 996 | 1,011 | 951 | 1,034 | 1,377 | 1,379 |

## Table B.22 Upstream $N_2O$ Emissions (all vehicles)

| | Upstream Emissions of $N_2O$ for the Base Case and for Each PNGV Technology/Fuel Combination ($10^3$ tonnes) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base Case | CV+RFG | CV+MeOH | CV+EtOH | CV+RFD | CV+DME | CV+HFCV | CV+MFCV | CV+GFC | CV+FTD/RFD | CV+Bio/RFD | CV+LPG | CV+CNG | CV+LNG |
| 2005 | 33.7 | 33.1 | 33.1 | 33.1 | 33.1 | 33.1 | 33.1 | 33.1 | 33.1 | 33.1 | 33.1 | 33.1 | 33.1 | 33.1 |
| 2006 | 33.9 | 33.6 | 33.6 | 33.6 | 33.6 | 33.6 | 33.6 | 33.6 | 33.6 | 33.6 | 33.6 | 33.6 | 33.6 | 33.6 |
| 2007 | 34.2 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 |
| 2008 | 31.5 | 31.4 | 31.4 | 31.5 | 31.4 | 31.4 | 31.4 | 31.4 | 31.4 | 31.4 | 31.4 | 31.4 | 31.4 | 31.4 |
| 2009 | 29.2 | 29.2 | 29.2 | 29.4 | 29.2 | 29.2 | 29.2 | 29.2 | 29.2 | 29.2 | 29.2 | 29.2 | 29.2 | 29.2 |
| 2010 | 27.1 | 27.0 | 27.0 | 27.5 | 27.0 | 27.0 | 27.1 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.1 |
| 2011 | 25.0 | 24.9 | 24.9 | 25.8 | 24.9 | 24.9 | 25.1 | 24.9 | 24.9 | 24.9 | 24.9 | 24.9 | 25.0 | 25.1 |
| 2012 | 23.0 | 22.9 | 22.9 | 24.3 | 22.9 | 22.9 | 23.2 | 22.9 | 22.9 | 22.9 | 22.9 | 22.9 | 23.0 | 23.2 |
| 2013 | 21.1 | 21.1 | 21.0 | 23.3 | 21.0 | 21.0 | 21.4 | 21.0 | 21.1 | 21.0 | 21.1 | 21.0 | 21.1 | 21.5 |
| 2014 | 19.4 | 19.3 | 19.2 | 22.9 | 19.2 | 19.2 | 19.9 | 19.2 | 19.3 | 19.2 | 19.3 | 19.2 | 19.5 | 20.0 |
| 2015 | 17.8 | 17.7 | 17.5 | 23.3 | 17.5 | 17.5 | 18.6 | 17.5 | 17.7 | 17.5 | 17.7 | 17.5 | 17.9 | 18.8 |
| 2016 | 16.2 | 16.2 | 15.9 | 24.8 | 16.0 | 15.9 | 17.6 | 15.9 | 16.2 | 15.9 | 16.2 | 15.9 | 16.5 | 17.9 |
| 2017 | 14.9 | 14.8 | 14.4 | 27.3 | 14.6 | 14.4 | 16.9 | 14.4 | 14.8 | 14.4 | 14.9 | 14.4 | 15.4 | 17.3 |
| 2018 | 13.6 | 13.6 | 13.1 | 27.9 | 13.3 | 13.1 | 16.5 | 13.1 | 13.6 | 13.1 | 13.7 | 13.0 | 14.4 | 17.1 |
| 2019 | 12.4 | 12.6 | 11.9 | 26.2 | 12.1 | 11.9 | 16.3 | 11.9 | 12.6 | 11.9 | 12.7 | 11.8 | 13.6 | 17.1 |
| 2020 | 11.4 | 11.7 | 10.8 | 25.9 | 11.1 | 10.8 | 16.5 | 10.8 | 11.7 | 10.8 | 11.8 | 10.7 | 12.9 | 17.5 |
| 2021 | 10.4 | 11.0 | 9.9 | 27.3 | 10.2 | 9.8 | 16.9 | 9.9 | 11.0 | 9.8 | 11.1 | 9.7 | 12.5 | 18.2 |
| 2022 | 9.5 | 10.4 | 9.0 | 29.1 | 9.4 | 9.0 | 17.6 | 9.0 | 10.4 | 9.0 | 10.5 | 8.8 | 12.2 | 19.2 |
| 2023 | 8.7 | 9.9 | 8.3 | 31.3 | 8.8 | 8.3 | 18.4 | 8.3 | 9.9 | 8.2 | 10.1 | 8.0 | 12.1 | 20.5 |
| 2024 | 8.0 | 9.6 | 7.7 | 33.8 | 8.2 | 7.6 | 19.5 | 7.7 | 9.6 | 7.6 | 9.8 | 7.3 | 12.2 | 22.0 |
| 2025 | 7.3 | 9.4 | 7.2 | 36.6 | 7.8 | 7.1 | 20.8 | 7.2 | 9.4 | 7.1 | 9.6 | 6.7 | 12.4 | 23.8 |
| 2026 | 6.7 | 9.3 | 6.7 | 39.7 | 7.5 | 6.7 | 22.2 | 6.7 | 9.3 | 6.6 | 9.5 | 6.3 | 12.8 | 25.8 |
| 2027 | 6.1 | 9.3 | 6.4 | 42.7 | 7.2 | 6.3 | 23.7 | 6.4 | 9.3 | 6.3 | 9.5 | 5.9 | 13.2 | 27.8 |
| 2028 | 5.6 | 9.3 | 6.1 | 45.7 | 7.0 | 6.1 | 25.1 | 6.1 | 9.3 | 6.0 | 9.6 | 5.5 | 13.6 | 29.8 |
| 2029 | 5.1 | 9.4 | 5.9 | 48.5 | 6.9 | 5.8 | 26.5 | 5.9 | 9.4 | 5.8 | 9.6 | 5.3 | 14.1 | 31.7 |
| 2030 | 4.7 | 9.5 | 5.8 | 51.0 | 6.8 | 5.7 | 27.7 | 5.8 | 9.5 | 5.6 | 9.8 | 5.1 | 14.5 | 33.4 |

## Table B.23 Total Energy Use by All Vehicles

| | Total Energy Use for the Base Case and for Each PNGV Technology/Fuel Combination (quads) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base Case | CV+RFG | CV+MeOH | CV+EtOH | CV+RFD | CV+DME | CV+HFCV | CV+MFCV | CV+GFC | CV+FTD/RFD | CV+Bio/RFD | CV+LPG | CV+CNG | CV+LNG |
| 2005 | 18.3 | 17.9 | 17.9 | 17.9 | 17.9 | 17.9 | 17.9 | 17.9 | 17.9 | 17.9 | 17.9 | 17.9 | 17.9 | 17.9 |
| 2006 | 18.4 | 18.2 | 18.2 | 18.2 | 18.2 | 18.2 | 18.2 | 18.2 | 18.2 | 18.2 | 18.2 | 18.2 | 18.2 | 18.2 |
| 2007 | 18.6 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 |
| 2008 | 18.7 | 18.6 | 18.6 | 18.6 | 18.6 | 18.6 | 18.6 | 18.6 | 18.6 | 18.6 | 18.6 | 18.6 | 18.6 | 18.6 |
| 2009 | 18.9 | 18.9 | 18.9 | 18.9 | 18.9 | 18.9 | 18.9 | 18.9 | 18.9 | 18.9 | 18.9 | 18.9 | 18.9 | 18.9 |
| 2010 | 19.2 | 19.1 | 19.1 | 19.1 | 19.1 | 19.1 | 19.2 | 19.1 | 19.1 | 19.1 | 19.1 | 19.1 | 19.1 | 19.1 |
| 2011 | 19.3 | 19.3 | 19.3 | 19.3 | 19.3 | 19.3 | 19.3 | 19.3 | 19.3 | 19.3 | 19.3 | 19.3 | 19.3 | 19.3 |
| 2012 | 19.5 | 19.4 | 19.4 | 19.4 | 19.4 | 19.4 | 19.4 | 19.4 | 19.4 | 19.4 | 19.4 | 19.4 | 19.4 | 19.4 |
| 2013 | 19.6 | 19.4 | 19.5 | 19.5 | 19.4 | 19.5 | 19.5 | 19.5 | 19.4 | 19.5 | 19.4 | 19.4 | 19.4 | 19.4 |
| 2014 | 19.6 | 19.4 | 19.5 | 19.5 | 19.4 | 19.5 | 19.5 | 19.5 | 19.4 | 19.5 | 19.4 | 19.4 | 19.4 | 19.4 |
| 2015 | 19.6 | 19.4 | 19.4 | 19.4 | 19.3 | 19.4 | 19.5 | 19.4 | 19.4 | 19.4 | 19.4 | 19.3 | 19.4 | 19.4 |
| 2016 | 19.6 | 19.2 | 19.3 | 19.3 | 19.2 | 19.3 | 19.4 | 19.3 | 19.2 | 19.3 | 19.2 | 19.2 | 19.2 | 19.2 |
| 2017 | 19.6 | 19.0 | 19.1 | 19.1 | 19.0 | 19.1 | 19.2 | 19.1 | 19.0 | 19.1 | 19.0 | 19.0 | 19.0 | 19.1 |
| 2018 | 19.6 | 18.8 | 19.0 | 19.0 | 18.8 | 18.9 | 19.1 | 19.0 | 18.8 | 18.9 | 18.8 | 18.8 | 18.8 | 18.8 |
| 2019 | 19.6 | 18.6 | 18.7 | 18.8 | 18.5 | 18.7 | 18.9 | 18.7 | 18.6 | 18.7 | 18.5 | 18.5 | 18.5 | 18.6 |
| 2020 | 19.6 | 18.3 | 18.5 | 18.6 | 18.2 | 18.5 | 18.7 | 18.5 | 18.3 | 18.4 | 18.2 | 18.1 | 18.2 | 18.3 |
| 2021 | 19.6 | 17.9 | 18.2 | 18.4 | 17.8 | 18.2 | 18.5 | 18.2 | 17.9 | 18.1 | 17.9 | 17.8 | 17.9 | 17.9 |
| 2022 | 19.6 | 17.6 | 17.9 | 18.1 | 17.4 | 17.9 | 18.2 | 17.9 | 17.6 | 17.8 | 17.5 | 17.4 | 17.5 | 17.6 |
| 2023 | 19.6 | 17.2 | 17.5 | 17.9 | 17.0 | 17.5 | 17.9 | 17.5 | 17.2 | 17.4 | 17.1 | 17.0 | 17.1 | 17.2 |
| 2024 | 19.6 | 16.8 | 17.2 | 17.6 | 16.6 | 17.2 | 17.5 | 17.2 | 16.8 | 17.1 | 16.6 | 16.5 | 16.7 | 16.8 |
| 2025 | 19.6 | 16.3 | 16.8 | 17.3 | 16.1 | 16.8 | 17.1 | 16.8 | 16.3 | 16.7 | 16.2 | 16.0 | 16.3 | 16.4 |
| 2026 | 19.7 | 15.9 | 16.4 | 17.0 | 15.6 | 16.4 | 16.7 | 16.4 | 15.9 | 16.3 | 15.7 | 15.6 | 15.8 | 15.9 |
| 2027 | 19.7 | 15.5 | 16.1 | 16.7 | 15.2 | 16.1 | 16.3 | 16.1 | 15.5 | 15.9 | 15.3 | 15.1 | 15.4 | 15.5 |
| 2028 | 19.7 | 15.1 | 15.7 | 16.5 | 14.8 | 15.7 | 15.9 | 15.7 | 15.1 | 15.6 | 14.9 | 14.7 | 15.0 | 15.1 |
| 2029 | 19.7 | 14.7 | 15.4 | 16.3 | 14.4 | 15.4 | 15.6 | 15.4 | 14.7 | 15.3 | 14.5 | 14.3 | 14.6 | 14.8 |
| 2030 | 19.7 | 14.4 | 15.2 | 16.1 | 14.1 | 15.2 | 15.3 | 15.2 | 14.4 | 15.0 | 14.2 | 14.0 | 14.3 | 14.5 |

