**Residential Power Demand Simulation Tool – Input Data File Formatting**

Files are stored as two different types, \_Default.txt files and \_Data.txt files. The \_Default.txt files are stored in the /Input Data/Default Settings/ folder and are not changeable by the user. The parameter values in these files are the same as the corresponding default GUI settings. \_Data.txt files are stored in the /Input Data/User Settings/ folder and are created when a user saves their selected parameters. The program tries to read the \_Data.txt file first and if it does not exist, uses the \_Default.txt file.

Parameters that are allowed to vary are varied by producing a normalized random scaling factor. The scaling factor, gives the number of standard deviations a parameter is away from the mean, and is allowed to vary a maximum of 3 standard deviations away from the mean (i.e. the maximum value for the square footage of a home given a mean square footage of 2400 ft2 and a standard deviation of 400 ft2 would be 2400 ft2 + 3400 ft2 = 3600 ft2).

The program uses three different scaling factors for each home (assuming certain parameters are correlated). These scaling factors affect the following parameter types: 1. Home/Appliance Sizes and Power Demand, 2. Insulation Values, 3. Thermostat Settings. Additionally, minimum and maximum bounds for each parameter are hardcoded into the models to avoid simulating unrealistically small or large parameters. To use a parameter outside of these bounds would require modifying the program (although this is not difficult in most cases).

HomeHVAC\_Default.txt

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Default Value** | **Allowed to Vary?** | **Range** |
| 1. Mean Square Footage of Home | 2400 ft2 | Yes | 1200 to 4800 ft2 |
| 2. Standard Deviation | 400 ft2 | No | 0 to 400 ft2 |
| 3. Ceiling Height | 8 ft | No | 7 to 12 ft |
| 4. Number of Floors | 2 | No | 1 to 3 |
| 5. Number of Doors | 4 | No | 1 to 6 |
| 6. Aspect Ratio (Depth/Width) | 1.5 | No | 0.5 to 2 |
| 7. Wall Insulation Value | R-19 | Yes | R-4 to R-22 |
| 8. Roof Insulation Value | R-30 | Yes | R-11 to R-48 |
| 9. Floor Insulation Value | R-11 | Yes | R-4 to R-30 |
| 10. Window Insulation Value | R-1.67 | Yes | R-0.75 to R-3.25 |
| 11. Door Insulation Value | R-3 | Yes | R-3 to R-11 |
| 12. Construction Type | 2 (Medium) | Yes | 1 (Loose) or 3 (Tight) |
| 13. Vary Home Insulation Values | 1 (Yes) | No | 0 (No) |
| 14. Percentage with Heat Pump | 9.75 % | No | N/A |
| 15. Percentage with Resistive Heating | 16.02 % | No | N/A |
| 16. Percentage with Nonelectric Heating | 66.57 % | No | N/A |
| 17. Percentage with Air Conditioning | 85.10 % | No | N/A |
| 18. HVAC Oversizing Factor | 0 % | No | -100 to 100 % |
| 19. Heat Pump COP (Standard Conditions) | 2.5 | No | 1.0 to 5.0 |
| 20. Air Conditioning COP (Standard Conditions) | 3.5 | No | 1.0 to 5.0 |
| 21. Mean Heating Thermostat Setting | 70 °F | Yes | 60 to 85 °F |
| 22. Mean Cooling Thermostat Setting | 75 °F | Yes | 60 to 85 °F |
| 23. Standard Deviation | 4 °F | No | 0 to 4 °F |
| 24. Thermostat Deadband | 4 °F | No | 2 to 6 °F |
| 25. Auxiliary Deadband | 2 °F | No | 0 to 4 °F |

