

## DOCKETED

|                         |  |
|-------------------------|--|
| <b>Docket Number:</b>   | 17-BSTD-01   |
| <b>Project Title:</b>   | 2019 Building Energy Efficiency Standards PreRulemaking          |
| <b>TN #:</b>            | 221264   |
| <b>Document Title:</b>  | Draft 2019 Standards Joint Appendix 3                            |
| <b>Description:</b>     | Draft version of Joint Appendix 3 for the 2019 Standards update. |
| <b>Filer:</b>           | Adrian Ownby   |
| <b>Organization:</b>    | California Energy Commission                                     |
| <b>Submitter Role:</b>  | Commission Staff   |
| <b>Submission Date:</b> | 9/20/2017 3:55:23 PM   |
| <b>Docketed Date:</b>   | 9/20/2017  |

## ***Joint Appendix JA3***

# **Appendix JA3 – Time Dependent Valuation (TDV)**

---

### ***JA3.1 Scope and Purpose***

Time dependent valuation (TDV) is the currency used to compare energy performance when the performance compliance method is used. TDV is also used to evaluate the cost effectiveness of measures and to perform other codes analysis. TDV replaces source energy, which was used to compare performance prior to the 2005 Standards.

TDV consists of large data sets that convert electricity, gas or propane to TDV energy. The rate of conversion varies for each hour of the year, for each climate zone and for each energy type (electricity, natural gas or propane). The conversion factors also vary by building type: low-rise residential and other building types, including nonresidential, hotel/motel and high-rise residential. There are a total of 144 hourly data sets (16 climate zones x 3 fuel types x 3 building types) where the 3 building types are residential 30 year, nonresidential 15 year, nonresidential 30 year. The actual TDV data may be downloaded from the Energy Commission's website.

Because of the length, the actual data is not published in this appendix.

---

### ***JA3.2 Summary of Data***

Table 3-1 through Table 3-3 give a statistical summary of the TDV conversion factors for electricity, natural gas and propane. Each table has the annual minimum, maximum, and average for each climate zone and building type.

- (a) Table 3-1 – TDV Statistical Data – Electricity (kBtu/kWh)
- (b) Table 3-32 – TDV Statistical Data – Natural Gas (kBtu/therm)
- (c) Table 3-3 – TDV Statistical Data – Propane (kBtu/therm)

Table 3-1 – TDV Statistical Data – Electricity (kBtu/kWh)

| Climate Zone | Residential |         |         | Nonresidential (15yr) |         |         | Nonresidential (30 yr) |         |         |
|--------------|-------------|---------|---------|-----------------------|---------|---------|------------------------|---------|---------|
|              | Minimum     | Average | Maximum | Minimum               | Average | Maximum | Minimum                | Average | Maximum |
| 1            | 10.68       | 21.26   | 165.87  | 9.40                  | 20.89   | 188.25  | 10.02                  | 21.92   | 184.56  |
| 2            | 10.68       | 21.26   | 237.74  | 9.35                  | 20.83   | 271.49  | 9.96                   | 21.86   | 265.33  |
| 3            | 10.68       | 21.26   | 276.54  | 9.36                  | 20.84   | 317.49  | 9.97                   | 21.87   | 308.99  |
| 4            | 10.68       | 21.26   | 254.19  | 9.35                  | 20.84   | 290.99  | 9.97                   | 21.87   | 283.84  |
| 5            | 10.67       | 21.26   | 203.75  | 9.42                  | 20.90   | 231.55  | 10.03                  | 21.93   | 227.17  |
| 6            | 9.99        | 20.53   | 343.04  | 9.31                  | 20.75   | 397.14  | 9.92                   | 21.77   | 384.48  |
| 7            | 10.78       | 21.32   | 308.10  | 9.71                  | 21.15   | 352.22  | 10.33                  | 22.18   | 344.71  |
| 8            | 10.02       | 20.56   | 240.70  | 9.32                  | 20.76   | 275.83  | 9.94                   | 21.79   | 269.38  |
| 9            | 9.87        | 20.41   | 317.59  | 9.22                  | 20.66   | 367.04  | 9.84                   | 21.70   | 355.93  |
| 10           | 9.86        | 20.40   | 241.73  | 9.20                  | 20.64   | 277.34  | 9.82                   | 21.68   | 270.60  |
| 11           | 9.86        | 21.26   | 245.82  | 9.37                  | 20.85   | 281.60  | 9.98                   | 21.89   | 274.44  |
| 12           | 10.67       | 21.26   | 208.46  | 9.38                  | 20.86   | 236.81  | 9.99                   | 21.89   | 232.43  |
| 13           | 10.68       | 21.26   | 175.5   | 9.36                  | 20.84   | 197.73  | 9.97                   | 21.87   | 195.34  |
| 14           | 9.85        | 20.39   | 153.52  | 9.20                  | 20.64   | 172.81  | 9.82                   | 21.68   | 171.40  |
| 15           | 9.87        | 20.40   | 156.97  | 9.23                  | 20.67   | 176.90  | 9.85                   | 21.70   | 175.29  |
| 16           | 9.81        | 20.35   | 225.15  | 9.17                  | 20.61   | 257.72  | 9.80                   | 21.65   | 251.97  |