## Table B.24 Total Fossil Energy Use by All Vehicles

| | Total Fossil Energy Use for the Base Case and for Each PNGV Technology/Fuel Combination (quads) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base Case | CV+RFG | CV+MeOH | CV+EtOH | CV+RFD | CV+DME | CV+HFCV | CV+MFCV | CV+GFC | CV+FTD/RFD | CV+Bio/RFD | CV+LPG | CV+CNG | CV+LNG |
| 2005 | 18.1 | 17.8 | 17.8 | 17.8 | 17.8 | 17.8 | 17.8 | 17.8 | 17.8 | 17.8 | 17.8 | 17.8 | 17.8 | 17.8 |
| 2006 | 18.2 | 18.0 | 18.0 | 18.0 | 18.0 | 18.0 | 18.0 | 18.0 | 18.0 | 18.0 | 18.0 | 18.0 | 18.0 | 18.0 |
| 2007 | 18.4 | 18.2 | 18.2 | 18.2 | 18.2 | 18.2 | 18.2 | 18.2 | 18.2 | 18.2 | 18.2 | 18.2 | 18.2 | 18.2 |
| 2008 | 18.5 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 |
| 2009 | 18.7 | 18.7 | 18.7 | 18.7 | 18.7 | 18.7 | 18.7 | 18.7 | 18.7 | 18.7 | 18.7 | 18.7 | 18.7 | 18.7 |
| 2010 | 19.0 | 18.9 | 18.9 | 18.9 | 18.9 | 18.9 | 18.9 | 18.9 | 18.9 | 18.9 | 18.9 | 18.9 | 18.9 | 18.9 |
| 2011 | 19.1 | 19.1 | 19.1 | 19.1 | 19.1 | 19.1 | 19.1 | 19.1 | 19.1 | 19.1 | 19.1 | 19.1 | 19.1 | 19.1 |
| 2012 | 19.3 | 19.2 | 19.2 | 19.2 | 19.2 | 19.2 | 19.2 | 19.2 | 19.2 | 19.2 | 19.2 | 19.2 | 19.2 | 19.2 |
| 2013 | 19.4 | 19.2 | 19.3 | 19.2 | 19.2 | 19.3 | 19.3 | 19.3 | 19.2 | 19.3 | 19.2 | 19.2 | 19.2 | 19.2 |
| 2014 | 19.4 | 19.2 | 19.3 | 19.2 | 19.2 | 19.3 | 19.3 | 19.3 | 19.2 | 19.3 | 19.2 | 19.2 | 19.2 | 19.2 |
| 2015 | 19.4 | 19.2 | 19.2 | 19.1 | 19.2 | 19.2 | 19.2 | 19.2 | 19.2 | 19.2 | 19.1 | 19.1 | 19.2 | 19.2 |
| 2016 | 19.5 | 19.0 | 19.1 | 18.9 | 19.0 | 19.1 | 19.2 | 19.1 | 19.0 | 19.1 | 19.0 | 19.0 | 19.0 | 19.0 |
| 2017 | 19.5 | 18.9 | 19.0 | 18.6 | 18.8 | 19.0 | 19.0 | 19.0 | 18.9 | 18.9 | 18.8 | 18.8 | 18.8 | 18.9 |
| 2018 | 19.5 | 18.6 | 18.8 | 18.3 | 18.6 | 18.8 | 18.9 | 18.8 | 18.6 | 18.7 | 18.6 | 18.6 | 18.6 | 18.6 |
| 2019 | 19.4 | 18.4 | 18.6 | 17.8 | 18.3 | 18.6 | 18.7 | 18.6 | 18.4 | 18.5 | 18.3 | 18.3 | 18.3 | 18.4 |
| 2020 | 19.4 | 18.1 | 18.3 | 17.3 | 18.0 | 18.3 | 18.5 | 18.3 | 18.1 | 18.2 | 17.9 | 18.0 | 18.0 | 18.1 |
| 2021 | 19.4 | 17.8 | 18.0 | 16.7 | 17.7 | 18.0 | 18.1 | 18.0 | 17.8 | 18.0 | 17.6 | 17.6 | 17.7 | 17.8 |
| 2022 | 19.4 | 17.4 | 17.7 | 16.1 | 17.3 | 17.7 | 17.5 | 17.7 | 17.4 | 17.6 | 17.2 | 17.2 | 17.3 | 17.4 |
| 2023 | 19.4 | 17.0 | 17.4 | 15.4 | 16.9 | 17.4 | 16.9 | 17.4 | 17.0 | 17.3 | 16.8 | 16.8 | 16.9 | 17.1 |
| 2024 | 19.5 | 16.6 | 17.1 | 14.7 | 16.4 | 17.0 | 16.1 | 17.1 | 16.6 | 16.9 | 16.3 | 16.4 | 16.5 | 16.6 |
| 2025 | 19.5 | 16.2 | 16.7 | 13.9 | 16.0 | 16.7 | 15.1 | 16.7 | 16.2 | 16.6 | 15.8 | 15.9 | 16.1 | 16.2 |
| 2026 | 19.5 | 15.7 | 16.3 | 13.2 | 15.5 | 16.3 | 14.4 | 16.3 | 15.7 | 16.2 | 15.3 | 15.4 | 15.6 | 15.8 |
| 2027 | 19.5 | 15.3 | 16.0 | 12.4 | 15.1 | 16.0 | 13.8 | 16.0 | 15.3 | 15.8 | 14.9 | 15.0 | 15.2 | 15.4 |
| 2028 | 19.5 | 14.9 | 15.6 | 11.7 | 14.7 | 15.6 | 13.1 | 15.6 | 14.9 | 15.5 | 14.4 | 14.6 | 14.8 | 15.0 |
| 2029 | 19.6 | 14.6 | 15.3 | 11.1 | 14.3 | 15.3 | 12.6 | 15.3 | 14.6 | 15.2 | 14.0 | 14.2 | 14.4 | 14.7 |
| 2030 | 19.6 | 14.3 | 15.1 | 10.5 | 14.0 | 15.1 | 12.1 | 15.1 | 14.3 | 14.9 | 13.7 | 13.9 | 14.1 | 14.4 |