Preset Home Insulation Values (Defined by GridLAB-D and ASHRAE)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Old, Uninsulated** | **Old, Insulated** | **Old, Weatherized** | **Old, Retrofit Upgraded** | **Moderately Insulated** | **Very Well Insulated** | **Extremely Well Insulated** | **Standard Deviation** |
| 1. Wall Insulation Value | R-4 | R-11 | R-19 | R-11 | R-19 | R-19 | R-22 | R-9/3 |
| 2. Roof Insulation Value | R-11 | R-19 | R-11 | R-30 | R-30 | R-30 | R-48 | R-18.5/3 |
| 3. Floor Insulation Value | R-4 | R-4 | R-11 | R-19 | R-11 | R-22 | R-30 | R-13/3 |
| 4. Window Insulation Value | R-0.79 | R-1.23 | R-1.23 | R-1.67 | R-1.67 | R-2.13 | R-3.23 | R-1.25/3 |
| 5. Door Insulation Value | R-3 | R-3 | R-3 | R-3 | R-3 | R-5 | R-11 | R-4/3 |
| 6. Construction Type | Loose | Loose | Medium | Medium | Medium | Tight | Tight | N/A |

WaterHeater\_Default.txt

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Default Value** | **Allowed to Vary?** | **Range** |
| 1. Water Heater Model Type | 2 (Two-Node) | No | 1 (One-Node) |
| 2. Percentage with Water Heater | 37.88 % | No | N/A |
| 3. Mean Water Heater Volume | 50 gal | Yes | 30 to 80 gal |
| 4. Standard Deviation | 10 gal | No | 0 to 10 gal |
| 5. Mean Water Heater Power Demand | 4500 W | Yes (Nearest 100 W) | 3000 to 6000 W |
| 6. Standard Deviation | 500 W | No | 0 to 500 W |
| 7. Mean Tank Insulation Value | R-13 | Yes | R-6 to R-20 |
| 8. Standard Deviation | R-2 | No | R-0 to R-3 |
| 9. Mean Thermostat Setting | 130 °F | Yes | 100 to 160 °F |
| 10. Standard Deviation | 5 °F | No | 0 to 10 °F |
| 11. Thermostat Deadband | 5 °F | No | 1 to 10 °F |
| 12. Shower Water Demand | 30 gal | No | 0 to 40 gal |
| 13. Bath Water Demand | 20 gal | No | 0 to 30 gal |
| 14. Washer Water Demand | 20 gal | No | 0 to 30 gal |
| 15. Dishwasher Water Demand | 15 gal | No | 0 to 20 gal |
| 16. Sink Water Demand | 0.5 gal | No | 0 to 1 gal |

RefrigeratorFreezer\_Default.txt

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Default Value** | **Allowed to Vary?** | **Range** |
| 1. Percentage with Refrigerator | 99.86 % | No | N/A |
| 2. Percentage with Automatic Defrost | 94.56 % | No | N/A |
| 3. Mean Refrigerator Volume | 21.5 ft3 | Yes | 10 to 35 ft3 |
| 4. Standard Deviation | 2.5 ft3 | No | 0 to 5 ft3 |
| 5. Percentage with Second Refrigerator | 32.45 % | No | N/A |
| 6. Percentage with Automatic Defrost | 94.56 % | No | N/A |
| 7. Mean Second Refrigerator Volume | 17.5 ft3 | Yes | 10 to 35 ft3 |
| 8. Standard Deviation | 2.5 ft3 | No | 0 to 5 ft3 |
| 9. Mean Thermostat Setting | 37 °F | Yes | 34 to 40 °F |
| 10. Standard Deviation | 1 °F | No | 0 to 1 °F |
| 11. Thermostat Deadband | 2 °F | No | 2 to 3 °F |
| 12. Percentage with Freezer | 40.81 % | No | N/A |
| 13. Percentage with Automatic Defrost | 44.03 % | No | N/A |
| 14. Mean Freezer Volume | 16.5 ft3 | Yes | 10 to 25 ft3 |
| 15. Standard Deviation | 1 ft3 | No | 0 to 2 ft3 |
| 16. Percentage with Second Freezer | 3.76 % | No | N/A |
| 17. Percentage with Automatic Defrost | 44.03 % | No | N/A |
| 18. Mean Second Freezer Volume | 15 ft3 | Yes | 10 to 25 ft3 |
| 19. Standard Deviation | 1 ft3 | No | 0 to 2 ft3 |
| 20. Mean Thermostat Setting | -5 °F | Yes | -10 to 0 °F |
| 21. Standard Deviation | 2 °F | No | 0 to 2 °F |
| 22. Thermostat Deadband | 2 °F | No | 2 to 3 °F |

