

TABLE 2.2
Hourly Variation Factors

| Hour | Lighting and Miscellaneous Refrigerator | Home Freezer | Skull Range | Air-Conditioning* | Heat Pump* | | Water Heater† OPWH‡ | | | Uncontrolled | Clothes‡ Dryer | |
|---------|---|--------------|----------------|-------------------|----------------|----------------|--------------------------|---------------------------------|------|--------------|-------------------|------|
| | | | | | Cooling Season | Heating Season | Both Elements Restricted | Only Bottom Elements Restricted | | | | |
| 12 A.M. | 0.32 | 0.93 | 0.92 | 0.02 | 0.40 | 0.42 | 0.34 | 0.11 | 0.41 | 0.61 | 0.51 | 0.03 |
| 1 | 0.12 | 0.89 | 0.90 | 0.01 | 0.39 | 0.35 | 0.49 | 0.07 | 0.33 | 0.46 | 0.37 | 0.02 |
| 2 | 0.10 | 0.80 | 0.87 | 0.01 | 0.36 | 0.35 | 0.51 | 0.09 | 0.25 | 0.34 | 0.30 | 0 |
| 3 | 0.09 | 0.76 | 0.85 | 0.01 | 0.35 | 0.28 | 0.54 | 0.08 | 0.17 | 0.24 | 0.22 | 0 |
| 4 | 0.08 | 0.79 | 0.82 | 0.01 | 0.35 | 0.28 | 0.57 | 0.13 | 0.13 | 0.19 | 0.15 | 0 |
| 5 | 0.10 | 0.72 | 0.84 | 0.02 | 0.33 | 0.26 | 0.63 | 0.15 | 0.13 | 0.19 | 0.14 | 0 |
| 6 | 0.19 | 0.75 | 0.85 | 0.05 | 0.30 | 0.26 | 0.74 | 0.17 | 0.17 | 0.24 | 0.16 | 0 |
| 7 | 0.41 | 0.75 | 0.85 | 0.30 | 0.41 | 0.35 | 1.00 | 0.76 | 0.27 | 0.37 | 0.46 | 0 |
| 8 | 0.35 | 0.79 | 0.86 | 0.47 | 0.53 | 0.49 | 0.91 | 1.00 | 0.47 | 0.65 | 0.70 | 0.08 |
| 9 | 0.31 | 0.79 | 0.86 | 0.28 | 0.62 | 0.58 | 0.83 | 0.97 | 0.63 | 0.87 | 1.00 | 0.20 |
| 10 | 0.31 | 0.79 | 0.87 | 0.22 | 0.72 | 0.70 | 0.74 | 0.68 | 0.67 | 0.93 | 1.00 | 0.65 |
| 11 | 0.30 | 0.85 | 0.90 | 0.22 | 0.74 | 0.73 | 0.60 | 0.57 | 0.67 | 0.93 | 0.99 | 1.00 |
| 12 noon | 0.28 | 0.85 | 0.92 | 0.33 | 0.80 | 0.84 | 0.57 | 0.55 | 0.67 | 0.93 | 0.98 | 0.98 |
| 1 | 0.26 | 0.87 | 0.96 | 0.25 | 0.86 | 0.88 | 0.49 | 0.51 | 0.61 | 0.85 | 0.86 | 0.70 |
| 2 | 0.29 | 0.90 | 0.98 | 0.16 | 0.89 | 0.95 | 0.46 | 0.49 | 0.55 | 0.76 | 0.82 | 0.65 |
| 3 | 0.30 | 0.90 | 0.99 | 0.17 | 0.96 | 1.00 | 0.40 | 0.48 | 0.49 | 0.68 | 0.81 | 0.63 |
| 4 | 0.32 | 0.90 | 1.00 | 0.24 | 0.97 | 1.00 | 0.43 | 0.44 | 0.33 | 0.46 | 0.79 | 0.38 |
| 5 | 0.70 | 0.90 | 1.00 | 0.80 | 0.99 | 1.00 | 0.43 | 0.79 | 0 | 0.09 | 0.75 | 0.30 |
| 6 | 0.92 | 0.90 | 0.99 | 1.00 | 1.00 | 1.00 | 0.49 | 0.88 | 0 | 0.13 | 0.75 | 0.22 |
| 7 | 1.00 | 0.95 | 0.98 | 0.30 | 0.91 | 0.88 | 0.51 | 0.76 | 0 | 0.19 | 0.80 | 0.26 |
| 8 | 0.95 | 1.00 | 0.98 | 0.12 | 0.79 | 0.73 | 0.60 | 0.54 | 1.00 | 1.00 | 0.81 | 0.20 |
| 9 | 0.85 | 0.95 | 0.97 | 0.09 | 0.71 | 0.72 | 0.54 | 0.42 | 0.84 | 0.98 | 0.73 | 0.18 |
| 10 | 0.72 | 0.88 | 0.96 | 0.05 | 0.64 | 0.53 | 0.51 | 0.27 | 0.67 | 0.77 | 0.67 | 0.10 |
| 11 | 0.50 | 0.88 | 0.95 | 0.04 | 0.55 | 0.49 | 0.34 | 0.23 | 0.54 | 0.69 | 0.59 | 0.04 |
| 12 P.M. | 0.32 | 0.93 | 0.92 | 0.02 | 0.40 | 0.42 | 0.34 | 0.11 | 0.44 | 0.61 | 0.51 | 0.03 |

*Load cycle and maximum diversified demand are dependent on outside temperature, dwelling construction and insulation, among other factors.

†Load cycle and maximum diversified demands are dependent on tank size, and heater element rating; values shown apply to 52-gal tank, 1500- and 1000-W elements.

‡Hourly variation factor is dependent on living habits of individuals; in a particular area, values may be different from those shown.

Source: From Sarkas, R. H., and H. B. Thacker, *AIEE Trans.*, 31, pt. III, August 1957. With permission.

load cycle dependent on schedule of water heater restriction.
 Hourly variation factor is dependent on living habits of individuals; in a particular area, values may be different from those shown.
 Source: From Sarkas, R. H., and W. B. Thacker, *IEEE Trans.*, 31, pp. 100, August 1957. With permission.

FIGURE 2.13 Maximum diversified 30-min demand characteristics of various residential loads: A = clothes dryer; B = off-peak water heater, "off-peak" load; C = water heater, uncontrolled, interlocked elements; D = range; E = lighting and miscellaneous appliances; F = 0.5-hp room coolers; G = off-peak water heater, "on-peak" load; H = upper element uncontrolled; I = oil burner; J = home freezer; K = refrigerator; L = central air-conditioning, including heat-pump cooling, 5-hp heat pump (4-ton air conditioner); M = house heating, including heat-pump-heating-connected load of 15-kW unit-type resistance heating or 5-hp heat pump. (From Westinghouse Electric Corporation, *Electric Utility Engineering Reference Book—Distribution Systems*, vol. 3, East Pittsburgh, PA, 1965. With permission.)