## Table B.25 Total Petroleum Use by All Vehicles

| | Total Petroleum Use for the Base Case and for Each PNGV Technology/Fuel Combination (quads) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base Case | CV+RFG | CV+MeOH | CV+EtOH | CV+RFD | CV+DME | CV+HFCV | CV+MFCV | CV+GFC | CV+FTD/RFD | CV+Bio/RFD | CV+LPG | CV+CNG | CV+LNG |
| 2005 | 16.0 | 15.7 | 15.7 | 15.7 | 15.7 | 15.7 | 15.7 | 15.7 | 15.7 | 15.7 | 15.7 | 15.7 | 15.7 | 15.7 |
| 2006 | 16.1 | 15.9 | 15.9 | 15.9 | 15.9 | 15.9 | 15.9 | 15.9 | 15.9 | 15.9 | 15.9 | 15.9 | 15.9 | 15.9 |
| 2007 | 16.2 | 16.1 | 16.1 | 16.1 | 16.1 | 16.1 | 16.1 | 16.1 | 16.1 | 16.1 | 16.1 | 16.1 | 16.1 | 16.1 |
| 2008 | 16.3 | 16.3 | 16.3 | 16.3 | 16.3 | 16.3 | 16.3 | 16.3 | 16.3 | 16.3 | 16.3 | 16.3 | 16.3 | 16.3 |
| 2009 | 16.6 | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 |
| 2010 | 16.8 | 16.7 | 16.7 | 16.7 | 16.7 | 16.7 | 16.7 | 16.7 | 16.7 | 16.7 | 16.7 | 16.7 | 16.7 | 16.7 |
| 2011 | 16.9 | 16.9 | 16.8 | 16.8 | 16.9 | 16.8 | 16.8 | 16.8 | 16.9 | 16.9 | 16.9 | 16.9 | 16.8 | 16.8 |
| 2012 | 17.0 | 17.0 | 16.9 | 16.9 | 17.0 | 16.9 | 16.9 | 16.9 | 17.0 | 16.9 | 17.0 | 16.9 | 16.9 | 16.9 |
| 2013 | 17.1 | 17.0 | 16.9 | 16.9 | 17.0 | 16.9 | 16.9 | 16.9 | 17.0 | 17.0 | 17.0 | 17.0 | 16.9 | 16.9 |
| 2014 | 17.2 | 17.0 | 16.9 | 16.9 | 17.0 | 16.9 | 16.9 | 16.9 | 17.0 | 17.0 | 17.0 | 16.9 | 16.9 | 16.9 |
| 2015 | 17.2 | 16.9 | 16.8 | 16.8 | 16.9 | 16.8 | 16.8 | 16.8 | 16.9 | 16.9 | 16.9 | 16.8 | 16.8 | 16.8 |
| 2016 | 17.2 | 16.8 | 16.6 | 16.6 | 16.8 | 16.6 | 16.6 | 16.6 | 16.8 | 16.7 | 16.8 | 16.7 | 16.6 | 16.6 |
| 2017 | 17.2 | 16.7 | 16.3 | 16.3 | 16.6 | 16.3 | 16.3 | 16.3 | 16.7 | 16.5 | 16.6 | 16.4 | 16.3 | 16.3 |
| 2018 | 17.2 | 16.5 | 16.0 | 16.0 | 16.4 | 16.0 | 16.0 | 16.0 | 16.5 | 16.2 | 16.4 | 16.2 | 16.0 | 16.0 |
| 2019 | 17.2 | 16.2 | 15.6 | 15.7 | 16.2 | 15.6 | 15.6 | 15.6 | 16.2 | 15.9 | 16.1 | 15.8 | 15.6 | 15.6 |
| 2020 | 17.2 | 16.0 | 15.2 | 15.2 | 15.9 | 15.2 | 15.2 | 15.2 | 16.0 | 15.6 | 15.9 | 15.5 | 15.2 | 15.2 |
| 2021 | 17.2 | 15.7 | 14.7 | 14.8 | 15.6 | 14.7 | 14.7 | 14.7 | 15.7 | 15.2 | 15.5 | 15.1 | 14.7 | 14.7 |
| 2022 | 17.2 | 15.4 | 14.2 | 14.3 | 15.3 | 14.2 | 14.2 | 14.2 | 15.4 | 14.8 | 15.2 | 14.6 | 14.2 | 14.2 |
| 2023 | 17.2 | 15.0 | 13.6 | 13.7 | 15.0 | 13.6 | 13.6 | 13.6 | 15.0 | 14.3 | 14.8 | 14.1 | 13.6 | 13.7 |
| 2024 | 17.2 | 14.7 | 13.0 | 13.1 | 14.6 | 13.0 | 13.0 | 13.0 | 14.7 | 13.9 | 14.4 | 13.6 | 13.0 | 13.1 |
| 2025 | 17.2 | 14.3 | 12.4 | 12.5 | 14.2 | 12.4 | 12.3 | 12.4 | 14.3 | 13.4 | 14.0 | 13.1 | 12.3 | 12.4 |
| 2026 | 17.2 | 13.9 | 11.7 | 11.8 | 13.8 | 11.7 | 11.7 | 11.7 | 13.9 | 12.8 | 13.6 | 12.5 | 11.6 | 11.8 |
| 2027 | 17.2 | 13.5 | 11.1 | 11.2 | 13.4 | 11.1 | 11.0 | 11.1 | 13.5 | 12.3 | 13.1 | 12.0 | 11.0 | 11.1 |
| 2028 | 17.2 | 13.2 | 10.5 | 10.6 | 13.1 | 10.5 | 10.4 | 10.5 | 13.2 | 11.9 | 12.8 | 11.4 | 10.4 | 10.5 |
| 2029 | 17.3 | 12.9 | 9.9 | 10.1 | 12.7 | 9.9 | 9.8 | 9.9 | 12.9 | 11.4 | 12.4 | 11.0 | 9.8 | 10.0 |
| 2030 | 17.3 | 12.6 | 9.4 | 9.6 | 12.5 | 9.4 | 9.4 | 9.4 | 12.6 | 11.1 | 12.1 | 10.6 | 9.4 | 9.5 |

## Table B.26 Total $NO_x$ Emissions (urban locations)

| | Total Emissions of $NO_x$ for the Base Case and for Each PNGV Technology/Fuel Combination ($10^3$ tonnes) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base Case | CV+RFG | CV+MeOH | CV+EtOH | CV+RFD | CV+DME | CV+HFCV | CV+MFCV | CV+GFC | CV+FTD/RFD | CV+Bio/RFD | CV+LPG | CV+CNG | CV+LNG |
| 2005 | 1,742 | 1,646 | 1,646 | 1,646 | 1,646 | 1,646 | 1,646 | 1,646 | 1,646 | 1,646 | 1,646 | 1,646 | 1,646 | 1,646 |
| 2006 | 1,714 | 1,656 | 1,656 | 1,656 | 1,656 | 1,656 | 1,656 | 1,656 | 1,656 | 1,656 | 1,656 | 1,656 | 1,656 | 1,656 |
| 2007 | 1,681 | 1,648 | 1,648 | 1,648 | 1,648 | 1,648 | 1,648 | 1,648 | 1,648 | 1,648 | 1,648 | 1,648 | 1,648 | 1,648 |
| 2008 | 1,631 | 1,615 | 1,615 | 1,615 | 1,615 | 1,615 | 1,615 | 1,615 | 1,615 | 1,615 | 1,615 | 1,615 | 1,615 | 1,615 |
| 2009 | 1,605 | 1,599 | 1,599 | 1,599 | 1,599 | 1,599 | 1,599 | 1,599 | 1,599 | 1,599 | 1,599 | 1,599 | 1,599 | 1,599 |
| 2010 | 1,569 | 1,569 | 1,569 | 1,569 | 1,569 | 1,569 | 1,568 | 1,568 | 1,568 | 1,569 | 1,569 | 1,569 | 1,569 | 1,569 |
| 2011 | 1,525 | 1,525 | 1,525 | 1,525 | 1,525 | 1,525 | 1,524 | 1,524 | 1,524 | 1,525 | 1,525 | 1,525 | 1,525 | 1,525 |
| 2012 | 1,477 | 1,476 | 1,476 | 1,477 | 1,476 | 1,476 | 1,475 | 1,474 | 1,474 | 1,476 | 1,476 | 1,476 | 1,476 | 1,476 |
| 2013 | 1,423 | 1,423 | 1,423 | 1,423 | 1,423 | 1,423 | 1,420 | 1,420 | 1,420 | 1,423 | 1,423 | 1,423 | 1,423 | 1,423 |
| 2014 | 1,373 | 1,373 | 1,373 | 1,373 | 1,373 | 1,373 | 1,368 | 1,367 | 1,367 | 1,373 | 1,373 | 1,373 | 1,373 | 1,373 |
| 2015 | 1,328 | 1,328 | 1,328 | 1,329 | 1,328 | 1,328 | 1,320 | 1,319 | 1,319 | 1,328 | 1,328 | 1,328 | 1,328 | 1,328 |
| 2016 | 1,291 | 1,290 | 1,290 | 1,291 | 1,290 | 1,290 | 1,279 | 1,276 | 1,276 | 1,290 | 1,290 | 1,290 | 1,290 | 1,291 |
| 2017 | 1,262 | 1,261 | 1,261 | 1,263 | 1,261 | 1,261 | 1,243 | 1,239 | 1,239 | 1,261 | 1,261 | 1,261 | 1,261 | 1,262 |
| 2018 | 1,241 | 1,240 | 1,239 | 1,242 | 1,240 | 1,239 | 1,213 | 1,208 | 1,208 | 1,239 | 1,240 | 1,240 | 1,240 | 1,240 |
| 2019 | 1,227 | 1,225 | 1,224 | 1,227 | 1,225 | 1,224 | 1,187 | 1,180 | 1,180 | 1,224 | 1,225 | 1,225 | 1,225 | 1,226 |
| 2020 | 1,218 | 1,216 | 1,215 | 1,219 | 1,216 | 1,215 | 1,164 | 1,155 | 1,155 | 1,215 | 1,216 | 1,216 | 1,216 | 1,217 |
| 2021 | 1,214 | 1,211 | 1,210 | 1,215 | 1,211 | 1,210 | 1,142 | 1,130 | 1,131 | 1,210 | 1,211 | 1,211 | 1,212 | 1,213 |
| 2022 | 1,213 | 1,209 | 1,209 | 1,214 | 1,209 | 1,208 | 1,118 | 1,104 | 1,105 | 1,209 | 1,209 | 1,210 | 1,211 | 1,211 |
| 2023 | 1,214 | 1,210 | 1,209 | 1,215 | 1,210 | 1,209 | 1,093 | 1,076 | 1,077 | 1,209 | 1,210 | 1,210 | 1,211 | 1,212 |
| 2024 | 1,220 | 1,215 | 1,214 | 1,220 | 1,214 | 1,213 | 1,068 | 1,049 | 1,049 | 1,214 | 1,215 | 1,215 | 1,216 | 1,217 |
| 2025 | 1,225 | 1,219 | 1,218 | 1,226 | 1,219 | 1,218 | 1,039 | 1,016 | 1,018 | 1,218 | 1,219 | 1,219 | 1,221 | 1,222 |
| 2026 | 1,230 | 1,223 | 1,222 | 1,231 | 1,223 | 1,222 | 1,007 | 981 | 982 | 1,222 | 1,224 | 1,224 | 1,226 | 1,227 |
| 2027 | 1,235 | 1,228 | 1,226 | 1,236 | 1,227 | 1,226 | 971 | 942 | 943 | 1,226 | 1,228 | 1,228 | 1,230 | 1,232 |
| 2028 | 1,240 | 1,232 | 1,231 | 1,242 | 1,232 | 1,230 | 934 | 901 | 903 | 1,231 | 1,232 | 1,233 | 1,235 | 1,237 |
| 2029 | 1,246 | 1,237 | 1,235 | 1,247 | 1,236 | 1,235 | 895 | 860 | 862 | 1,235 | 1,237 | 1,237 | 1,240 | 1,242 |
| 2030 | 1,251 | 1,242 | 1,240 | 1,253 | 1,241 | 1,239 | 856 | 818 | 820 | 1,240 | 1,242 | 1,242 | 1,245 | 1,247 |