Deferrable\_Default.txt

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Default Value** | **Allowed to Vary?** | **Range** |
| 1. Percentage with Washer | 96.66 % | No | N/A |
| 2. Mean Washer Power Demand | 425 W | Yes (Nearest 15 W) | 350 to 500 W |
| 3. Standard Deviation | 25 W | No | 0 to 25 W |
| 4. Percentage with Electric Dryer | 73.40 % | No | N/A |
| 5. Mean Electric Dryer Power Demand | 3400 W | Yes (Nearest 100 W) | 1800 to 5000 W |
| 6. Standard Deviation | 550 W | No | 0 to 550 W |
| 7. Percentage with Nonelectric Dryer | 21.59 % | No | N/A |
| 8. Mean Nonelectric Dryer Power Demand | 350 W | Yes (Nearest 15 W) | 275 to 425 W |
| 9. Standard Deviation | 25 W | No | 0 to 25 W |
| 10. Percentage with Dishwasher | 67.83 % | No | N/A |
| 11. Mean Dishwasher Power Demand | 1800 W | Yes (Nearest 100 W) | 1200 to 2400 W |
| 12. Standard Deviation | 200 W | No | 0 to 200 W |

Uninterruptible\_Default.txt

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Default Value** | **Allowed to Vary?** | **Range** |
| 1. Percentage with Cooking | 100 % | No | N/A |
| 2. Mean Cooking Power Demand | 1250 W | Yes (Nearest 25 W) | 1100 to 1400 W |
| 3. Standard Deviation | 50 W | No | 0 to 50 W |
| 4. Number of Televisions per Home | 3 | No | 0 to 4 |
| 5. Mean Television Power Demand | 120 W | Yes (Nearest 5 W) | 65 to 170 W |
| 6. Standard Deviation | 10 W | No | 0 to 10 W |
| 7. Television Standby Power Demand | 10 W | No | 0 to 20 W |
| 8. Number of Computers per Home | 2 | No | 0 to 3 |
| 9. Mean Computer Power Demand | 270 W | Yes (Nearest 5 W) | 240 to 300 W |
| 10. Standard Deviation | 10 W | No | 0 to 10 W |
| 11. Computer Standby Power Demand | 20 W | No | 0 to 40 W |
| 12. Additional Power Demand per Occupant | 60 W | No | 0 to 150 W |
| 13. Percentage with Lighting | 100 % | No | N/A |
| 14. Incandescent Lighting Percentage | 62.50 % | No | N/A |
| 15. Halogen Lighting Percentage | 4.46 % | No | N/A |
| 16. Linear Fluorescent Lighting Percentage | 9.94 % | No | N/A |
| 17. Compact Fluorescent Lighting Percentage | 22.94 % | No | N/A |
| 18. LED Lighting Percentage | 0.16 % | No | N/A |