Table 3-32 – TDV Statistical Data – Natural Gas (kBtu/therm)

| Climate Zone | Residential |         |         | Nonresidential (15yr) |         |         | Nonresidential (30 year) |         |         |
|--------------|-------------|---------|---------|-----------------------|---------|---------|--------------------------|---------|---------|
|              | Minimum     | Average | Maximum | Minimum               | Average | Maximum | Minimum                  | Average | Maximum |
| 1            | 140.86      | 159.51  | 185.55  | 142.20                | 163.33  | 192.87  | 147.02                   | 167.98  | 197.27  |
| 2            | 140.86      | 159.51  | 185.55  | 142.20                | 163.33  | 192.87  | 147.02                   | 167.98  | 197.27  |
| 3            | 140.86      | 159.51  | 185.55  | 142.20                | 163.33  | 192.87  | 147.02                   | 167.98  | 197.27  |
| 4            | 140.86      | 159.51  | 185.55  | 142.20                | 163.33  | 192.87  | 147.02                   | 167.98  | 197.27  |
| 5            | 140.86      | 159.51  | 185.55  | 142.20                | 163.33  | 192.87  | 147.02                   | 167.98  | 197.27  |
| 6            | 141.14      | 160.45  | 187.44  | 142.50                | 164.40  | 195.04  | 147.33                   | 169.04  | 199.40  |
| 7            | 140.43      | 157.62  | 181.62  | 142.70                | 165.49  | 197.38  | 147.54                   | 170.12  | 201.70  |
| 8            | 141.14      | 160.45  | 187.44  | 142.50                | 164.40  | 195.04  | 147.33                   | 169.04  | 199.40  |
| 9            | 141.14      | 160.45  | 187.44  | 142.50                | 164.40  | 195.04  | 147.33                   | 169.04  | 199.40  |
| 10           | 141.14      | 160.45  | 187.44  | 142.50                | 164.40  | 195.04  | 147.33                   | 169.04  | 199.40  |
| 11           | 140.86      | 159.51  | 185.55  | 142.20                | 163.33  | 192.87  | 147.02                   | 167.98  | 197.27  |
| 12           | 140.86      | 159.51  | 185.55  | 142.20                | 16.33   | 192.87  | 147.02                   | 167.98  | 197.27  |
| 13           | 140.86      | 159.51  | 185.55  | 142.20                | 163.33  | 192.87  | 147.02                   | 167.98  | 197.27  |
| 14           | 141.14      | 160.45  | 187.44  | 142.50                | 164.40  | 195.04  | 147.33                   | 169.04  | 199.40  |
| 15           | 141.14      | 160.45  | 187.44  | 142.50                | 164.40  | 195.04  | 147.33                   | 169.04  | 199.40  |
| 16           | 141.14      | 160.45  | 187.44  | 142.50                | 164.40  | 195.04  | 147.33                   | 169.04  | 199.40  |

Table 3-3 – TDV Statistical Data – Propane (kBtu/therm)

| Climate Zone | Residential |         |         | Nonresidential (15yr) |         |         | Nonresidential (30 year) |         |         |
|--------------|-------------|---------|---------|-----------------------|---------|---------|--------------------------|---------|---------|
|              | Minimum     | Average | Maximum | Minimum               | Average | Maximum | Minimum                  | Average | Maximum |
| 1            | 328.06      | 410.71  | 480.19  | 299.23                | 374.89  | 438.49  | 311.42                   | 389.24  | 454.66  |
| 2            | 328.06      | 410.71  | 480.19  | 299.23                | 374.89  | 438.49  | 311.42                   | 389.24  | 454.66  |
| 3            | 328.06      | 410.71  | 480.19  | 299.23                | 374.89  | 438.49  | 311.42                   | 389.24  | 454.66  |
| 4            | 328.06      | 410.71  | 480.19  | 299.23                | 374.89  | 438.49  | 311.42                   | 389.24  | 454.66  |
| 5            | 328.06      | 410.71  | 480.19  | 299.23                | 374.89  | 438.49  | 311.42                   | 389.24  | 454.66  |
| 6            | 328.06      | 410.71  | 480.19  | 299.23                | 374.89  | 438.49  | 311.42                   | 389.24  | 454.66  |
| 7            | 328.06      | 410.71  | 480.19  | 299.23                | 374.89  | 438.49  | 311.42                   | 389.24  | 454.66  |
| 8            | 328.06      | 410.71  | 480.19  | 299.23                | 374.89  | 438.49  | 311.42                   | 389.24  | 454.66  |
| 9            | 328.06      | 410.71  | 480.19  | 299.23                | 374.89  | 438.49  | 311.42                   | 389.24  | 454.66  |
| 10           | 328.06      | 410.71  | 480.19  | 299.23                | 374.89  | 438.49  | 311.42                   | 389.24  | 454.66  |
| 11           | 328.06      | 410.71  | 480.19  | 299.23                | 374.89  | 438.49  | 311.42                   | 389.24  | 454.66  |
| 12           | 328.06      | 410.71  | 480.19  | 299.23                | 374.89  | 438.49  | 311.42                   | 389.24  | 454.66  |
| 13           | 328.06      | 410.71  | 480.19  | 299.23                | 374.89  | 438.49  | 311.42                   | 389.24  | 454.66  |
| 14           | 328.06      | 410.71  | 480.19  | 299.23                | 374.89  | 438.49  | 311.42                   | 389.24  | 454.66  |
| 15           | 328.06      | 410.71  | 480.19  | 299.23                | 374.89  | 438.49  | 311.42                   | 389.24  | 454.66  |
| 16           | 328.06      | 410.71  | 480.19  | 299.23                | 374.89  | 438.49  | 311.42                   | 389.24  | 454.66  |