## Table B.27 Total CO Emissions (urban locations)

| | Total Emissions of CO for the Base Case and for Each PNGV Technology/Fuel Combination ($10^3$ tonnes) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base Case | CV+RFG | CV+MeOH | CV+EtOH | CV+RFD | CV+DME | CV+HFCV | CV+MFCV | CV+GFC | CV+FTD/RFD | CV+Bio/RFD | CV+LPG | CV+CNG | CV+LNG |
| 2005 | 26,683 | 25,113 | 25,113 | 25,113 | 25,113 | 25,113 | 25,113 | 25,113 | 25,113 | 25,113 | 25,113 | 25,113 | 25,113 | 25,113 |
| 2006 | 26,294 | 25,341 | 25,341 | 25,341 | 25,341 | 25,341 | 25,341 | 25,341 | 25,341 | 25,341 | 25,341 | 25,341 | 25,341 | 25,341 |
| 2007 | 25,818 | 25,286 | 25,286 | 25,286 | 25,285 | 25,285 | 25,285 | 25,285 | 25,285 | 25,285 | 25,285 | 25,286 | 25,286 | 25,286 |
| 2008 | 25,070 | 24,808 | 24,808 | 24,808 | 24,808 | 24,808 | 24,807 | 24,807 | 24,807 | 24,808 | 24,808 | 24,808 | 24,808 | 24,808 |
| 2009 | 24,684 | 24,586 | 24,586 | 24,586 | 24,585 | 24,585 | 24,583 | 24,583 | 24,583 | 24,585 | 24,585 | 24,586 | 24,586 | 24,586 |
| 2010 | 24,121 | 24,121 | 24,121 | 24,121 | 24,117 | 24,117 | 24,113 | 24,113 | 24,113 | 24,117 | 24,117 | 24,121 | 24,121 | 24,121 |
| 2011 | 23,429 | 23,429 | 23,429 | 23,429 | 23,422 | 23,422 | 23,414 | 23,414 | 23,414 | 23,422 | 23,422 | 23,429 | 23,429 | 23,429 |
| 2012 | 22,661 | 22,661 | 22,661 | 22,661 | 22,646 | 22,646 | 22,634 | 22,634 | 22,634 | 22,646 | 22,646 | 22,661 | 22,661 | 22,661 |
| 2013 | 21,810 | 21,809 | 21,809 | 21,810 | 21,783 | 21,783 | 21,763 | 21,763 | 21,763 | 21,783 | 21,783 | 21,809 | 21,809 | 21,810 |
| 2014 | 20,999 | 20,999 | 20,999 | 20,999 | 20,954 | 20,954 | 20,920 | 20,921 | 20,921 | 20,954 | 20,954 | 20,999 | 20,999 | 20,999 |
| 2015 | 20,277 | 20,277 | 20,277 | 20,277 | 20,201 | 20,201 | 20,149 | 20,149 | 20,149 | 20,201 | 20,201 | 20,277 | 20,277 | 20,277 |
| 2016 | 19,673 | 19,673 | 19,673 | 19,673 | 19,550 | 19,550 | 19,469 | 19,470 | 19,470 | 19,550 | 19,550 | 19,673 | 19,673 | 19,673 |
| 2017 | 19,203 | 19,202 | 19,202 | 19,203 | 19,010 | 19,010 | 18,893 | 18,895 | 18,895 | 19,010 | 19,010 | 19,202 | 19,202 | 19,203 |
| 2018 | 18,858 | 18,857 | 18,857 | 18,858 | 18,566 | 18,566 | 18,404 | 18,407 | 18,407 | 18,566 | 18,567 | 18,857 | 18,857 | 18,858 |
| 2019 | 18,620 | 18,619 | 18,619 | 18,620 | 18,194 | 18,194 | 17,979 | 17,983 | 17,983 | 18,194 | 18,195 | 18,619 | 18,619 | 18,620 |
| 2020 | 18,469 | 18,468 | 18,467 | 18,469 | 17,866 | 17,865 | 17,589 | 17,594 | 17,594 | 17,865 | 17,866 | 18,468 | 18,468 | 18,469 |
| 2021 | 18,389 | 18,387 | 18,386 | 18,388 | 17,556 | 17,556 | 17,208 | 17,216 | 17,216 | 17,556 | 17,557 | 18,387 | 18,387 | 18,389 |
| 2022 | 18,365 | 18,363 | 18,363 | 18,365 | 17,249 | 17,249 | 16,821 | 16,831 | 16,831 | 17,249 | 17,250 | 18,363 | 18,363 | 18,366 |
| 2023 | 18,380 | 18,377 | 18,377 | 18,379 | 16,923 | 16,922 | 16,406 | 16,419 | 16,419 | 16,922 | 16,923 | 18,378 | 18,377 | 18,381 |
| 2024 | 18,465 | 18,462 | 18,461 | 18,464 | 16,607 | 16,607 | 15,994 | 16,011 | 16,012 | 16,607 | 16,608 | 18,462 | 18,461 | 18,465 |
| 2025 | 18,547 | 18,543 | 18,542 | 18,545 | 16,232 | 16,231 | 15,516 | 15,537 | 15,538 | 16,232 | 16,233 | 18,543 | 18,543 | 18,547 |
| 2026 | 18,627 | 18,623 | 18,622 | 18,626 | 15,802 | 15,801 | 14,977 | 15,003 | 15,003 | 15,801 | 15,803 | 18,624 | 18,623 | 18,628 |
| 2027 | 18,708 | 18,703 | 18,703 | 18,707 | 15,324 | 15,323 | 14,390 | 14,422 | 14,422 | 15,323 | 15,325 | 18,704 | 18,703 | 18,709 |
| 2028 | 18,790 | 18,784 | 18,784 | 18,788 | 14,807 | 14,806 | 13,770 | 13,807 | 13,808 | 14,807 | 14,809 | 18,785 | 18,784 | 18,791 |
| 2029 | 18,873 | 18,867 | 18,866 | 18,871 | 14,265 | 14,264 | 13,128 | 13,172 | 13,172 | 14,264 | 14,266 | 18,868 | 18,867 | 18,874 |
| 2030 | 18,957 | 18,951 | 18,951 | 18,956 | 13,709 | 13,708 | 12,480 | 12,529 | 12,530 | 13,708 | 13,710 | 18,953 | 18,951 | 18,959 |