ElectricVehicle\_Default.txt

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Default Value** | **Allowed to Vary?** | **Range** |
| 1. Percentage with Electric Vehicle | 0 % | No | N/A |
| 2. Percentage with Nissan Leaf | 59.37 % | No | N/A |
| 3. Percentage with Chevrolet Volt | 17.71 % | No | N/A |
| 4. Percentage with Toyota Prius | 22.92 % | No | N/A |
| 5. Mean Battery Capacity (Leaf) | 24000 Wh | Yes | 0 to 30000 Wh |
| 6. Standard Deviation (Leaf) | 0 Wh | No | 0 to 1000 Wh |
| 7. Usable Battery Capacity (Leaf) | 87.5 % | No | 0 to 100 % |
| 8. Driving Consumption (Leaf) | 175 Wh/km | No | 0 to 250 Wh/km |
| 9. Driving Velocity (Leaf) | 46 km/h | No | 0 to 60 km/h |
| 10. Percentage with Level 1 Charger (Leaf) | 12 % | No | N/A |
| 11. Level 1 Charger Power Demand (Leaf) | 1800 W | Yes | 0 to 2500 W |
| 12. Standard Deviation (Leaf) | 0 W | No | 0 to 150 W |
| 13. Percentage with Level 2 Charger (Leaf) | 88 % | No | N/A |
| 14. Level 2 Charger Power Demand (Leaf) | 3300 W | Yes | 0 to 10000 W |
| 15. Standard Deviation (Leaf) | 0 W | No | 0 to 500 W |
| 16. Percentage with Level 3 Charger (Leaf) | 0 % | No | N/A |
| 17. Level 3 Charger Power Demand (Leaf) | 50000 W | Yes | 0 to 100000 W |
| 18. Standard Deviation (Leaf) | 0 W | No | 0 to 5000 W |
| 19. Mean Battery Capacity (Volt) | 16500 Wh | Yes | 0 to 30000 Wh |
| 20. Standard Deviation (Volt) | 0 Wh | No | 0 to 1000 Wh |
| 21. Usable Battery Capacity (Volt) | 65 % | No | 0 to 100 % |
| 22. Driving Consumption (Volt) | 175 Wh/km | No | 0 to 250 Wh/km |
| 23. Driving Velocity (Volt) | 46 km/h | No | 0 to 60 km/h |
| 24. Percentage with Level 1 Charger (Volt) | 54 % | No | N/A |
| 25. Level 1 Charger Power Demand (Volt) | 1400 W | Yes | 0 to 2500 W |
| 26. Standard Deviation (Volt) | 0 W | No | 0 to 150 W |
| 27. Percentage with Level 2 Charger (Volt) | 46 % | No | N/A |
| 28. Level 2 Charger Power Demand (Volt) | 3800 W | Yes | 0 to 10000 W |
| 29. Standard Deviation (Volt) | 0 W | No | 0 to 500 W |
| 30. Percentage with Level 3 Charger (Volt) | 0 % | No | N/A |
| 31. Level 3 Charger Power Demand (Volt) | 0 W | Yes | 0 to 100000 W |
| 32. Standard Deviation (Volt) | 0 W | No | 0 to 5000 W |
| 33. Mean Battery Capacity (Prius) | 4400 Wh | Yes | 0 to 30000 Wh |
| 34. Standard Deviation (Prius) | 0 Wh | No | 0 to 1000 Wh |
| 35. Usable Battery Capacity (Prius) | 75 % | No | 0 to 100 % |
| 36. Driving Consumption (Prius) | 175 Wh/km | No | 0 to 250 Wh/km |
| 37. Driving Velocity (Prius) | 46 km/h | No | 0 to 60 km/h |
| 38. Percentage with Level 1 Charger (Prius) | 89 % | No | N/A |
| 39. Level 1 Charger Power Demand (Prius) | 1400 W | Yes | 0 to 2500 W |
| 40. Standard Deviation (Prius) | 0 W | No | 0 to 150 W |
| 41. Percentage with Level 2 Charger (Prius) | 11 % | No | N/A |
| 42. Level 2 Charger Power Demand (Prius) | 3800 W | Yes | 0 to 10000 W |
| 43. Standard Deviation (Prius) | 0 W | No | 0 to 500 W |
| 44. Percentage with Level 3 Charger (Prius) | 0 % | No | N/A |
| 45. Level 3 Charger Power Demand (Prius) | 0 W | Yes | 0 to 100000 W |
| 46. Standard Deviation (Prius) | 0 W | No | 0 to 5000 W |

OccupantsPerHome\_Default.txt

|  |  |
| --- | --- |
| **Parameter** | **Default Value** |
| 1. One Occupant | 33188 (27.41 %) |
| 2. Two Occupants | 40983 (33.85 %) |
| 3. Three Occupants | 19241 (15.89 %) |
| 4. Four Occupants | 16049 (13.25 %) |
| 5. Five Occupants | 7271 (6.00 %) |
| 6. Six Occupants | 2734 (2.26 %) |
| 7. Seven Occupants | 1617 (1.33 %) |

