

### Commercial Analysis Appendix Tables

|                                   |   |
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|    | A   | C  | D                                      | E  | F                         | G  |
|----|---|--|--|--|---------------------------|--|
| 1  | <b>Upstate Commercial Measures</b>  |  |  |  |                           |  |
| 2  | <b>Total Resource Cost Test Benefit/Cost Ratio and Levelized Cost of Saved Energy</b> |  |  |  |                           |  |
| 3  | <b></b>   |  |  |  |                           |  |
| 4  | <b></b>   |  |  |  |                           |  |
| 5  | <b>Measure Name</b>   | <b>Measure ID4<br/>(e.g., Bldg type)</b> | <b>Measure ID5<br/>(e.g., End Use)</b> | <b>Measure ID6<br/>(e.g., Market: Retrofit, NC, ROB)</b> | <b>Total Resource BCR</b> | <b>TRC Levelized Cost per Saved Therm (\$/Therm)</b> |
| 6  | Exhaust Hood Makeup Air   | Office                                   | Space Heating                          | New construction   | 12.23                     | (0.28)   |
| 7  | Exhaust Hood Makeup Air   | Office                                   | Space Heating                          | Remodel/Replacment                                       | 15.64                     | (0.31)   |
| 8  | High efficiency ENERGY STAR fryer   | Office                                   | Cooking                                | New construction   | 1.92                      | 0.44   |
| 9  | Pre-Rinse Spray Valve   | Office                                   | Water Heating                          | Retrofit   | 33.27                     | 0.00   |
| 10 | Refrigeration heat recovery   | Office                                   | Water Heating                          | Retrofit   | 3.19                      | 0.50   |
| 11 | Refrigeration heat recovery   | Office                                   | Water Heating                          | New construction   | 2.55                      | 0.31   |
| 12 | Refrigeration heat recovery   | Office                                   | Water Heating                          | Remodel/Replacment                                       | 3.25                      | 0.23   |
| 13 | Cooling system chilled water reset  | Office                                   | Cooling                                | Retrofit   | 1.14                      | 1.42   |
| 14 | Cooling system chilled water reset  | Office                                   | Cooling                                | Remodel/Replacment                                       | 1.14                      | 0.65   |
| 15 | Cooling system water side economizer  | Office                                   | Cooling                                | Retrofit   | 1.19                      | 1.05   |
| 16 | Cooling system water side economizer  | Office                                   | Cooling                                | Remodel/Replacment                                       | 1.20                      | 0.48   |
| 17 | Condensing DHW stand-alone  | Office                                   | Water Heating                          | Retrofit   | 3.05                      | 0.64   |
| 18 | Condensing DHW stand-alone  | Office                                   | Water Heating                          | New construction   | 3.50                      | 0.25   |
| 19 | Condensing DHW stand-alone  | Office                                   | Water Heating                          | Remodel/Replacment                                       | 4.52                      | 0.19   |
| 20 | Faucet aerator  | Office                                   | Water Heating                          | Retrofit   | 5.87                      | (2.97)   |
| 21 | Indirect-fired DHW off space heating boiler   | Office                                   | Water Heating                          | Retrofit   | 2.58                      | 0.87   |
| 22 | Indirect-fired DHW off space heating boiler   | Office                                   | Water Heating                          | New construction   | 2.60                      | 0.34   |
| 23 | Indirect-fired DHW off space heating boiler   | Office                                   | Water Heating                          | Remodel/Replacment                                       | 3.36                      | 0.26   |
| 24 | Instantaneous. High-Modulating Water Heater   | Office                                   | Water Heating                          | Retrofit   | 3.10                      | 0.63   |
| 25 | Instantaneous. High-Modulating Water Heater   | Office                                   | Water Heating                          | New construction   | 5.95                      | 0.15   |
| 26 | Instantaneous. High-Modulating Water Heater   | Office                                   | Water Heating                          | Renovation   | 5.95                      | 0.15   |
| 27 | Instantaneous. High-Modulating Water Heater   | Office                                   | Water Heating                          | Remodel/Replacment                                       | 7.68                      | 0.11   |
| 28 | Low-flow shower heads   | Office                                   | Water Heating                          | Retrofit   | 35.31                     | (2.29)   |
| 29 | Low-flow shower heads   | Office                                   | Water Heating                          | New construction   | 20.20                     | (0.99)   |
| 30 | Low-flow shower heads   | Office                                   | Water Heating                          | Remodel/Replacment                                       | 26.08                     | (1.01)   |
| 31 | Pipe insulation - water heating   | Office                                   | Water Heating                          | Retrofit   | 23.43                     | 0.08   |
| 32 | Pipe insulation - water heating   | Office                                   | Water Heating                          | New construction   | 18.32                     | 0.05   |
| 33 | Pipe insulation - water heating   | Office                                   | Water Heating                          | Renovation   | 18.32                     | 0.05   |
| 34 | Tank insulation   | Office                                   | Water Heating                          | Retrofit   | 1.73                      | 1.10   |
| 35 | Tank insulation   | Office                                   | Water Heating                          | New construction   | 1.35                      | 0.65   |
| 36 | Tank insulation   | Office                                   | Water Heating                          | Remodel/Replacment                                       | 1.75                      | 0.50   |
| 37 | Air Sealing   | Office                                   | Space Heating                          | Retrofit   | 13.37                     | (0.25)   |
| 38 | Air Sealing   | Office                                   | Space Heating                          | New construction   | 3.83                      | 0.16   |
| 39 | Air Sealing   | Office                                   | Space Heating                          | Renovation   | 3.83                      | 0.16   |
| 40 | Improved heating system high efficiency unit - Tier 1                                 | Office                                   | Space Heating                          | Retrofit   | 3.89                      | 0.77   |
| 41 | Improved heating system condensing unit - Tier 2                                      | Office                                   | Space Heating                          | Retrofit   | 0.83                      | 3.60   |
| 42 | Programmable Thermostat   | Office                                   | Space Heating                          | Retrofit   | 8.87                      | 0.28   |
| 43 | Programmable Thermostat   | Office                                   | Space Heating                          | Renovation   | 3.55                      | 0.33   |
| 44 | Programmable Thermostat   | Office                                   | Space Heating                          | Remodel/Replacment                                       | 4.59                      | 0.25   |
| 45 | Demand-Controlled Ventilation (controller, sensor)                                    | Office                                   | Space Heating                          | Retrofit   | 6.16                      | 0.34   |
| 46 | Demand-Controlled Ventilation (controller, sensor)                                    | Office                                   | Space Heating                          | New construction   | 1.84                      | 0.63   |
| 47 | Demand-Controlled Ventilation (controller, sensor)                                    | Office                                   | Space Heating                          | Remodel/Replacment                                       | 2.34                      | 0.49   |
| 48 | Improved wall insulation  | Office                                   | Space Heating                          | New construction   | 1.05                      | 1.14   |
| 49 | Improved wall insulation  | Office                                   | Space Heating                          | Renovation   | 1.05                      | 1.14   |
| 50 | Improved below-grade insulation   | Office                                   | Space Heating                          | New construction   | 2.08                      | 0.57   |
| 51 | Improved below-grade insulation   | Office                                   | Space Heating                          | Renovation   | 2.08                      | 0.57   |
| 52 | Pipe insulation - space heating   | Office                                   | Space Heating                          | Retrofit   | 55.11                     | 0.05   |

|    | A   | C                                | D                              | E  | F                  | G   |
|----|---|----------------------------------|--------------------------------|--|--------------------|---|
| 1  | <b>Upstate Commercial Measures</b>  |                                  |                                |  |                    |   |
| 2  | <b>Total Resource Cost Test Benefit/Cost Ratio and Levelized Cost of Saved Energy</b> |                                  |                                |  |                    |   |
| 3  | <b></b>   |                                  |                                |  |                    |   |
| 4  | <b></b>   |                                  |                                |  |                    |   |
| 5  | Measure Name  | Measure ID4<br>(e.g., Bldg type) | Measure ID5<br>(e.g., End Use) | Measure ID6<br>(e.g., Market: Retrofit, NC, ROB) | Total Resource BCR | TRC Levelized Cost per Saved Therm (\$/Therm) |
| 53 | Pipe insulation - space heating   | Office                           | Space Heating                  | New construction                                 | 44.00              | 0.03  |
| 54 | Pipe insulation - space heating   | Office                           | Space Heating                  | Renovation                                       | 44.00              | 0.03  |
| 55 | Commissioning   | Office                           | Total                          | Renovation                                       | 2.40               | (0.41)  |