## Table B.28 Total VOC Emissions (urban locations)

| | Total Emissions of VOC for the Base Case and for Each PNGV Technology/Fuel Combination ($10^3$ tonnes) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base Case | CV+RFG | CV+MeOH | CV+EtOH | CV+RFD | CV+DME | CV+HFCV | CV+MFCV | CV+GFC | CV+FTD/RFD | CV+Bio/RFD | CV+LPG | CV+CNG | CV+LNG |
| 2005 | 1,242 | 1,158 | 1,158 | 1,158 | 1,158 | 1,158 | 1,158 | 1,158 | 1,158 | 1,158 | 1,158 | 1,158 | 1,158 | 1,158 |
| 2006 | 1,241 | 1,195 | 1,195 | 1,195 | 1,195 | 1,195 | 1,195 | 1,195 | 1,195 | 1,195 | 1,195 | 1,195 | 1,195 | 1,195 |
| 2007 | 1,249 | 1,227 | 1,227 | 1,227 | 1,227 | 1,227 | 1,227 | 1,227 | 1,227 | 1,227 | 1,227 | 1,227 | 1,227 | 1,227 |
| 2008 | 1,261 | 1,253 | 1,253 | 1,253 | 1,253 | 1,253 | 1,253 | 1,253 | 1,253 | 1,253 | 1,253 | 1,253 | 1,253 | 1,253 |
| 2009 | 1,302 | 1,299 | 1,299 | 1,299 | 1,298 | 1,298 | 1,298 | 1,298 | 1,298 | 1,298 | 1,298 | 1,298 | 1,298 | 1,298 |
| 2010 | 1,340 | 1,340 | 1,340 | 1,340 | 1,340 | 1,340 | 1,339 | 1,339 | 1,339 | 1,340 | 1,340 | 1,339 | 1,339 | 1,340 |
| 2011 | 1,376 | 1,376 | 1,376 | 1,376 | 1,375 | 1,375 | 1,374 | 1,374 | 1,374 | 1,375 | 1,375 | 1,375 | 1,375 | 1,375 |
| 2012 | 1,409 | 1,408 | 1,408 | 1,408 | 1,406 | 1,406 | 1,404 | 1,405 | 1,405 | 1,406 | 1,406 | 1,406 | 1,406 | 1,406 |
| 2013 | 1,438 | 1,437 | 1,437 | 1,437 | 1,434 | 1,434 | 1,431 | 1,432 | 1,433 | 1,434 | 1,434 | 1,434 | 1,434 | 1,434 |
| 2014 | 1,463 | 1,463 | 1,462 | 1,462 | 1,458 | 1,458 | 1,452 | 1,453 | 1,455 | 1,458 | 1,458 | 1,457 | 1,457 | 1,457 |
| 2015 | 1,485 | 1,484 | 1,483 | 1,483 | 1,476 | 1,476 | 1,467 | 1,469 | 1,471 | 1,476 | 1,476 | 1,475 | 1,475 | 1,475 |
| 2016 | 1,503 | 1,501 | 1,501 | 1,501 | 1,489 | 1,489 | 1,475 | 1,478 | 1,482 | 1,489 | 1,489 | 1,488 | 1,487 | 1,488 |
| 2017 | 1,518 | 1,515 | 1,515 | 1,515 | 1,498 | 1,498 | 1,477 | 1,481 | 1,488 | 1,498 | 1,498 | 1,496 | 1,495 | 1,497 |
| 2018 | 1,530 | 1,527 | 1,527 | 1,527 | 1,503 | 1,502 | 1,474 | 1,479 | 1,488 | 1,502 | 1,503 | 1,500 | 1,499 | 1,501 |
| 2019 | 1,541 | 1,537 | 1,536 | 1,537 | 1,503 | 1,503 | 1,464 | 1,472 | 1,484 | 1,503 | 1,503 | 1,500 | 1,499 | 1,501 |
| 2020 | 1,550 | 1,545 | 1,544 | 1,544 | 1,500 | 1,500 | 1,449 | 1,459 | 1,474 | 1,500 | 1,500 | 1,496 | 1,495 | 1,497 |
| 2021 | 1,558 | 1,552 | 1,550 | 1,551 | 1,493 | 1,493 | 1,427 | 1,440 | 1,460 | 1,492 | 1,493 | 1,488 | 1,486 | 1,490 |
| 2022 | 1,565 | 1,558 | 1,556 | 1,556 | 1,482 | 1,481 | 1,399 | 1,416 | 1,441 | 1,481 | 1,482 | 1,477 | 1,475 | 1,479 |
| 2023 | 1,572 | 1,563 | 1,560 | 1,561 | 1,467 | 1,466 | 1,365 | 1,386 | 1,417 | 1,466 | 1,467 | 1,463 | 1,460 | 1,464 |
| 2024 | 1,578 | 1,567 | 1,565 | 1,565 | 1,448 | 1,448 | 1,325 | 1,351 | 1,389 | 1,447 | 1,448 | 1,445 | 1,441 | 1,447 |
| 2025 | 1,584 | 1,572 | 1,569 | 1,569 | 1,426 | 1,426 | 1,280 | 1,311 | 1,357 | 1,425 | 1,426 | 1,424 | 1,420 | 1,427 |
| 2026 | 1,590 | 1,576 | 1,572 | 1,573 | 1,401 | 1,401 | 1,231 | 1,268 | 1,322 | 1,400 | 1,402 | 1,402 | 1,397 | 1,404 |
| 2027 | 1,596 | 1,580 | 1,576 | 1,577 | 1,375 | 1,375 | 1,179 | 1,222 | 1,285 | 1,373 | 1,375 | 1,378 | 1,373 | 1,381 |
| 2028 | 1,602 | 1,585 | 1,580 | 1,581 | 1,348 | 1,347 | 1,127 | 1,175 | 1,247 | 1,346 | 1,348 | 1,353 | 1,348 | 1,357 |
| 2029 | 1,608 | 1,589 | 1,585 | 1,586 | 1,320 | 1,319 | 1,074 | 1,128 | 1,209 | 1,318 | 1,320 | 1,329 | 1,323 | 1,333 |
| 2030 | 1,615 | 1,594 | 1,589 | 1,590 | 1,291 | 1,291 | 1,022 | 1,082 | 1,172 | 1,289 | 1,292 | 1,306 | 1,299 | 1,309 |

## Table B.29 Total $SO_X$ Emissions (urban locations)

| | Total Emissions of $SO_x$ for the Base Case and for Each PNGV Technology/Fuel Combination ($10^3$ tonnes) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base Case | CV+RFG | CV+MeOH | CV+EtOH | CV+RFD | CV+DME | CV+HFCV | CV+MFCV | CV+GFC | CV+FTD/RFD | CV+Bio/RFD | CV+LPG | CV+CNG | CV+LNG |
| 2005 | 46 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 |
| 2006 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 |
| 2007 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 |
| 2008 | 47 | 47 | 47 | 47 | 47 | 46 | 46 | 47 | 47 | 47 | 47 | 46 | 46 | 47 |
| 2009 | 47 | 47 | 47 | 47 | 47 | 47 | 47 | 47 | 47 | 47 | 47 | 47 | 47 | 47 |
| 2010 | 48 | 48 | 48 | 48 | 48 | 48 | 48 | 48 | 48 | 48 | 48 | 48 | 48 | 48 |
| 2011 | 48 | 48 | 48 | 48 | 48 | 48 | 48 | 48 | 48 | 48 | 48 | 48 | 48 | 48 |
| 2012 | 49 | 48 | 48 | 48 | 48 | 48 | 48 | 48 | 48 | 48 | 48 | 48 | 48 | 48 |
| 2013 | 49 | 49 | 48 | 48 | 49 | 48 | 48 | 48 | 49 | 49 | 49 | 48 | 48 | 49 |
| 2014 | 49 | 49 | 48 | 48 | 49 | 48 | 48 | 48 | 49 | 48 | 49 | 48 | 48 | 49 |
| 2015 | 49 | 48 | 48 | 48 | 48 | 48 | 48 | 48 | 48 | 48 | 48 | 48 | 48 | 48 |
| 2016 | 49 | 48 | 48 | 47 | 48 | 47 | 47 | 48 | 48 | 48 | 48 | 47 | 47 | 48 |
| 2017 | 49 | 48 | 47 | 47 | 48 | 47 | 47 | 47 | 48 | 47 | 47 | 47 | 47 | 48 |
| 2018 | 49 | 47 | 46 | 46 | 47 | 46 | 46 | 46 | 47 | 46 | 47 | 46 | 46 | 47 |
| 2019 | 49 | 46 | 45 | 45 | 46 | 45 | 45 | 45 | 46 | 46 | 46 | 45 | 45 | 47 |
| 2020 | 49 | 46 | 44 | 44 | 46 | 44 | 44 | 44 | 46 | 45 | 45 | 44 | 44 | 46 |
| 2021 | 49 | 45 | 43 | 42 | 45 | 42 | 42 | 43 | 45 | 44 | 44 | 42 | 42 | 45 |
| 2022 | 49 | 44 | 42 | 41 | 44 | 41 | 41 | 42 | 44 | 43 | 43 | 41 | 41 | 45 |
| 2023 | 49 | 43 | 40 | 39 | 43 | 40 | 39 | 40 | 43 | 41 | 42 | 39 | 39 | 44 |
| 2024 | 49 | 42 | 39 | 38 | 42 | 38 | 37 | 39 | 42 | 40 | 41 | 37 | 37 | 43 |
| 2025 | 49 | 41 | 37 | 36 | 41 | 36 | 36 | 37 | 41 | 39 | 40 | 36 | 36 | 42 |
| 2026 | 49 | 40 | 36 | 34 | 40 | 34 | 34 | 36 | 40 | 37 | 39 | 34 | 34 | 41 |
| 2027 | 49 | 39 | 34 | 32 | 39 | 33 | 32 | 34 | 39 | 36 | 38 | 32 | 32 | 40 |
| 2028 | 49 | 38 | 33 | 31 | 38 | 31 | 30 | 33 | 38 | 35 | 37 | 30 | 30 | 39 |
| 2029 | 49 | 37 | 31 | 29 | 37 | 30 | 29 | 31 | 37 | 34 | 36 | 29 | 29 | 39 |
| 2030 | 49 | 36 | 30 | 28 | 36 | 28 | 27 | 30 | 36 | 33 | 35 | 27 | 28 | 38 |