Occupant\_Default.txt

|  |  |
| --- | --- |
| **Parameter** | **Default Value** |
| 1. Working Male Occupant | 24.81888254 % |
| 2. Nonworking Male Occupant | 11.89544075 % |
| 3. Working Female Occupant | 26.61013706 % |
| 4. Nonworking Female Occupant | 12.75397102 % |
| 5. Child Occupant | 23.92156863 % |

HVACDemandResponse\_Default.txt, WaterHeaterDemandResponse\_Default.txt, RefrigeratorDemandResponse\_Default.txt, and FreezerDemandResponse\_Default.txt

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Default Value** | **Allowed to Vary?** | **Range** |
| 1. HVAC Demand Response Percentage | 30 % | No | N/A |
| 2. Simulate HVAC Load Shed | 0 (No) | No | 1 (Yes) |
| 3. Shed Load Hour | 4 | No | 1-12 |
| 4. Shed Load Minute | 0 | No | 0-59 |
| 5. Shed Load AM/PM | 2 (PM) | No | 1 (AM) |
| 6. Shed Load Day | 1 | No | N/A |
| 7. Shed Load Signal Duration | 0 Minutes | No | N/A |
| 8. Simulate HVAC Adjust Thermostat | 0 (No) | No | 1 (Yes) |
| 9. HVAC Adjust Thermostat Temperature | 0 °F | No | N/A |
| 10. Adjust Thermostat Hour 1 | 2 | No | 1-12 |
| 11. Adjust Thermostat Minute 1 | 0 | No | 0-59 |
| 12. Adjust Thermostat AM/PM 1 | 2 (PM) | No | 1 (AM) |
| 13. Adjust Thermostat Day 1 | 1 | No | N/A |
| 14. Adjust Thermostat Signal Duration 1 | 0 Minutes | No | N/A |
| 15. Adjust Thermostat Hour 2 | 6 | No | 1-12 |
| 16. Adjust Thermostat Minute 2 | 0 | No | 0-59 |
| 17. Adjust Thermostat AM/PM 2 | 2 (PM) | No | 1 (AM) |
| 18. Adjust Thermostat Day 2 | 1 | No | N/A |
| 19. Adjust Thermostat Signal Duration 2 | 0 Minutes | No | N/A |

WasherDryerDemandResponse\_Default.txt and DishwasherDemandResponse\_Default.txt

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Default Value** | **Allowed to Vary?** | **Range** |
| 1. Washer/Dryer Demand Response Percentage | 30 % | No | N/A |
| 2. Simulate Washer/Dryer Defer Load | 0 (No) | No | 1 (Yes) |
| 3. Defer Load Hour 1 | 7 and 5 | No | 1-12 |
| 4. Defer Load Minute 1 | 0 | No | 0-59 |
| 5. Defer Load AM/PM 1 | 2 (PM) | No | 1 (AM) |
| 6. Defer Load Hour 2 | 11 and 9 | No | 1-12 |
| 7. Defer Load Minute 2 | 0 | No | 0-59 |
| 8. Defer Load AM/PM 2 | 2 (PM) | No | 1 (AM) |

LoadDistribution\_Override.csv (Manually create and place in /Input Data/User Settings/ folder). Allows the user to override the defined residential load distribution percentages.