| 56 | Commissioning   | Office                           | Total                          | Remodel/Replacment                               | 3.09               | (0.67)  |
| 57 | Retrocommissioning  | Office                           | Total                          | Retrofit   | 3.36               | (0.33)  |
| 58 | Steam trap Maintenance  | Office                           | Space Heating                  | Retrofit   | 2.36               | 0.49  |
| 59 | Oxygen Trim   | Office                           | Space Heating                  | Retrofit   | 33.58              | 0.08  |
| 60 | Oxygen Trim   | Office                           | Space Heating                  | New construction                                 | 49.79              | 0.02  |
| 61 | Oxygen Trim   | Office                           | Space Heating                  | Remodel/Replacment                               | 45.16              | 0.03  |
| 62 | Direct fired convection range/oven  | Retail                           | Cooking                        | New construction                                 | 2.99               | 0.28  |
| 63 | Direct fired convection range/oven  | Retail                           | Cooking                        | Remodel/Replacment                               | 2.99               | 0.28  |
| 64 | Exhaust Hood Makeup Air   | Retail                           | Space Heating                  | New construction                                 | 11.59              | (0.19)  |
| 65 | Exhaust Hood Makeup Air   | Retail                           | Space Heating                  | Remodel/Replacment                               | 13.15              | (0.20)  |
| 66 | High efficiency ENERGY STAR fryer   | Retail                           | Cooking                        | New construction                                 | 1.92               | 0.44  |
| 67 | High efficiency ENERGY STAR fryer   | Retail                           | Cooking                        | Remodel/Replacment                               | 1.92               | 0.44  |
| 68 | High efficiency ENERGY STAR steam cooker  | Retail                           | Cooking                        | Retrofit   | 1.04               | 1.57  |
| 69 | High efficiency ENERGY STAR steam cooker  | Retail                           | Cooking                        | New construction                                 | 13.25              | (2.23)  |
| 70 | High efficiency ENERGY STAR steam cooker  | Retail                           | Cooking                        | Remodel/Replacment                               | 13.25              | (2.23)  |
| 71 | Pre-Rinse Spray Valve   | Retail                           | Water Heating                  | Retrofit   | 34.47              | 0.00  |
| 72 | Refrigeration heat recovery   | Retail                           | Water Heating                  | Retrofit   | 3.24               | 0.50  |
| 73 | Refrigeration heat recovery   | Retail                           | Water Heating                  | New construction                                 | 2.58               | 0.30  |
| 74 | Refrigeration heat recovery   | Retail                           | Water Heating                  | Remodel/Replacment                               | 3.30               | 0.22  |
| 75 | Cooling system chilled water reset  | Retail                           | Cooling                        | Retrofit   | 1.12               | 1.44  |
| 76 | Cooling system chilled water reset  | Retail                           | Cooling                        | Remodel/Replacment                               | 1.13               | 0.66  |
| 77 | Cooling system water side economizer  | Retail                           | Cooling                        | Retrofit   | 1.19               | 1.03  |
| 78 | Cooling system water side economizer  | Retail                           | Cooling                        | Remodel/Replacment                               | 1.20               | 0.47  |
| 79 | Condensing DHW stand-alone  | Retail                           | Water Heating                  | Retrofit   | 9,999.00           | (0.19)  |
| 80 | Condensing DHW stand-alone  | Retail                           | Water Heating                  | New construction                                 | 3.50               | 0.25  |
| 81 | Condensing DHW stand-alone  | Retail                           | Water Heating                  | Remodel/Replacment                               | 4.52               | 0.19  |
| 82 | Faucet aerator  | Retail                           | Water Heating                  | Retrofit   | 18.48              | (3.66)  |
| 83 | Indirect-fired DHW off space heating boiler   | Retail                           | Water Heating                  | Retrofit   | 14.01              | 0.16  |
| 84 | Indirect-fired DHW off space heating boiler   | Retail                           | Water Heating                  | New construction                                 | 2.60               | 0.34  |
| 85 | Indirect-fired DHW off space heating boiler   | Retail                           | Water Heating                  | Remodel/Replacment                               | 3.36               | 0.26  |
| 86 | Instantaneous. High-Modulating Water Heater   | Retail                           | Water Heating                  | Retrofit   | 9,999.00           | (0.82)  |
| 87 | Instantaneous. High-Modulating Water Heater   | Retail                           | Water Heating                  | New construction                                 | 5.95               | 0.15  |
| 88 | Instantaneous. High-Modulating Water Heater   | Retail                           | Water Heating                  | Renovation                                       | 5.95               | 0.15  |
| 89 | Instantaneous. High-Modulating Water Heater   | Retail                           | Water Heating                  | Remodel/Replacment                               | 7.68               | 0.11  |
| 90 | Pipe insulation - water heating   | Retail                           | Water Heating                  | Retrofit   | 23.85              | 0.08  |
| 91 | Pipe insulation - water heating   | Retail                           | Water Heating                  | New construction                                 | 18.62              | 0.05  |
| 92 | Pipe insulation - water heating   | Retail                           | Water Heating                  | Renovation                                       | 18.62              | 0.05  |
| 93 | Tank insulation   | Retail                           | Water Heating                  | Retrofit   | 1.76               | 1.08  |
| 94 | Tank insulation   | Retail                           | Water Heating                  | New construction                                 | 1.37               | 0.64  |
| 95 | Tank insulation   | Retail                           | Water Heating                  | Remodel/Replacment                               | 1.78               | 0.49  |
| 96 | Air Sealing   | Retail                           | Space Heating                  | Retrofit   | 10.45              | 0.11  |
| 97 | Air Sealing   | Retail                           | Space Heating                  | New construction                                 | 5.66               | 0.15  |
| 98 | Air Sealing   | Retail                           | Space Heating                  | Renovation                                       | 5.66               | 0.15  |
| 99 | Improved heating system high efficiency unit - Tie                                    | Retail                           | Space Heating                  | Retrofit   | 2.00               | 1.50  |

|     | A   | C                                | D                              | E  | F                  | G   |
|-----|---|----------------------------------|--------------------------------|--|--------------------|---|
| 1   | <b>Upstate Commercial Measures</b>  |                                  |                                |  |                    |   |
| 2   | <b>Total Resource Cost Test Benefit/Cost Ratio and Levelized Cost of Saved Energy</b> |                                  |                                |  |                    |   |
| 3   | <b></b>   |                                  |                                |  |                    |   |
| 4   | <b></b>   |                                  |                                |  |                    |   |
| 5   | Measure Name  | Measure ID4<br>(e.g., Bldg type) | Measure ID5<br>(e.g., End Use) | Measure ID6<br>(e.g., Market: Retrofit, NC, ROB) | Total Resource BCR | TRC Levelized Cost per Saved Therm (\$/Therm) |
| 100 | Improved heating system high efficiency unit - Tier 2                                 | Retail                           | Space Heating                  | New construction                                 | 1.02               | 1.17  |
| 101 | Improved heating system high efficiency unit - Tier 2                                 | Retail                           | Space Heating                  | Remodel/Replacment                               | 1.28               | 0.93  |
| 102 | Improved heating system condensing unit - Tier 2                                      | Retail                           | Space Heating                  | Retrofit   | 1.66               | 1.80  |
| 103 | Improved heating system condensing unit - Tier 2                                      | Retail                           | Space Heating                  | New construction                                 | 1.27               | 0.94  |
| 104 | Improved heating system condensing unit - Tier 2                                      | Retail                           | Space Heating                  | Remodel/Replacment                               | 1.59               | 0.75  |
| 105 | Programmable Thermostat   | Retail                           | Space Heating                  | Retrofit   | 71.07              | 0.03  |
| 106 | Programmable Thermostat   | Retail                           | Space Heating                  | Renovation                                       | 8.19               | 0.14  |
| 107 | Programmable Thermostat   | Retail                           | Space Heating                  | Remodel/Replacment                               | 10.57              | 0.11  |
| 108 | Demand-Controlled Ventilation (controller, sensor)                                    | Retail                           | Space Heating                  | Retrofit   | 2.76               | 0.61  |
| 109 | Demand-Controlled Ventilation (controller, sensor)                                    | Retail                           | Space Heating                  | New construction                                 | 5.28               | 0.03  |
| 110 | Demand-Controlled Ventilation (controller, sensor)                                    | Retail                           | Space Heating                  | Remodel/Replacment                               | 6.38               | (0.01)  |
| 111 | Improved below-grade insulation   | Retail                           | Space Heating                  | New construction                                 | 1.61               | 0.74  |