## Table B.30 Total $PM_{10}$ Emissions (urban locations)

| | Total Emissions of $PM_{10}$ for the Base Case and for Each PNGV Technology/Fuel Combination ($10^3$ tonnes) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base Case | CV+RFG | CV+MeOH | CV+EtOH | CV+RFD | CV+DME | CV+HFCV | CV+MFCV | CV+GFC | CV+FTD/RFD | CV+Bio/RFD | CV+LPG | CV+CNG | CV+LNG |
| 2005 | 54 | 53 | 53 | 53 | 53 | 53 | 53 | 53 | 53 | 53 | 53 | 53 | 53 | 53 |
| 2006 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 |
| 2007 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 |
| 2008 | 56 | 56 | 56 | 56 | 56 | 56 | 56 | 56 | 56 | 56 | 56 | 56 | 56 | 56 |
| 2009 | 57 | 57 | 57 | 57 | 57 | 57 | 57 | 57 | 57 | 57 | 57 | 57 | 57 | 57 |
| 2010 | 58 | 58 | 58 | 58 | 58 | 58 | 58 | 58 | 58 | 58 | 58 | 58 | 58 | 58 |
| 2011 | 59 | 59 | 59 | 59 | 59 | 59 | 59 | 59 | 59 | 59 | 59 | 59 | 59 | 59 |
| 2012 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 |
| 2013 | 60 | 60 | 60 | 60 | 61 | 60 | 60 | 60 | 60 | 61 | 61 | 60 | 60 | 60 |
| 2014 | 61 | 61 | 61 | 61 | 62 | 61 | 61 | 61 | 61 | 62 | 62 | 61 | 61 | 61 |
| 2015 | 61 | 61 | 61 | 61 | 63 | 61 | 61 | 61 | 61 | 63 | 63 | 61 | 61 | 61 |
| 2016 | 62 | 62 | 61 | 61 | 64 | 62 | 61 | 61 | 61 | 64 | 64 | 61 | 61 | 62 |
| 2017 | 62 | 62 | 61 | 61 | 65 | 62 | 61 | 61 | 61 | 65 | 65 | 61 | 61 | 62 |
| 2018 | 63 | 63 | 61 | 61 | 66 | 62 | 61 | 61 | 61 | 66 | 66 | 61 | 61 | 62 |
| 2019 | 63 | 63 | 61 | 61 | 67 | 63 | 61 | 61 | 61 | 67 | 67 | 61 | 61 | 63 |
| 2020 | 63 | 63 | 61 | 61 | 69 | 63 | 60 | 60 | 60 | 69 | 69 | 60 | 60 | 63 |
| 2021 | 63 | 63 | 60 | 60 | 70 | 63 | 60 | 60 | 60 | 70 | 70 | 60 | 60 | 63 |
| 2022 | 64 | 63 | 60 | 60 | 72 | 63 | 59 | 59 | 59 | 72 | 72 | 59 | 59 | 63 |
| 2023 | 64 | 64 | 59 | 59 | 74 | 64 | 59 | 59 | 59 | 74 | 74 | 59 | 59 | 64 |
| 2024 | 64 | 64 | 58 | 59 | 76 | 64 | 58 | 58 | 58 | 76 | 76 | 58 | 58 | 64 |
| 2025 | 64 | 64 | 58 | 58 | 78 | 64 | 57 | 57 | 57 | 78 | 78 | 57 | 57 | 64 |
| 2026 | 65 | 64 | 57 | 58 | 80 | 64 | 57 | 56 | 56 | 80 | 80 | 57 | 56 | 64 |
| 2027 | 65 | 64 | 56 | 57 | 82 | 64 | 56 | 56 | 56 | 82 | 82 | 56 | 56 | 64 |
| 2028 | 65 | 64 | 56 | 57 | 84 | 64 | 55 | 55 | 55 | 84 | 84 | 55 | 55 | 64 |
| 2029 | 65 | 65 | 55 | 56 | 86 | 65 | 55 | 54 | 54 | 86 | 86 | 54 | 54 | 65 |
| 2030 | 65 | 65 | 55 | 56 | 88 | 65 | 54 | 54 | 54 | 88 | 88 | 54 | 54 | 65 |

## Table B.31 Total $CO_2$ Emissions (all vehicles, all locations)

| | Total Emissions of $CO_2$ for the Base Case and for Each PNGV Technology/Fuel Combination ($10^3$ tonnes) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base Case | CV+RFG | CV+MeOH | CV+EtOH | CV+RFD | CV+DME | CV+HFCV | CV+MFCV | CV+GFC | CV+FTD/RFD | CV+Bio/RFD | CV+LPG | CV+CNG | CV+LNG |
| 2005 | 1,338,923 | 1,316,140 | 1,316,140 | 1,316,140 | 1,316,140 | 1,316,140 | 1,316,140 | 1,316,140 | 1,316,140 | 1,316,140 | 1,316,140 | 1,316,140 | 1,316,140 | 1,316,140 |
| 2006 | 1,349,744 | 1,336,052 | 1,336,052 | 1,336,052 | 1,336,052 | 1,336,052 | 1,336,052 | 1,336,052 | 1,336,052 | 1,336,052 | 1,336,052 | 1,336,052 | 1,336,052 | 1,336,052 |
| 2007 | 1,360,630 | 1,352,778 | 1,352,782 | 1,352,750 | 1,352,777 | 1,352,782 | 1,352,787 | 1,352,782 | 1,352,778 | 1,352,789 | 1,352,778 | 1,352,770 | 1,352,767 | 1,352,767 |
| 2008 | 1,369,116 | 1,364,664 | 1,364,682 | 1,364,557 | 1,364,661 | 1,364,681 | 1,364,700 | 1,364,682 | 1,364,664 | 1,364,710 | 1,364,664 | 1,364,633 | 1,364,623 | 1,364,621 |
| 2009 | 1,389,666 | 1,386,911 | 1,386,954 | 1,386,646 | 1,386,902 | 1,386,951 | 1,386,998 | 1,386,954 | 1,386,911 | 1,387,024 | 1,386,910 | 1,386,834 | 1,386,809 | 1,386,804 |
| 2010 | 1,406,511 | 1,404,190 | 1,404,277 | 1,403,665 | 1,404,173 | 1,404,271 | 1,404,365 | 1,404,277 | 1,404,190 | 1,404,415 | 1,404,190 | 1,404,039 | 1,403,989 | 1,403,980 |
| 2011 | 1,419,047 | 1,415,519 | 1,415,673 | 1,414,577 | 1,415,488 | 1,415,663 | 1,415,830 | 1,415,673 | 1,415,519 | 1,415,921 | 1,415,518 | 1,415,247 | 1,415,159 | 1,415,142 |
| 2012 | 1,428,217 | 1,422,793 | 1,423,050 | 1,421,193 | 1,422,742 | 1,423,033 | 1,423,310 | 1,423,050 | 1,422,793 | 1,423,461 | 1,422,792 | 1,422,344 | 1,422,197 | 1,422,168 |
| 2013 | 1,435,211 | 1,426,761 | 1,427,175 | 1,424,146 | 1,426,679 | 1,427,148 | 1,427,595 | 1,427,175 | 1,426,761 | 1,427,838 | 1,426,759 | 1,426,036 | 1,425,800 | 1,425,753 |
| 2014 | 1,439,780 | 1,426,592 | 1,427,253 | 1,422,385 | 1,426,461 | 1,427,210 | 1,427,924 | 1,427,253 | 1,426,592 | 1,428,313 | 1,426,589 | 1,425,434 | 1,425,056 | 1,424,981 |
| 2015 | 1,441,537 | 1,421,064 | 1,422,107 | 1,414,396 | 1,420,857 | 1,422,039 | 1,423,165 | 1,422,107 | 1,421,064 | 1,423,780 | 1,421,060 | 1,419,237 | 1,418,640 | 1,418,523 |
| 2016 | 1,442,253 | 1,411,335 | 1,412,927 | 1,401,135 | 1,411,018 | 1,412,823 | 1,414,543 | 1,412,927 | 1,411,335 | 1,415,482 | 1,411,327 | 1,408,544 | 1,407,633 | 1,407,454 |
| 2017 | 1,442,340 | 1,397,993 | 1,400,296 | 1,383,230 | 1,397,535 | 1,400,146 | 1,402,635 | 1,400,296 | 1,397,993 | 1,403,992 | 1,397,983 | 1,393,956 | 1,392,638 | 1,392,379 |
| 2018 | 1,442,047 | 1,381,472 | 1,384,639 | 1,355,653 | 1,380,841 | 1,384,433 | 1,387,856 | 1,384,639 | 1,381,472 | 1,389,723 | 1,381,457 | 1,375,918 | 1,374,105 | 1,373,749 |
| 2019 | 1,441,566 | 1,362,154 | 1,366,333 | 1,318,616 | 1,361,323 | 1,366,062 | 1,370,578 | 1,366,333 | 1,362,154 | 1,373,041 | 1,362,134 | 1,354,826 | 1,352,434 | 1,351,964 |
| 2020 | 1,441,089 | 1,340,436 | 1,345,765 | 1,278,980 | 1,339,375 | 1,345,419 | 1,351,178 | 1,345,765 | 1,340,436 | 1,354,318 | 1,340,411 | 1,331,092 | 1,328,041 | 1,327,442 |
| 2021 | 1,440,803 | 1,316,110 | 1,322,751 | 1,237,073 | 1,314,788 | 1,322,320 | 1,326,561 | 1,322,751 | 1,316,110 | 1,333,411 | 1,316,078 | 1,304,464 | 1,300,662 | 1,299,915 |
| 2022 | 1,440,807 | 1,289,531 | 1,297,637 | 1,190,856 | 1,287,918 | 1,297,110 | 1,296,911 | 1,297,637 | 1,289,531 | 1,310,647 | 1,289,493 | 1,275,318 | 1,270,677 | 1,269,766 |
| 2023 | 1,441,132 | 1,260,999 | 1,270,709 | 1,140,833 | 1,259,067 | 1,270,078 | 1,262,327 | 1,270,709 | 1,260,999 | 1,286,295 | 1,260,953 | 1,243,973 | 1,238,414 | 1,237,323 |
| 2024 | 1,441,777 | 1,230,788 | 1,242,230 | 1,087,398 | 1,228,510 | 1,241,486 | 1,220,971 | 1,242,230 | 1,230,788 | 1,260,595 | 1,230,734 | 1,210,724 | 1,204,174 | 1,202,888 |
| 2025 | 1,442,770 | 1,199,201 | 1,212,490 | 1,031,039 | 1,196,556 | 1,211,627 | 1,174,579 | 1,212,490 | 1,199,201 | 1,233,821 | 1,199,138 | 1,175,897 | 1,168,290 | 1,166,796 |
| 2026 | 1,444,053 | 1,166,963 | 1,182,174 | 973,038 | 1,163,935 | 1,181,185 | 1,123,651 | 1,182,174 | 1,166,963 | 1,206,589 | 1,166,891 | 1,140,290 | 1,131,583 | 1,129,873 |
| 2027 | 1,445,600 | 1,135,995 | 1,153,093 | 916,774 | 1,132,592 | 1,151,982 | 1,075,971 | 1,153,093 | 1,135,995 | 1,180,537 | 1,135,915 | 1,106,014 | 1,096,226 | 1,094,304 |
| 2028 | 1,447,369 | 1,107,499 | 1,126,380 | 864,379 | 1,103,742 | 1,125,153 | 1,030,783 | 1,126,380 | 1,107,499 | 1,156,685 | 1,107,410 | 1,074,392 | 1,063,584 | 1,061,462 |
| 2029 | 1,449,331 | 1,081,929 | 1,102,459 | 816,685 | 1,077,843 | 1,101,125 | 991,704 | 1,102,459 | 1,081,929 | 1,135,412 | 1,081,832 | 1,045,929 | 1,034,177 | 1,031,869 |
| 2030 | 1,451,435 | 1,059,325 | 1,081,365 | 773,841 | 1,054,939 | 1,079,933 | 955,155 | 1,081,365 | 1,059,325 | 1,116,742 | 1,059,221 | 1,020,677 | 1,008,061 | 1,005,583 |