|  |  |
| --- | --- |
| **Parameter** | **Default Value** |
| 1. Percentage with Heat Pump | 9.75 % |
| 2. Percentage with Resistive Heating | 16.02 % |
| 3. Percentage with Nonelectric Heating | 66.57 % |
| 4. Percentage with Air Conditioning | 85.10 % |
| 5. Percentage with Water Heater | 37.88 % |
| 6. Percentage with Refrigerator | 99.86 % |
| 7. Percentage with Automatic Defrost | 94.56 % |
| 8. Percentage with Second Refrigerator | 32.45 % |
| 9. Percentage with Automatic Defrost | 94.56 % |
| 10. Percentage with Freezer | 40.81 % |
| 11. Percentage with Automatic Defrost | 44.03 % |
| 12. Percentage with Second Freezer | 3.76 % |
| 13. Percentage with Automatic Defrost | 44.03 % |
| 14. Percentage with Washer | 96.66 % |
| 15. Percentage with Electric Dryer | 73.40 % |
| 16. Percentage with Nonelectric Dryer | 21.59 % |
| 17. Percentage with Dishwasher | 67.83 % |
| 18. Percentage with Cooking | 100 % |
| 19. Number of Televisions per Home | 3 |
| 20. Number of Computers per Home | 2 |
| 21. Percentage with Lighting | 100 % |
| 22. Incandescent Lighting Percentage | 62.50 % |
| 23. Halogen Lighting Percentage | 4.46 % |
| 24. Linear Fluorescent Lighting Percentage | 9.94 % |
| 25. Compact Fluorescent Lighting Percentage | 22.94 % |
| 26. LED Lighting Percentage | 0.16 % |

Occupant\_Override.csv (Manually create and place in /Input Data/User Settings/ folder). Allows the user to override the occupant generator and simulate a home with a defined occupant make-up. To simulate different occupant types, the following values are used: working male (1), nonworking male (2), working female (3), nonworking female (4), and child (5).

|  |  |  |
| --- | --- | --- |
| **Home 1** | **Home 2** | **Home 3** |
| 1 | 1 | 2 |
| 3 | 4 | 3 |
| 5 | 5 | 4 |
| 5 |  | 5 |
|  |  | 5 |

Load\_Override.csv (Manually create and place in /Input Data/User Settings/ folder). Allows the user to override the defined residential load distribution percentages on a home-by-home basis.

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Home 1** | **Home 2** | **Home 3** |
| 1. Percentage with Heat Pump | 0 % | 100 % | 0 % |
| 2. Percentage with Resistive Heating | 0 % | 0 % | 0 % |
| 3. Percentage with Nonelectric Heating | 100 % | 0 % | 100 % |
| 4. Percentage with Air Conditioning | 100 % | 100 % | 100 % |
| 5. Percentage with Water Heater | 0 % | 100 % | 0 % |
| 6. Percentage with Refrigerator | 100 % | 100 % | 100 % |
| 7. Percentage with Automatic Defrost | 100 % | 100 % | 100 % |
| 8. Percentage with Second Refrigerator | 100 % | 0 % | 0 % |
| 9. Percentage with Automatic Defrost | 100 % | 0 % | 0 % |
| 10. Percentage with Freezer | 100 % | 100 % | 0 % |
| 11. Percentage with Automatic Defrost | 100 % | 0 % | 0 % |
| 12. Percentage with Second Freezer | 0 % | 0 % | 0 % |
| 13. Percentage with Automatic Defrost | 0 % | 0 % | 0 % |
| 14. Percentage with Washer | 100 % | 100 % | 100 % |
| 15. Percentage with Electric Dryer | 100 % | 100 % | 100 % |
| 16. Percentage with Nonelectric Dryer | 0 % | 0 % | 0 % |
| 17. Percentage with Dishwasher | 100 % | 0 % | 100 % |
| 18. Percentage with Cooking | 100 % | 100 % | 100 % |
| 19. Number of Televisions per Home | 3 | 3 | 3 |
| 20. Number of Computers per Home | 2 | 2 | 2 |
| 21. Percentage with Lighting | 100 % | 100 % | 100 % |
| 22. Incandescent Lighting Percentage | 62.5 % | 62.5 % | 62.5 % |
| 23. Halogen Lighting Percentage | 4.46 % | 4.46 % | 4.46 % |
| 24. Linear Fluorescent Lighting Percentage | 9.94 % | 9.94 % | 9.94 % |
| 25. Compact Fluorescent Lighting Percentage | 22.94 % | 22.94 % | 22.94 % |
| 26. LED Lighting Percentage | 0.16 % | 0.16 % | 0.16 % |