| 112 | Improved below-grade insulation   | Retail                           | Space Heating                  | Renovation                                       | 1.61               | 0.74  |
| 113 | Sensible Heat Recovery  | Retail                           | Space Heating                  | Retrofit   | 8.43               | 1.30  |
| 114 | Sensible Heat Recovery  | Retail                           | Space Heating                  | New construction                                 | 2.03               | 0.85  |
| 115 | Sensible Heat Recovery  | Retail                           | Space Heating                  | Remodel/Replacment                               | 2.43               | 0.80  |
| 116 | Pipe insulation - space heating   | Retail                           | Space Heating                  | Retrofit   | 55.57              | 0.05  |
| 117 | Pipe insulation - space heating   | Retail                           | Space Heating                  | New construction                                 | 44.32              | 0.03  |
| 118 | Pipe insulation - space heating   | Retail                           | Space Heating                  | Renovation                                       | 44.32              | 0.03  |
| 119 | Commissioning   | Retail                           | Total                          | Renovation                                       | 2.50               | (0.52)  |
| 120 | Commissioning   | Retail                           | Total                          | Remodel/Replacment                               | 3.22               | (0.78)  |
| 121 | Retrocommissioning  | Retail                           | Total                          | Retrofit   | 3.46               | (0.45)  |
| 122 | Steam trap Maintenance  | Retail                           | Space Heating                  | Retrofit   | 1.66               | 0.70  |
| 123 | Oxygen Trim   | Retail                           | Space Heating                  | Retrofit   | 23.60              | 0.11  |
| 124 | Oxygen Trim   | Retail                           | Space Heating                  | New construction                                 | 49.79              | 0.02  |
| 125 | Oxygen Trim   | Retail                           | Space Heating                  | Remodel/Replacment                               | 32.17              | 0.04  |
| 126 | Direct fired convection range/oven  | Grocery                          | Cooking                        | New construction                                 | 2.99               | 0.28  |
| 127 | Direct fired convection range/oven  | Grocery                          | Cooking                        | Remodel/Replacment                               | 2.99               | 0.28  |
| 128 | Exhaust Hood Makeup Air   | Grocery                          | Space Heating                  | New construction                                 | 11.78              | (0.18)  |
| 129 | Exhaust Hood Makeup Air   | Grocery                          | Space Heating                  | Remodel/Replacment                               | 10.22              | (0.16)  |
| 130 | High efficiency ENERGY STAR fryer   | Grocery                          | Cooking                        | New construction                                 | 1.92               | 0.44  |
| 131 | High efficiency ENERGY STAR fryer   | Grocery                          | Cooking                        | Remodel/Replacment                               | 1.92               | 0.44  |
| 132 | High efficiency ENERGY STAR steam cooker  | Grocery                          | Cooking                        | Retrofit   | 1.04               | 1.57  |
| 133 | High efficiency ENERGY STAR steam cooker  | Grocery                          | Cooking                        | New construction                                 | 13.25              | (2.23)  |
| 134 | High efficiency ENERGY STAR steam cooker  | Grocery                          | Cooking                        | Remodel/Replacment                               | 13.25              | (2.23)  |
| 135 | Pre-Rinse Spray Valve   | Grocery                          | Water Heating                  | Retrofit   | 33.82              | 0.00  |
| 136 | Refrigeration heat recovery   | Grocery                          | Water Heating                  | Retrofit   | 3.19               | 0.51  |
| 137 | Refrigeration heat recovery   | Grocery                          | Water Heating                  | New construction                                 | 2.58               | 0.31  |
| 138 | Refrigeration heat recovery   | Grocery                          | Water Heating                  | Remodel/Replacment                               | 3.26               | 0.23  |
| 139 | Cooling system chilled water reset  | Grocery                          | Cooling                        | Retrofit   | 1.18               | 1.37  |
| 140 | Cooling system chilled water reset  | Grocery                          | Cooling                        | Remodel/Replacment                               | 1.19               | 0.63  |
| 141 | Cooling system water side economizer  | Grocery                          | Cooling                        | Retrofit   | 1.17               | 1.09  |
| 142 | Cooling system water side economizer  | Grocery                          | Cooling                        | Remodel/Replacment                               | 1.18               | 0.49  |
| 143 | Condensing DHW stand-alone  | Grocery                          | Water Heating                  | Retrofit   | 2.13               | 0.92  |
| 144 | Condensing DHW stand-alone  | Grocery                          | Water Heating                  | New construction                                 | 2.67               | 0.33  |
| 145 | Condensing DHW stand-alone  | Grocery                          | Water Heating                  | Remodel/Replacment                               | 3.39               | 0.26  |
| 146 | Faucet aerator  | Grocery                          | Water Heating                  | Retrofit   | 18.26              | (3.65)  |

|     | A   | C                                | D                              | E  | F                  | G   |
|-----|---|----------------------------------|--------------------------------|--|--------------------|---|
| 1   | <b>Upstate Commercial Measures</b>  |                                  |                                |  |                    |   |
| 2   | <b>Total Resource Cost Test Benefit/Cost Ratio and Levelized Cost of Saved Energy</b> |                                  |                                |  |                    |   |
| 3   | <div style="border: 1px solid black; width: 100px; height: 15px;"></div>              |                                  |                                |  |                    |   |
| 4   |   |                                  |                                |  |                    |   |
| 5   | Measure Name  | Measure ID4<br>(e.g., Bldg type) | Measure ID5<br>(e.g., End Use) | Measure ID6<br>(e.g., Market: Retrofit, NC, ROB) | Total Resource BCR | TRC Levelized Cost per Saved Therm (\$/Therm) |
| 147 | Indirect-fired DHW off space heating boiler   | Grocery                          | Water Heating                  | Retrofit   | 1.84               | 1.22  |
| 148 | Indirect-fired DHW off space heating boiler   | Grocery                          | Water Heating                  | New construction                                 | 1.98               | 0.44  |
| 149 | Indirect-fired DHW off space heating boiler   | Grocery                          | Water Heating                  | Remodel/Replacment                               | 2.52               | 0.35  |
| 150 | Pipe insulation - water heating   | Grocery                          | Water Heating                  | Retrofit   | 23.57              | 0.08  |
| 151 | Pipe insulation - water heating   | Grocery                          | Water Heating                  | New construction                                 | 18.70              | 0.05  |
| 152 | Pipe insulation - water heating   | Grocery                          | Water Heating                  | Renovation                                       | 18.70              | 0.05  |
| 153 | Tank insulation   | Grocery                          | Water Heating                  | Retrofit   | 1.74               | 1.10  |
| 154 | Tank insulation   | Grocery                          | Water Heating                  | New construction                                 | 1.38               | 0.64  |
| 155 | Tank insulation   | Grocery                          | Water Heating                  | Remodel/Replacment                               | 1.76               | 0.50  |
| 156 | Improved heating system high efficiency unit - Tier 1                                 | Grocery                          | Space Heating                  | Retrofit   | 1.03               | 2.92  |
| 157 | Improved heating system high efficiency unit - Tier 1                                 | Grocery                          | Space Heating                  | New construction                                 | 1.48               | 0.81  |
| 158 | Improved heating system high efficiency unit - Tier 1                                 | Grocery                          | Space Heating                  | Remodel/Replacment                               | 1.82               | 0.66  |
| 159 | Improved heating system condensing unit - Tier 2                                      | Grocery                          | Space Heating                  | Retrofit   | 2.73               | 1.10  |
| 160 | Improved heating system condensing unit - Tier 2                                      | Grocery                          | Space Heating                  | New construction                                 | 0.52               | 2.29  |
| 161 | Improved heating system condensing unit - Tier 2                                      | Grocery                          | Space Heating                  | Remodel/Replacment                               | 0.64               | 1.86  |
| 162 | Programmable Thermostat   | Grocery                          | Space Heating                  | Retrofit   | 7.30               | 0.36  |
| 163 | Programmable Thermostat   | Grocery                          | Space Heating                  | Renovation                                       | 7.44               | 0.16  |
| 164 | Programmable Thermostat   | Grocery                          | Space Heating                  | Remodel/Replacment                               | 9.46               | 0.12  |
| 165 | Demand-Controlled Ventilation (controller, sensor)                                    | Grocery                          | Space Heating                  | Retrofit   | 15.17              | (0.10)  |
| 166 | Demand-Controlled Ventilation (controller, sensor)                                    | Grocery                          | Space Heating                  | New construction                                 | 6.41               | 0.07  |
| 167 | Demand-Controlled Ventilation (controller, sensor)                                    | Grocery                          | Space Heating                  | Remodel/Replacment                               | 8.07               | 0.03  |