## Table B.32 Total $CH_4$ Emissions (all vehicles, all locations)

| | Total Emissions of $CH_4$ for the Base Case and for Each PNGV Technology/Fuel Combination ($10^3$ tonnes) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base Case | CV+RFG | CV+MeOH | CV+EtOH | CV+RFD | CV+DME | CV+HFCV | CV+MFCV | CV+GFC | CV+FTD/RFD | CV+Bio/RFD | CV+LPG | CV+CNG | CV+LNG |
| 2005 | 1,376 | 1,352 | 1,352 | 1,352 | 1,352 | 1,352 | 1,352 | 1,352 | 1,352 | 1,352 | 1,352 | 1,352 | 1,352 | 1,352 |
| 2006 | 1,388 | 1,374 | 1,374 | 1,374 | 1,374 | 1,374 | 1,374 | 1,374 | 1,374 | 1,374 | 1,374 | 1,374 | 1,374 | 1,374 |
| 2007 | 1,400 | 1,392 | 1,392 | 1,392 | 1,392 | 1,392 | 1,392 | 1,392 | 1,392 | 1,392 | 1,392 | 1,392 | 1,392 | 1,392 |
| 2008 | 1,409 | 1,405 | 1,405 | 1,405 | 1,405 | 1,405 | 1,405 | 1,405 | 1,405 | 1,405 | 1,405 | 1,405 | 1,406 | 1,406 |
| 2009 | 1,432 | 1,429 | 1,429 | 1,429 | 1,429 | 1,429 | 1,429 | 1,429 | 1,429 | 1,429 | 1,429 | 1,429 | 1,431 | 1,431 |
| 2010 | 1,450 | 1,448 | 1,449 | 1,448 | 1,448 | 1,448 | 1,449 | 1,448 | 1,448 | 1,448 | 1,448 | 1,448 | 1,452 | 1,452 |
| 2011 | 1,464 | 1,461 | 1,462 | 1,461 | 1,460 | 1,462 | 1,463 | 1,462 | 1,461 | 1,461 | 1,460 | 1,461 | 1,468 | 1,468 |
| 2012 | 1,475 | 1,470 | 1,472 | 1,471 | 1,469 | 1,471 | 1,473 | 1,471 | 1,469 | 1,470 | 1,469 | 1,470 | 1,482 | 1,482 |
| 2013 | 1,484 | 1,476 | 1,479 | 1,476 | 1,474 | 1,478 | 1,481 | 1,478 | 1,475 | 1,475 | 1,474 | 1,476 | 1,494 | 1,494 |
| 2014 | 1,490 | 1,477 | 1,482 | 1,478 | 1,475 | 1,481 | 1,486 | 1,481 | 1,475 | 1,476 | 1,474 | 1,479 | 1,507 | 1,507 |
| 2015 | 1,493 | 1,474 | 1,481 | 1,475 | 1,469 | 1,479 | 1,487 | 1,479 | 1,471 | 1,472 | 1,469 | 1,476 | 1,521 | 1,521 |
| 2016 | 1,495 | 1,466 | 1,477 | 1,468 | 1,459 | 1,474 | 1,486 | 1,474 | 1,461 | 1,463 | 1,458 | 1,469 | 1,538 | 1,538 |
| 2017 | 1,496 | 1,455 | 1,471 | 1,458 | 1,445 | 1,467 | 1,483 | 1,466 | 1,448 | 1,450 | 1,444 | 1,459 | 1,558 | 1,559 |
| 2018 | 1,497 | 1,440 | 1,462 | 1,432 | 1,427 | 1,457 | 1,480 | 1,456 | 1,430 | 1,434 | 1,425 | 1,446 | 1,583 | 1,583 |
| 2019 | 1,498 | 1,423 | 1,452 | 1,389 | 1,406 | 1,445 | 1,475 | 1,444 | 1,410 | 1,414 | 1,403 | 1,430 | 1,612 | 1,612 |
| 2020 | 1,498 | 1,404 | 1,441 | 1,347 | 1,381 | 1,432 | 1,470 | 1,430 | 1,387 | 1,393 | 1,378 | 1,413 | 1,645 | 1,645 |
| 2021 | 1,499 | 1,382 | 1,428 | 1,305 | 1,354 | 1,416 | 1,459 | 1,415 | 1,361 | 1,368 | 1,350 | 1,393 | 1,682 | 1,683 |
| 2022 | 1,500 | 1,358 | 1,414 | 1,259 | 1,323 | 1,400 | 1,443 | 1,398 | 1,333 | 1,341 | 1,318 | 1,371 | 1,725 | 1,726 |
| 2023 | 1,501 | 1,332 | 1,400 | 1,208 | 1,291 | 1,382 | 1,422 | 1,380 | 1,302 | 1,311 | 1,285 | 1,348 | 1,772 | 1,773 |
| 2024 | 1,503 | 1,304 | 1,384 | 1,155 | 1,256 | 1,364 | 1,391 | 1,361 | 1,269 | 1,280 | 1,249 | 1,324 | 1,824 | 1,825 |
| 2025 | 1,505 | 1,276 | 1,368 | 1,098 | 1,219 | 1,345 | 1,354 | 1,341 | 1,234 | 1,247 | 1,211 | 1,298 | 1,880 | 1,881 |
| 2026 | 1,507 | 1,246 | 1,352 | 1,039 | 1,181 | 1,325 | 1,310 | 1,321 | 1,198 | 1,214 | 1,172 | 1,272 | 1,938 | 1,940 |
| 2027 | 1,509 | 1,218 | 1,337 | 982 | 1,145 | 1,307 | 1,270 | 1,302 | 1,164 | 1,181 | 1,135 | 1,247 | 1,997 | 1,998 |
| 2028 | 1,512 | 1,192 | 1,323 | 929 | 1,111 | 1,290 | 1,232 | 1,285 | 1,133 | 1,152 | 1,100 | 1,224 | 2,053 | 2,055 |
| 2029 | 1,515 | 1,169 | 1,312 | 881 | 1,081 | 1,275 | 1,201 | 1,270 | 1,104 | 1,125 | 1,069 | 1,204 | 2,106 | 2,108 |
| 2030 | 1,518 | 1,149 | 1,302 | 838 | 1,054 | 1,262 | 1,171 | 1,257 | 1,079 | 1,101 | 1,041 | 1,186 | 2,156 | 2,158 |