| 168 | Improved below-grade insulation   | Grocery                          | Space Heating                  | New construction                                 | 2.15               | 0.56  |
| 169 | Improved below-grade insulation   | Grocery                          | Space Heating                  | Renovation                                       | 2.15               | 0.56  |
| 170 | Sensible Heat Recovery  | Grocery                          | Space Heating                  | Retrofit   | 3.06               | 1.59  |
| 171 | Sensible Heat Recovery  | Grocery                          | Space Heating                  | New construction                                 | 1.91               | 0.87  |
| 172 | Sensible Heat Recovery  | Grocery                          | Space Heating                  | Remodel/Replacment                               | 2.35               | 0.80  |
| 173 | Pipe insulation - space heating   | Grocery                          | Space Heating                  | Retrofit   | 55.51              | 0.05  |
| 174 | Pipe insulation - space heating   | Grocery                          | Space Heating                  | New construction                                 | 45.17              | 0.03  |
| 175 | Pipe insulation - space heating   | Grocery                          | Space Heating                  | Renovation                                       | 45.17              | 0.03  |
| 176 | Commissioning   | Grocery                          | Total                          | Renovation                                       | 2.23               | (0.19)  |
| 177 | Commissioning   | Grocery                          | Total                          | Remodel/Replacment                               | 2.83               | (0.44)  |
| 178 | Retrocommissioning  | Grocery                          | Total                          | Retrofit   | 3.14               | (0.10)  |
| 179 | Steam trap Maintenance  | Grocery                          | Space Heating                  | Retrofit   | 1.34               | 0.87  |
| 180 | Oxygen Trim   | Grocery                          | Space Heating                  | Retrofit   | 19.90              | 0.13  |
| 181 | Oxygen Trim   | Grocery                          | Space Heating                  | New construction                                 | 49.79              | 0.02  |
| 182 | Oxygen Trim   | Grocery                          | Space Heating                  | Remodel/Replacment                               | 26.02              | 0.05  |
| 183 | Infrared Heater   | Grocery                          | Space Heating                  | Retrofit   | 27.47              | 0.11  |
| 184 | Infrared Heater   | Grocery                          | Space Heating                  | Remodel/Replacment                               | 90.45              | 0.01  |
| 185 | Exhaust Hood Makeup Air   | Warehouse                        | Space Heating                  | New construction                                 | 11.21              | (0.12)  |
| 186 | Exhaust Hood Makeup Air   | Warehouse                        | Space Heating                  | Remodel/Replacment                               | 11.92              | (0.12)  |
| 187 | High efficiency ENERGY STAR fryer   | Warehouse                        | Cooking                        | New construction                                 | 1.92               | 0.44  |
| 188 | High efficiency ENERGY STAR fryer   | Warehouse                        | Cooking                        | Remodel/Replacment                               | 1.92               | 0.44  |
| 189 | Pre-Rinse Spray Valve   | Warehouse                        | Water Heating                  | Retrofit   | 34.22              | 0.00  |
| 190 | Refrigeration heat recovery   | Warehouse                        | Water Heating                  | Retrofit   | 3.23               | 0.50  |
| 191 | Refrigeration heat recovery   | Warehouse                        | Water Heating                  | New construction                                 | 2.61               | 0.30  |
| 192 | Refrigeration heat recovery   | Warehouse                        | Water Heating                  | Remodel/Replacment                               | 3.28               | 0.23  |
| 193 | Cooling system chilled water reset  | Warehouse                        | Cooling                        | Retrofit   | 1.17               | 1.38  |

|     | A   | C                                | D                              | E  | F                  | G   |
|-----|---|----------------------------------|--------------------------------|--|--------------------|---|
| 1   | <b>Upstate Commercial Measures</b>  |                                  |                                |  |                    |   |
| 2   | <b>Total Resource Cost Test Benefit/Cost Ratio and Levelized Cost of Saved Energy</b> |                                  |                                |  |                    |   |
| 3   | <b></b>   |                                  |                                |  |                    |   |
| 4   | <b></b>   |                                  |                                |  |                    |   |
| 5   | Measure Name  | Measure ID4<br>(e.g., Bldg type) | Measure ID5<br>(e.g., End Use) | Measure ID6<br>(e.g., Market: Retrofit, NC, ROB) | Total Resource BCR | TRC Levelized Cost per Saved Therm (\$/Therm) |
| 194 | Cooling system chilled water reset  | Warehouse                        | Cooling                        | Remodel/Replacment                               | 1.18               | 0.63  |
| 195 | Cooling system water side economizer  | Warehouse                        | Cooling                        | Retrofit   | 1.18               | 1.08  |
| 196 | Cooling system water side economizer  | Warehouse                        | Cooling                        | Remodel/Replacment                               | 1.18               | 0.49  |
| 197 | Condensing DHW stand-alone  | Warehouse                        | Water Heating                  | Retrofit   | 3.51               | 0.56  |
| 198 | Condensing DHW stand-alone  | Warehouse                        | Water Heating                  | New construction                                 | 3.56               | 0.25  |
| 199 | Condensing DHW stand-alone  | Warehouse                        | Water Heating                  | Remodel/Replacment                               | 4.52               | 0.19  |
| 200 | Faucet aerator  | Warehouse                        | Water Heating                  | Retrofit   | 18.40              | (3.66)  |
| 201 | Indirect-fired DHW off space heating boiler   | Warehouse                        | Water Heating                  | Retrofit   | 2.81               | 0.80  |
| 202 | Indirect-fired DHW off space heating boiler   | Warehouse                        | Water Heating                  | New construction                                 | 2.64               | 0.33  |
| 203 | Indirect-fired DHW off space heating boiler   | Warehouse                        | Water Heating                  | Remodel/Replacment                               | 3.36               | 0.26  |
| 204 | Instantaneous. High-Modulating Water Heater   | Warehouse                        | Water Heating                  | Retrofit   | 4.02               | 0.49  |
| 205 | Instantaneous. High-Modulating Water Heater   | Warehouse                        | Water Heating                  | New construction                                 | 6.04               | 0.15  |
| 206 | Instantaneous. High-Modulating Water Heater   | Warehouse                        | Water Heating                  | Renovation                                       | 6.04               | 0.15  |
| 207 | Instantaneous. High-Modulating Water Heater   | Warehouse                        | Water Heating                  | Remodel/Replacment                               | 7.68               | 0.11  |
| 208 | Low-flow shower heads   | Warehouse                        | Water Heating                  | Retrofit   | 36.20              | (2.30)  |
| 209 | Low-flow shower heads   | Warehouse                        | Water Heating                  | New construction                                 | 20.84              | (1.00)  |
| 210 | Low-flow shower heads   | Warehouse                        | Water Heating                  | Remodel/Replacment                               | 26.51              | (1.02)  |
| 211 | Pipe insulation - water heating   | Warehouse                        | Water Heating                  | Retrofit   | 23.84              | 0.08  |
| 212 | Pipe insulation - water heating   | Warehouse                        | Water Heating                  | New construction                                 | 18.89              | 0.05  |
| 213 | Pipe insulation - water heating   | Warehouse                        | Water Heating                  | Renovation                                       | 18.89              | 0.05  |
| 214 | Tank insulation   | Warehouse                        | Water Heating                  | Retrofit   | 1.76               | 1.08  |
| 215 | Tank insulation   | Warehouse                        | Water Heating                  | New construction                                 | 1.39               | 0.63  |
| 216 | Tank insulation   | Warehouse                        | Water Heating                  | Remodel/Replacment                               | 1.77               | 0.49  |
| 217 | Air Sealing   | Warehouse                        | Space Heating                  | Retrofit   | 2.98               | 0.95  |
| 218 | Air Sealing   | Warehouse                        | Space Heating                  | New construction                                 | 2.32               | 0.50  |
| 219 | Air Sealing   | Warehouse                        | Space Heating                  | Renovation                                       | 2.32               | 0.50  |
| 220 | Improved heating system high efficiency unit - Tier 1                                 | Warehouse                        | Space Heating                  | Retrofit   | 0.78               | 3.84  |
| 221 | Improved heating system high efficiency unit - Tier 1                                 | Warehouse                        | Space Heating                  | New construction                                 | 1.90               | 0.63  |
| 222 | Improved heating system high efficiency unit - Tier 1                                 | Warehouse                        | Space Heating                  | Remodel/Replacment                               | 2.34               | 0.51  |
| 223 | Improved heating system condensing unit - Tier 2                                      | Warehouse                        | Space Heating                  | Retrofit   | 3.03               | 0.99  |
| 224 | Improved heating system condensing unit - Tier 2                                      | Warehouse                        | Space Heating                  | New construction                                 | 2.35               | 0.51  |
| 225 | Improved heating system condensing unit - Tier 2                                      | Warehouse                        | Space Heating                  | Remodel/Replacment                               | 2.90               | 0.41  |
| 226 | Programmable Thermostat   | Warehouse                        | Space Heating                  | Retrofit   | 56.59              | 0.05  |
| 227 | Programmable Thermostat   | Warehouse                        | Space Heating                  | Renovation                                       | 24.91              | 0.05  |
| 228 | Programmable Thermostat   | Warehouse                        | Space Heating                  | Remodel/Replacment                               | 31.69              | 0.04  |
| 229 | Demand-Controlled Ventilation (controller, sensor)                                    | Warehouse                        | Space Heating                  | Retrofit   | 2.95               | 0.88  |
| 230 | Demand-Controlled Ventilation (controller, sensor)                                    | Warehouse                        | Space Heating                  | New construction                                 | 1.95               | 0.62  |
| 231 | Demand-Controlled Ventilation (controller, sensor)                                    | Warehouse                        | Space Heating                  | Remodel/Replacment                               | 2.41               | 0.50  |
| 232 | Improved below-grade insulation   | Warehouse                        | Space Heating                  | New construction                                 | 3.02               | 0.40  |
| 233 | Improved below-grade insulation   | Warehouse                        | Space Heating                  | Renovation                                       | 3.02               | 0.40  |
| 234 | Improved roof insulation  | Warehouse                        | Space Heating                  | New construction                                 | 1.38               | 0.86  |
| 235 | Improved roof insulation  | Warehouse                        | Space Heating                  | Renovation                                       | 1.38               | 0.86  |
| 236 | Sensible Heat Recovery  | Warehouse                        | Space Heating                  | Retrofit   | 2.39               | 1.73  |
| 237 | Sensible Heat Recovery  | Warehouse                        | Space Heating                  | New construction                                 | 1.69               | 0.92  |
| 238 | Sensible Heat Recovery  | Warehouse                        | Space Heating                  | Remodel/Replacment                               | 2.02               | 0.85  |
| 239 | Pipe insulation - space heating   | Warehouse                        | Space Heating                  | Retrofit   | 55.57              | 0.05  |
| 240 | Pipe insulation - space heating   | Warehouse                        | Space Heating                  | New construction                                 | 44.98              | 0.03  |

|     | A   | C                                | D                              | E  | F                  | G   |
|-----|---|----------------------------------|--------------------------------|--|--------------------|---|
| 1   | <b>Upstate Commercial Measures</b>  |                                  |                                |  |                    |   |
| 2   | <b>Total Resource Cost Test Benefit/Cost Ratio and Levelized Cost of Saved Energy</b> |                                  |                                |  |                    |   |
| 3   | <b></b>   |                                  |                                |  |                    |   |
| 4   | <b></b>   |                                  |                                |  |                    |   |
| 5   | Measure Name  | Measure ID4<br>(e.g., Bldg type) | Measure ID5<br>(e.g., End Use) | Measure ID6<br>(e.g., Market: Retrofit, NC, ROB) | Total Resource BCR | TRC Levelized Cost per Saved Therm (\$/Therm) |
| 241 | Pipe insulation - space heating   | Warehouse                        | Space Heating                  | Renovation                                       | 44.98              | 0.03  |
| 242 | Commissioning   | Warehouse                        | Total                          | New construction                                 | 2.30               | (0.28)  |
| 243 | Commissioning   | Warehouse                        | Total                          | Renovation                                       | 2.30               | (0.28)  |
| 244 | Commissioning   | Warehouse                        | Total                          | Remodel/Replacment                               | 2.93               | (0.52)  |
| 245 | Retrocommissioning  | Warehouse                        | Total                          | Retrofit   | 3.21               | (0.17)  |
| 246 | Integrated Design - High Performance (30% > code)                                     | Warehouse                        | Total                          | New construction                                 | 1.53               | 0.59  |
| 247 | Integrated Design - High Performance (50% > code)                                     | Warehouse                        | Total                          | New construction                                 | 0.46               | 3.26  |
| 248 | Steam trap Maintenance  | Warehouse                        | Space Heating                  | Retrofit   | 1.54               | 0.76  |
| 249 | Oxygen Trim   | Warehouse                        | Space Heating                  | Retrofit   | 24.10              | 0.11  |
| 250 | Oxygen Trim   | Warehouse                        | Space Heating                  | New construction                                 | 49.79              | 0.02  |
| 251 | Oxygen Trim   | Warehouse                        | Space Heating                  | Remodel/Replacment                               | 35.81              | 0.03  |
| 252 | Infrared Heater   | Warehouse                        | Space Heating                  | Retrofit   | 18.89              | 0.16  |
| 253 | Infrared Heater   | Warehouse                        | Space Heating                  | Remodel/Replacment                               | 110.83             | 0.01  |
| 254 | Direct fired convection range/oven  | Education                        | Cooking                        | New construction                                 | 2.99               | 0.28  |
| 255 | Direct fired convection range/oven  | Education                        | Cooking                        | Remodel/Replacment                               | 2.99               | 0.28  |
| 256 | Exhaust Hood Makeup Air   | Education                        | Space Heating                  | New construction                                 | 12.09              | (0.26)  |
| 257 | Exhaust Hood Makeup Air   | Education                        | Space Heating                  | Remodel/Replacment                               | 11.72              | (0.26)  |
| 258 | High efficiency ENERGY STAR fryer   | Education                        | Cooking                        | New construction                                 | 1.92               | 0.44  |
| 259 | High efficiency ENERGY STAR fryer   | Education                        | Cooking                        | Remodel/Replacment                               | 1.92               | 0.44  |
| 260 | Pre-Rinse Spray Valve   | Education                        | Water Heating                  | Retrofit   | 29.56              | 0.00  |
| 261 | Refrigeration heat recovery   | Education                        | Water Heating                  | Retrofit   | 3.14               | 0.52  |
| 262 | Refrigeration heat recovery   | Education                        | Water Heating                  | New construction                                 | 2.51               | 0.31  |
| 263 | Refrigeration heat recovery   | Education                        | Water Heating                  | Remodel/Replacment                               | 3.00               | 0.25  |
| 264 | Cooling system chilled water reset  | Education                        | Cooling                        | Retrofit   | 1.05               | 1.51  |
| 265 | Cooling system chilled water reset  | Education                        | Cooling                        | Remodel/Replacment                               | 1.06               | 0.69  |
| 266 | Cooling system water side economizer  | Education                        | Cooling                        | Retrofit   | 1.21               | 0.98  |
| 267 | Cooling system water side economizer  | Education                        | Cooling                        | Remodel/Replacment                               | 1.22               | 0.44  |
| 268 | Condensing DHW stand-alone  | Education                        | Water Heating                  | Retrofit   | 1.73               | 1.13  |
| 269 | Condensing DHW stand-alone  | Education                        | Water Heating                  | New construction                                 | 2.19               | 0.40  |
| 270 | Condensing DHW stand-alone  | Education                        | Water Heating                  | Remodel/Replacment                               | 2.83               | 0.31  |
| 271 | Faucet aerator  | Education                        | Water Heating                  | Retrofit   | 5.43               | (2.89)  |
| 272 | Graywater heat exchanger/GFX  | Education                        | Water Heating                  | New construction                                 | 1.93               | 0.45  |
| 273 | Graywater heat exchanger/GFX  | Education                        | Water Heating                  | Remodel/Replacment                               | 2.50               | 0.35  |
| 274 | Indirect-fired DHW off space heating boiler   | Education                        | Water Heating                  | Retrofit   | 1.51               | 1.49  |
| 275 | Indirect-fired DHW off space heating boiler   | Education                        | Water Heating                  | New construction                                 | 1.62               | 0.54  |
| 276 | Indirect-fired DHW off space heating boiler   | Education                        | Water Heating                  | Remodel/Replacment                               | 2.10               | 0.42  |
| 277 | Instantaneous. High-Modulating Water Heater   | Education                        | Water Heating                  | Retrofit   | 1.64               | 1.20  |
| 278 | Instantaneous. High-Modulating Water Heater   | Education                        | Water Heating                  | New construction                                 | 3.72               | 0.24  |
| 279 | Instantaneous. High-Modulating Water Heater   | Education                        | Water Heating                  | Renovation                                       | 3.72               | 0.24  |
| 280 | Instantaneous. High-Modulating Water Heater   | Education                        | Water Heating                  | Remodel/Replacment                               | 4.80               | 0.18  |
| 281 | Low-flow shower heads   | Education                        | Water Heating                  | Retrofit   | 29.69              | (2.27)  |
| 282 | Low-flow shower heads   | Education                        | Water Heating                  | New construction                                 | 23.90              | (1.01)  |
| 283 | Low-flow shower heads   | Education                        | Water Heating                  | Remodel/Replacment                               | 30.86              | (1.03)  |