## Table B.33 Total $N_2O$ Emissions (all vehicles, all locations)

| | Total Emissions of $N_2O$ for the Base Case and for Each PNGV Technology/Fuel Combination ($10^3$ tonnes) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base Case | CV+RFG | CV+MeOH | CV+EtOH | CV+RFD | CV+DME | CV+HFCV | CV+MFCV | CV+GFC | CV+FTD/RFD | CV+Bio/RFD | CV+LPG | CV+CNG | CV+LNG |
| 2005 | 41.6 | 40.9 | 40.9 | 40.9 | 40.9 | 40.9 | 40.9 | 40.9 | 40.9 | 40.9 | 40.9 | 40.9 | 40.9 | 40.9 |
| 2006 | 42.0 | 41.5 | 41.5 | 41.5 | 41.5 | 41.5 | 41.5 | 41.5 | 41.5 | 41.5 | 41.5 | 41.5 | 41.5 | 41.5 |
| 2007 | 42.4 | 42.1 | 42.1 | 42.1 | 42.1 | 42.1 | 42.1 | 42.1 | 42.1 | 42.1 | 42.1 | 42.1 | 42.1 | 42.1 |
| 2008 | 39.7 | 39.6 | 39.6 | 39.7 | 39.6 | 39.6 | 39.6 | 39.6 | 39.6 | 39.6 | 39.6 | 39.6 | 39.6 | 39.6 |
| 2009 | 37.7 | 37.6 | 37.6 | 37.9 | 37.6 | 37.6 | 37.7 | 37.6 | 37.6 | 37.6 | 37.6 | 37.6 | 37.6 | 37.7 |
| 2010 | 35.7 | 35.7 | 35.6 | 36.1 | 35.6 | 35.6 | 35.7 | 35.6 | 35.6 | 35.6 | 35.7 | 35.6 | 35.7 | 35.8 |
| 2011 | 33.8 | 33.7 | 33.7 | 34.6 | 33.7 | 33.7 | 33.8 | 33.7 | 33.7 | 33.7 | 33.7 | 33.7 | 33.8 | 33.9 |
| 2012 | 31.9 | 31.9 | 31.8 | 33.3 | 31.8 | 31.8 | 32.0 | 31.8 | 31.8 | 31.8 | 31.9 | 31.8 | 31.9 | 32.2 |
| 2013 | 30.2 | 30.1 | 30.1 | 32.4 | 30.1 | 30.1 | 30.4 | 30.0 | 30.0 | 30.1 | 30.1 | 30.1 | 30.2 | 30.6 |
| 2014 | 28.6 | 28.5 | 28.4 | 32.1 | 28.4 | 28.4 | 29.0 | 28.3 | 28.4 | 28.4 | 28.5 | 28.4 | 28.7 | 29.2 |
| 2015 | 27.0 | 27.0 | 26.8 | 32.6 | 26.8 | 26.8 | 27.7 | 26.6 | 26.7 | 26.8 | 27.0 | 26.8 | 27.2 | 28.1 |
| 2016 | 25.6 | 25.6 | 25.3 | 34.2 | 25.4 | 25.3 | 26.7 | 25.0 | 25.2 | 25.3 | 25.6 | 25.2 | 25.9 | 27.3 |
| 2017 | 24.3 | 24.3 | 23.9 | 36.8 | 24.0 | 23.9 | 25.9 | 23.4 | 23.8 | 23.9 | 24.3 | 23.8 | 24.8 | 26.8 |
| 2018 | 23.1 | 23.2 | 22.7 | 37.4 | 22.8 | 22.6 | 25.4 | 22.0 | 22.5 | 22.6 | 23.2 | 22.6 | 23.9 | 26.6 |
| 2019 | 22.0 | 22.2 | 21.5 | 35.8 | 21.7 | 21.5 | 25.1 | 20.6 | 21.3 | 21.5 | 22.3 | 21.4 | 23.2 | 26.8 |
| 2020 | 21.0 | 21.4 | 20.5 | 35.5 | 20.8 | 20.5 | 25.0 | 19.4 | 20.3 | 20.5 | 21.5 | 20.3 | 22.6 | 27.2 |
| 2021 | 20.1 | 20.7 | 19.6 | 37.0 | 19.9 | 19.6 | 25.2 | 18.2 | 19.3 | 19.6 | 20.8 | 19.4 | 22.2 | 27.9 |
| 2022 | 19.3 | 20.2 | 18.8 | 38.9 | 19.2 | 18.8 | 25.6 | 17.1 | 18.5 | 18.8 | 20.3 | 18.6 | 22.0 | 29.0 |
| 2023 | 18.6 | 19.8 | 18.2 | 41.1 | 18.6 | 18.1 | 26.3 | 16.1 | 17.7 | 18.1 | 19.9 | 17.9 | 22.0 | 30.3 |
| 2024 | 17.9 | 19.5 | 17.6 | 43.7 | 18.1 | 17.6 | 27.0 | 15.2 | 17.1 | 17.5 | 19.7 | 17.2 | 22.1 | 31.9 |
| 2025 | 17.3 | 19.4 | 17.1 | 46.6 | 17.8 | 17.1 | 28.0 | 14.3 | 16.6 | 17.0 | 19.6 | 16.7 | 22.4 | 33.8 |
| 2026 | 16.7 | 19.3 | 16.8 | 49.7 | 17.5 | 16.7 | 29.0 | 13.6 | 16.1 | 16.7 | 19.5 | 16.3 | 22.8 | 35.8 |
| 2027 | 16.2 | 19.4 | 16.5 | 52.8 | 17.3 | 16.4 | 30.1 | 12.9 | 15.7 | 16.4 | 19.6 | 16.0 | 23.3 | 37.9 |
| 2028 | 15.8 | 19.5 | 16.3 | 55.9 | 17.2 | 16.2 | 31.2 | 12.3 | 15.5 | 16.1 | 19.7 | 15.7 | 23.8 | 40.0 |
| 2029 | 15.3 | 19.6 | 16.2 | 58.7 | 17.1 | 16.1 | 32.3 | 11.8 | 15.2 | 16.0 | 19.9 | 15.5 | 24.3 | 41.9 |
| 2030 | 15.0 | 19.8 | 16.1 | 61.3 | 17.1 | 16.0 | 33.3 | 11.3 | 15.1 | 15.9 | 20.0 | 15.4 | 24.8 | 43.7 |

## Table B.34 Total Greenhouse Gas Emissions (all vehicles)

| | Total Global Warming Potential for the Base Case and for Each PNGV Technology/Fuel Combination ($10^6$ tonnes $CO_2$-equivalent) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base Case | CV+RFG | CV+MeOH | CV+EtOH | CV+RFD | CV+DME | CV+HFCV | CV+MFCV | CV+GFC | CV+FTD/RFD | CV+Bio/RFD | CV+LPG | CV+CNG | CV+LNG |
| 2005 | 1381 | 1357 | 1357 | 1357 | 1357 | 1357 | 1357 | 1357 | 1357 | 1357 | 1357 | 1357 | 1357 | 1357 |
| 2006 | 1392 | 1378 | 1378 | 1378 | 1378 | 1378 | 1378 | 1378 | 1378 | 1378 | 1378 | 1378 | 1378 | 1378 |
| 2007 | 1403 | 1395 | 1395 | 1395 | 1395 | 1395 | 1395 | 1395 | 1395 | 1395 | 1395 | 1395 | 1395 | 1395 |
| 2008 | 1411 | 1406 | 1406 | 1406 | 1406 | 1406 | 1406 | 1406 | 1406 | 1406 | 1406 | 1406 | 1406 | 1406 |
| 2009 | 1431 | 1429 | 1429 | 1428 | 1429 | 1429 | 1429 | 1429 | 1429 | 1429 | 1429 | 1429 | 1429 | 1429 |
| 2010 | 1448 | 1446 | 1446 | 1445 | 1446 | 1446 | 1446 | 1446 | 1446 | 1446 | 1446 | 1445 | 1446 | 1446 |
| 2011 | 1460 | 1457 | 1457 | 1456 | 1457 | 1457 | 1457 | 1457 | 1457 | 1457 | 1457 | 1456 | 1456 | 1456 |
| 2012 | 1469 | 1464 | 1464 | 1462 | 1463 | 1464 | 1464 | 1464 | 1464 | 1464 | 1464 | 1463 | 1463 | 1463 |
| 2013 | 1476 | 1467 | 1468 | 1465 | 1467 | 1468 | 1468 | 1468 | 1467 | 1468 | 1467 | 1466 | 1467 | 1467 |
| 2014 | 1480 | 1466 | 1467 | 1463 | 1466 | 1467 | 1468 | 1467 | 1466 | 1468 | 1466 | 1465 | 1466 | 1466 |
| 2015 | 1481 | 1460 | 1462 | 1455 | 1460 | 1461 | 1463 | 1461 | 1460 | 1463 | 1460 | 1459 | 1459 | 1459 |
| 2016 | 1482 | 1450 | 1452 | 1443 | 1450 | 1452 | 1454 | 1452 | 1450 | 1454 | 1450 | 1447 | 1448 | 1448 |
| 2017 | 1481 | 1436 | 1439 | 1425 | 1435 | 1438 | 1442 | 1438 | 1436 | 1442 | 1436 | 1432 | 1433 | 1433 |
| 2018 | 1481 | 1419 | 1422 | 1397 | 1418 | 1422 | 1427 | 1422 | 1418 | 1427 | 1419 | 1413 | 1415 | 1415 |
| 2019 | 1480 | 1399 | 1404 | 1359 | 1398 | 1403 | 1409 | 1403 | 1398 | 1409 | 1399 | 1391 | 1393 | 1394 |
| 2020 | 1479 | 1377 | 1382 | 1318 | 1375 | 1382 | 1390 | 1382 | 1376 | 1390 | 1376 | 1367 | 1370 | 1370 |
| 2021 | 1479 | 1352 | 1359 | 1276 | 1349 | 1358 | 1365 | 1358 | 1351 | 1368 | 1351 | 1340 | 1343 | 1344 |
| 2022 | 1478 | 1324 | 1333 | 1229 | 1322 | 1332 | 1335 | 1332 | 1323 | 1345 | 1323 | 1310 | 1314 | 1315 |
| 2023 | 1478 | 1295 | 1306 | 1179 | 1292 | 1305 | 1300 | 1305 | 1294 | 1319 | 1294 | 1278 | 1282 | 1284 |
| 2024 | 1479 | 1264 | 1277 | 1125 | 1261 | 1276 | 1259 | 1276 | 1263 | 1293 | 1263 | 1244 | 1249 | 1251 |
| 2025 | 1480 | 1232 | 1247 | 1069 | 1228 | 1245 | 1212 | 1245 | 1230 | 1265 | 1231 | 1208 | 1215 | 1217 |
| 2026 | 1481 | 1199 | 1216 | 1010 | 1194 | 1214 | 1160 | 1214 | 1197 | 1237 | 1198 | 1172 | 1179 | 1182 |
| 2027 | 1482 | 1168 | 1186 | 954 | 1162 | 1185 | 1112 | 1184 | 1165 | 1210 | 1166 | 1137 | 1145 | 1148 |
| 2028 | 1484 | 1139 | 1159 | 901 | 1132 | 1157 | 1066 | 1157 | 1136 | 1186 | 1137 | 1105 | 1114 | 1117 |
| 2029 | 1486 | 1113 | 1135 | 853 | 1106 | 1133 | 1027 | 1133 | 1110 | 1164 | 1110 | 1076 | 1086 | 1089 |
| 2030 | 1488 | 1090 | 1114 | 810 | 1082 | 1111 | 990 | 1111 | 1087 | 1145 | 1087 | 1050 | 1061 | 1064 |

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