| 284 | Pipe insulation - water heating   | Education                        | Water Heating                  | Retrofit   | 23.10              | 0.08  |
| 285 | Pipe insulation - water heating   | Education                        | Water Heating                  | New construction                                 | 18.09              | 0.05  |
| 286 | Pipe insulation - water heating   | Education                        | Water Heating                  | Renovation                                       | 18.09              | 0.05  |
| 287 | Tank insulation   | Education                        | Water Heating                  | Retrofit   | 1.71               | 1.12  |

|     | A   | C                                | D                              | E  | F                  | G   |
|-----|---|----------------------------------|--------------------------------|--|--------------------|---|
| 1   | <b>Upstate Commercial Measures</b>  |                                  |                                |  |                    |   |
| 2   | <b>Total Resource Cost Test Benefit/Cost Ratio and Levelized Cost of Saved Energy</b> |                                  |                                |  |                    |   |
| 3   | <b></b>   |                                  |                                |  |                    |   |
| 4   | <b></b>   |                                  |                                |  |                    |   |
| 5   | Measure Name  | Measure ID4<br>(e.g., Bldg type) | Measure ID5<br>(e.g., End Use) | Measure ID6<br>(e.g., Market: Retrofit, NC, ROB) | Total Resource BCR | TRC Levelized Cost per Saved Therm (\$/Therm) |
| 288 | Tank insulation   | Education                        | Water Heating                  | New construction                                 | 1.34               | 0.66  |
| 289 | Tank insulation   | Education                        | Water Heating                  | Remodel/Replacment                               | 1.72               | 0.51  |
| 290 | Air Sealing   | Education                        | Space Heating                  | Retrofit   | 3.10               | 0.86  |
| 291 | Air Sealing   | Education                        | Space Heating                  | New construction                                 | 3.79               | 0.27  |
| 292 | Air Sealing   | Education                        | Space Heating                  | Renovation                                       | 3.79               | 0.27  |
| 293 | Improved heating system high efficiency unit - Tier 1                                 | Education                        | Space Heating                  | Retrofit   | 1.08               | 2.78  |
| 294 | Improved heating system high efficiency unit - Tier 1                                 | Education                        | Space Heating                  | New construction                                 | 2.08               | 0.58  |
| 295 | Improved heating system high efficiency unit - Tier 1                                 | Education                        | Space Heating                  | Remodel/Replacment                               | 2.60               | 0.46  |
| 296 | Improved heating system condensing unit - Tier 2                                      | Education                        | Space Heating                  | Retrofit   | 5.03               | 0.60  |
| 297 | Improved heating system condensing unit - Tier 2                                      | Education                        | Space Heating                  | New construction                                 | 1.86               | 0.64  |
| 298 | Improved heating system condensing unit - Tier 2                                      | Education                        | Space Heating                  | Remodel/Replacment                               | 2.33               | 0.51  |
| 299 | Programmable Thermostat   | Education                        | Space Heating                  | Retrofit   | 21.87              | 0.09  |
| 300 | Programmable Thermostat   | Education                        | Space Heating                  | Renovation                                       | 9.48               | 0.11  |
| 301 | Programmable Thermostat   | Education                        | Space Heating                  | Remodel/Replacment                               | 12.25              | 0.09  |
| 302 | Demand-Controlled Ventilation (controller, sensor)                                    | Education                        | Space Heating                  | Retrofit   | 4.62               | 0.55  |
| 303 | Demand-Controlled Ventilation (controller, sensor)                                    | Education                        | Space Heating                  | New construction                                 | 2.46               | 0.48  |
| 304 | Demand-Controlled Ventilation (controller, sensor)                                    | Education                        | Space Heating                  | Remodel/Replacment                               | 3.16               | 0.38  |
| 305 | Improved below-grade insulation   | Education                        | Space Heating                  | New construction                                 | 2.55               | 0.47  |
| 306 | Improved below-grade insulation   | Education                        | Space Heating                  | Renovation                                       | 2.55               | 0.47  |
| 307 | Sensible Heat Recovery  | Education                        | Space Heating                  | Retrofit   | 2.47               | 1.25  |
| 308 | Sensible Heat Recovery  | Education                        | Space Heating                  | New construction                                 | 3.03               | 0.50  |
| 309 | Sensible Heat Recovery  | Education                        | Space Heating                  | Remodel/Replacment                               | 3.75               | 0.43  |
| 310 | Pipe insulation - space heating   | Education                        | Space Heating                  | Retrofit   | 55.09              | 0.05  |
| 311 | Pipe insulation - space heating   | Education                        | Space Heating                  | New construction                                 | 43.98              | 0.03  |
| 312 | Pipe insulation - space heating   | Education                        | Space Heating                  | Renovation                                       | 43.98              | 0.03  |
| 313 | Energy Star washer  | Education                        | Water Heating                  | New construction                                 | 1.67               | (2.10)  |
| 314 | Energy Star washer  | Education                        | Water Heating                  | Remodel/Replacment                               | 1.94               | (2.71)  |
| 315 | Swimming pool/spa covers  | Education                        | Miscellaneous                  | Retrofit   | 3.97               | 0.38  |
| 316 | Swimming pool/spa covers  | Education                        | Miscellaneous                  | New construction                                 | 3.74               | 0.24  |
| 317 | Swimming pool/spa covers  | Education                        | Miscellaneous                  | Remodel/Replacment                               | 3.94               | 0.22  |
| 318 | Commissioning   | Education                        | Total                          | New construction                                 | 2.45               | (0.47)  |
| 319 | Commissioning   | Education                        | Total                          | Renovation                                       | 2.45               | (0.47)  |
| 320 | Commissioning   | Education                        | Total                          | Remodel/Replacment                               | 3.16               | (0.73)  |
| 321 | Retrocommissioning  | Education                        | Total                          | Retrofit   | 3.41               | (0.39)  |
| 322 | Integrated Design - High Performance (30% > code)                                     | Education                        | Total                          | New construction                                 | 1.60               | 0.51  |
| 323 | Integrated Design - High Performance (50% > code)                                     | Education                        | Total                          | New construction                                 | 0.48               | 3.17  |
| 324 | Steam trap Maintenance  | Education                        | Space Heating                  | Retrofit   | 1.49               | 0.78  |
| 325 | Oxygen Trim   | Education                        | Space Heating                  | Retrofit   | 21.26              | 0.12  |
| 326 | Oxygen Trim   | Education                        | Space Heating                  | New construction                                 | 49.79              | 0.02  |
| 327 | Oxygen Trim   | Education                        | Space Heating                  | Remodel/Replacment                               | 31.01              | 0.04  |
| 328 | Direct fired convection range/oven  | Health                           | Cooking                        | New construction                                 | 2.99               | 0.28  |
| 329 | Direct fired convection range/oven  | Health                           | Cooking                        | Remodel/Replacment                               | 2.99               | 0.28  |
| 330 | Exhaust Hood Makeup Air   | Health                           | Space Heating                  | New construction                                 | 12.81              | (0.18)  |
| 331 | Exhaust Hood Makeup Air   | Health                           | Space Heating                  | Remodel/Replacment                               | 14.74              | (0.20)  |
| 332 | High efficiency ENERGY STAR fryer   | Health                           | Cooking                        | New construction                                 | 1.92               | 0.44  |
| 333 | High efficiency ENERGY STAR fryer   | Health                           | Cooking                        | Remodel/Replacment                               | 1.92               | 0.44  |
| 334 | High efficiency ENERGY STAR steam cooker  | Health                           | Cooking                        | Retrofit   | 1.04               | 1.57  |



|     | A   | C                                | D                              | E  | F                  | G   |
|-----|---|----------------------------------|--------------------------------|--|--------------------|---|
| 1   | <b>Upstate Commercial Measures</b>  |                                  |                                |  |                    |   |
| 2   | <b>Total Resource Cost Test Benefit/Cost Ratio and Levelized Cost of Saved Energy</b> |                                  |                                |  |                    |   |
| 3   | <b></b>   |                                  |                                |  |                    |   |
| 4   | <b></b>   |                                  |                                |  |                    |   |
| 5   | Measure Name  | Measure ID4<br>(e.g., Bldg type) | Measure ID5<br>(e.g., End Use) | Measure ID6<br>(e.g., Market: Retrofit, NC, ROB) | Total Resource BCR | TRC Levelized Cost per Saved Therm (\$/Therm) |
| 335 | High efficiency ENERGY STAR steam cooker  | Health                           | Cooking                        | New construction                                 | 13.25              | (2.23)  |
| 336 | High efficiency ENERGY STAR steam cooker  | Health                           | Cooking                        | Remodel/Replacment                               | 13.25              | (2.23)  |
| 337 | Pre-Rinse Spray Valve   | Health                           | Water Heating                  | Retrofit   | 32.36              | 0.00  |
| 338 | Refrigeration heat recovery   | Health                           | Water Heating                  | Retrofit   | 3.12               | 0.52  |
| 339 | Refrigeration heat recovery   | Health                           | Water Heating                  | New construction                                 | 2.80               | 0.27  |
| 340 | Refrigeration heat recovery   | Health                           | Water Heating                  | Remodel/Replacment                               | 3.18               | 0.23  |
| 341 | Cooling system chilled water reset  | Health                           | Cooling                        | Retrofit   | 1.19               | 1.36  |
| 342 | Cooling system chilled water reset  | Health                           | Cooling                        | New construction                                 | 1.04               | 0.70  |
| 343 | Cooling system chilled water reset  | Health                           | Cooling                        | Remodel/Replacment                               | 1.20               | 0.62  |
| 344 | Cooling system water side economizer  | Health                           | Cooling                        | Retrofit   | 1.17               | 1.10  |
| 345 | Cooling system water side economizer  | Health                           | Cooling                        | New construction                                 | 1.05               | 0.65  |
| 346 | Cooling system water side economizer  | Health                           | Cooling                        | Remodel/Replacment                               | 1.18               | 0.50  |
| 347 | Condensing DHW stand-alone  | Health                           | Water Heating                  | Retrofit   | 2.78               | 0.70  |
| 348 | Condensing DHW stand-alone  | Health                           | Water Heating                  | New construction                                 | 3.94               | 0.22  |
| 349 | Condensing DHW stand-alone  | Health                           | Water Heating                  | Remodel/Replacment                               | 4.52               | 0.19  |
| 350 | Faucet aerator  | Health                           | Water Heating                  | Retrofit   | 5.76               | (2.95)  |
| 351 | Graywater heat exchanger/GFX  | Health                           | Water Heating                  | New construction                                 | 2.17               | 0.40  |
| 352 | Graywater heat exchanger/GFX  | Health                           | Water Heating                  | Remodel/Replacment                               | 2.49               | 0.35  |
| 353 | Indirect-fired DHW off space heating boiler   | Health                           | Water Heating                  | Retrofit   | 2.43               | 0.93  |
| 354 | Indirect-fired DHW off space heating boiler   | Health                           | Water Heating                  | New construction                                 | 2.92               | 0.30  |
| 355 | Indirect-fired DHW off space heating boiler   | Health                           | Water Heating                  | Remodel/Replacment                               | 3.36               | 0.26  |
| 356 | Instantaneous. High-Modulating Water Heater   | Health                           | Water Heating                  | Retrofit   | 2.64               | 0.74  |
| 357 | Instantaneous. High-Modulating Water Heater   | Health                           | Water Heating                  | New construction                                 | 6.69               | 0.13  |
| 358 | Instantaneous. High-Modulating Water Heater   | Health                           | Water Heating                  | Renovation                                       | 6.69               | 0.13  |
| 359 | Instantaneous. High-Modulating Water Heater   | Health                           | Water Heating                  | Remodel/Replacment                               | 7.68               | 0.11  |
| 360 | Low-flow shower heads   | Health                           | Water Heating                  | Retrofit   | 3,933.29           | (2.41)  |
| 361 | Low-flow shower heads   | Health                           | Water Heating                  | New construction                                 | 5.93               | (0.76)  |
| 362 | Low-flow shower heads   | Health                           | Water Heating                  | Remodel/Replacment                               | 6.82               | (0.80)  |
| 363 | Pipe insulation - water heating   | Health                           | Water Heating                  | Retrofit   | 23.00              | 0.08  |
| 364 | Pipe insulation - water heating   | Health                           | Water Heating                  | New construction                                 | 20.26              | 0.04  |
| 365 | Pipe insulation - water heating   | Health                           | Water Heating                  | Renovation                                       | 20.26              | 0.04  |
| 366 | Tank insulation   | Health                           | Water Heating                  | Retrofit   | 1.70               | 1.12  |
| 367 | Tank insulation   | Health                           | Water Heating                  | New construction                                 | 1.50               | 0.59  |
| 368 | Tank insulation   | Health                           | Water Heating                  | Remodel/Replacment                               | 1.72               | 0.51  |
| 369 | Air Sealing   | Health                           | Space Heating                  | Retrofit   | 4.34               | (0.29)  |
| 370 | Air Sealing   | Health                           | Space Heating                  | New construction                                 | 3.47               | (0.02)  |
| 371 | Air Sealing   | Health                           | Space Heating                  | Renovation                                       | 3.47               | (0.02)  |
| 372 | Improved heating system high efficiency unit - Tier 1                                 | Health                           | Space Heating                  | Retrofit   | 6.14               | 0.72  |
| 373 | Improved heating system high efficiency unit - Tier 1                                 | Health                           | Space Heating                  | New construction                                 | 3.07               | 0.46  |
| 374 | Improved heating system high efficiency unit - Tier 1                                 | Health                           | Space Heating                  | Remodel/Replacment                               | 3.42               | 0.43  |
| 375 | Improved heating system condensing unit - Tier 2                                      | Health                           | Space Heating                  | Retrofit   | 6.50               | 0.46  |
| 376 | Improved heating system condensing unit - Tier 2                                      | Health                           | Space Heating                  | New construction                                 | 5.33               | 0.22  |
| 377 | Improved heating system condensing unit - Tier 2                                      | Health                           | Space Heating                  | Remodel/Replacment                               | 5.93               | 0.20  |
| 378 | Outdoor Air Reset   | Health                           | Space Heating                  | Retrofit   | 3.39               | 0.75  |
| 379 | High Performance Glazing double pane, low-E, low-U                                    | Health                           | Space Heating                  | New construction                                 | 1.38               | 0.68  |
| 380 | High Performance Glazing double pane, low-E, low-U                                    | Health                           | Space Heating                  | Renovation                                       | 1.38               | 0.68  |
| 381 | Improved below-grade insulation   | Health                           | Space Heating                  | New construction                                 | 1.60               | 0.75  |

|     | A   | C                                | D                              | E  | F                  | G   |
|-----|---|----------------------------------|--------------------------------|--|--------------------|---|
| 1   | <b>Upstate Commercial Measures</b>  |                                  |                                |  |                    |   |
| 2   | <b>Total Resource Cost Test Benefit/Cost Ratio and Levelized Cost of Saved Energy</b> |                                  |                                |  |                    |   |
| 3   | <b></b>   |                                  |                                |  |                    |   |
| 4   | <b></b>   |                                  |                                |  |                    |   |
| 5   | Measure Name  | Measure ID4<br>(e.g., Bldg type) | Measure ID5<br>(e.g., End Use) | Measure ID6<br>(e.g., Market: Retrofit, NC, ROB) | Total Resource BCR | TRC Levelized Cost per Saved Therm (\$/Therm) |
| 382 | Improved below-grade insulation   | Health                           | Space Heating                  | Renovation                                       | 1.60               | 0.75  |
| 383 | Improved roof insulation  | Health                           | Space Heating                  | New construction                                 | 1.37               | 0.84  |
| 384 | Improved roof insulation  | Health                           | Space Heating                  | Renovation                                       | 1.37               | 0.84  |
| 385 | Sensible Heat Recovery  | Health                           | Space Heating                  | Retrofit   | 2.17               | 2.33  |
| 386 | Pipe insulation - space heating   | Health                           | Space Heating                  | Retrofit   | 55.09              | 0.05  |
| 387 | Pipe insulation - space heating   | Health                           | Space Heating                  | New construction                                 | 49.45              | 0.02  |
| 388 | Pipe insulation - space heating   | Health                           | Space Heating                  | Renovation                                       | 49.45              | 0.02  |
| 389 | Swimming pool/spa covers  | Health                           | Miscellaneous                  | Retrofit   | 3.97               | 0.38  |
| 390 | Swimming pool/spa covers  | Health                           | Miscellaneous                  | New construction                                 | 3.85               | 0.23  |
| 391 | Swimming pool/spa covers  | Health                           | Miscellaneous                  | Remodel/Replacment                               | 3.94               | 0.22  |
| 392 | Commissioning   | Health                           | Total                          | New construction                                 | 2.55               | (0.39)  |
| 393 | Commissioning   | Health                           | Total                          | Renovation                                       | 2.55               | (0.39)  |
| 394 | Commissioning   | Health                           | Total                          | Remodel/Replacment                               | 2.93               | (0.52)  |
| 395 | Retrocommissioning  | Health                           | Total                          | Retrofit   | 3.23               | (0.20)  |
| 396 | Integrated Design - High Performance (30% > code)                                     | Health                           | Total                          | New construction                                 | 1.54               | 0.58  |
| 397 | Integrated Design - High Performance (50% > code)                                     | Health                           | Total                          | New construction                                 | 9,999.00           | 0.00  |
| 398 | Steam trap Maintenance  | Health                           | Space Heating                  | Retrofit   | 2.86               | 0.41  |
| 399 | Oxygen Trim   | Health                           | Space Heating                  | Retrofit   | 40.66              | 0.06  |
| 400 | Oxygen Trim   | Health                           | Space Heating                  | New construction                                 | 49.79              | 0.02  |
| 401 | Oxygen Trim   | Health                           | Space Heating                  | Remodel/Replacment                               | 43.31              | 0.03  |
| 402 | Direct fired convection range/oven  | Lodging                          | Cooking                        | New construction                                 | 2.99               | 0.28  |
| 403 | Direct fired convection range/oven  | Lodging                          | Cooking                        | Remodel/Replacment                               | 2.99               | 0.28  |
| 404 | Exhaust Hood Makeup Air   | Lodging                          | Space Heating                  | New construction                                 | 11.68              | (0.20)  |
| 405 | Exhaust Hood Makeup Air   | Lodging                          | Space Heating                  | Remodel/Replacment                               | 15.00              | (0.22)  |
| 406 | High efficiency ENERGY STAR fryer   | Lodging                          | Cooking                        | New construction                                 | 1.92               | 0.44  |
| 407 | High efficiency ENERGY STAR fryer   | Lodging                          | Cooking                        | Remodel/Replacment                               | 1.92               | 0.44  |
| 408 | High efficiency ENERGY STAR steam cooker  | Lodging                          | Cooking                        | Retrofit   | 1.04               | 1.57  |
| 409 | High efficiency ENERGY STAR steam cooker  | Lodging                          | Cooking                        | New construction                                 | 13.25              | (2.23)  |
| 410 | High efficiency ENERGY STAR steam cooker  | Lodging                          | Cooking                        | Remodel/Replacment                               | 13.25              | (2.23)  |
| 411 | Pre-Rinse Spray Valve   | Lodging                          | Water Heating                  | Retrofit   | 30.75              | 0.00  |
| 412 | Refrigeration heat recovery   | Lodging                          | Water Heating                  | Retrofit   | 3.12               | 0.53  |
| 413 | Refrigeration heat recovery   | Lodging                          | Water Heating                  | New construction                                 | 2.51               | 0.31  |
| 414 | Refrigeration heat recovery   | Lodging                          | Water Heating                  | Remodel/Replacment                               | 3.07               | 0.25  |
| 415 | Cooling system chilled water reset  | Lodging                          | Cooling                        | Retrofit   | 1.12               | 1.43  |
| 416 | Cooling system chilled water reset  | Lodging                          | Cooling                        | Remodel/Replacment                               | 1.13               | 0.66  |
| 417 | Cooling system water side economizer  | Lodging                          | Cooling                        | Retrofit   | 1.19               | 1.04  |
| 418 | Cooling system water side economizer  | Lodging                          | Cooling                        | Remodel/Replacment                               | 1.20               | 0.47  |
| 419 | Condensing DHW stand-alone  | Lodging                          | Water Heating                  | Retrofit   | 3.50               | 0.56  |
| 420 | Condensing DHW stand-alone  | Lodging                          | Water Heating                  | New construction                                 | 3.53               | 0.25  |
| 421 | Condensing DHW stand-alone  | Lodging                          | Water Heating                  | Remodel/Replacment                               | 4.52               | 0.19  |
| 422 | Faucet aerator  | Lodging                          | Water Heating                  | Retrofit   | 8.42               | (3.27)  |
| 423 | Graywater heat exchanger/GFX  | Lodging                          | Water Heating                  | New construction                                 | 1.00               | 0.87  |
| 424 | Graywater heat exchanger/GFX  | Lodging                          | Water Heating                  | Remodel/Replacment                               | 1.29               | 0.68  |
| 425 | Indirect-fired DHW off space heating boiler   | Lodging                          | Water Heating                  | Retrofit   | 2.80               | 0.80  |
| 426 | Indirect-fired DHW off space heating boiler   | Lodging                          | Water Heating                  | New construction                                 | 2.62               | 0.33  |
| 427 | Indirect-fired DHW off space heating boiler   | Lodging                          | Water Heating                  | Remodel/Replacment                               | 3.36               | 0.26  |
| 428 | Low-flow shower heads   | Lodging                          | Water Heating                  | Retrofit   | 629.57             | (2.41)  |

|     | A   | C                                | D                              | E  | F                  | G   |
|-----|---|----------------------------------|--------------------------------|--|--------------------|---|
| 1   | <b>Upstate Commercial Measures</b>  |                                  |                                |  |                    |   |
| 2   | <b>Total Resource Cost Test Benefit/Cost Ratio and Levelized Cost of Saved Energy</b> |                                  |                                |  |                    |   |
| 3   | <b></b>   |                                  |                                |  |                    |   |
| 4   | <b></b>   |                                  |                                |  |                    |   |
| 5   | Measure Name  | Measure ID4<br>(e.g., Bldg type) | Measure ID5<br>(e.g., End Use) | Measure ID6<br>(e.g., Market: Retrofit, NC, ROB) | Total Resource BCR | TRC Levelized Cost per Saved Therm (\$/Therm) |
| 429 | Low-flow shower heads   | Lodging                          | Water Heating                  | New construction                                 | 5.15               | (0.71)  |
| 430 | Low-flow shower heads   | Lodging                          | Water Heating                  | Remodel/Replacment                               | 6.60               | (0.79)  |
| 431 | Pipe insulation - water heating   | Lodging                          | Water Heating                  | Retrofit   | 23.08              | 0.08  |
| 432 | Pipe insulation - water heating   | Lodging                          | Water Heating                  | New construction                                 | 18.21              | 0.05  |
| 433 | Pipe insulation - water heating   | Lodging                          | Water Heating                  | Renovation                                       | 18.21              | 0.05  |
| 434 | Tank insulation   | Lodging                          | Water Heating                  | Retrofit   | 1.70               | 1.12  |
| 435 | Tank insulation   | Lodging                          | Water Heating                  | New construction                                 | 1.34               | 0.65  |
| 436 | Tank insulation   | Lodging                          | Water Heating                  | Remodel/Replacment                               | 1.72               | 0.51  |
| 437 | Air Sealing   | Lodging                          | Space Heating                  | Retrofit   | 2.88               | 1.03  |
| 438 | Air Sealing   | Lodging                          | Space Heating                  | New construction                                 | 2.17               | 0.55  |
| 439 | Air Sealing   | Lodging                          | Space Heating                  | Renovation                                       | 2.17               | 0.55  |
| 440 | Improved heating system high efficiency unit - Tier 2                                 | Lodging                          | Space Heating                  | Retrofit   | 0.79               | 3.81  |
| 441 | Improved heating system high efficiency unit - Tier 2                                 | Lodging                          | Space Heating                  | New construction                                 | 3.51               | 0.34  |
| 442 | Improved heating system high efficiency unit - Tier 2                                 | Lodging                          | Space Heating                  | Remodel/Replacment                               | 4.36               | 0.27  |
| 443 | Improved heating system condensing unit - Tier 2                                      | Lodging                          | Space Heating                  | Retrofit   | 6.47               | 0.46  |
| 444 | Improved heating system condensing unit - Tier 2                                      | Lodging                          | Space Heating                  | New construction                                 | 4.86               | 0.25  |
| 445 | Improved heating system condensing unit - Tier 2                                      | Lodging                          | Space Heating                  | Remodel/Replacment                               | 6.04               | 0.20  |
| 446 | Programmable Thermostat   | Lodging                          | Space Heating                  | Retrofit   | 4.65               | 0.57  |
| 447 | Improved below-grade insulation   | Lodging                          | Space Heating                  | New construction                                 | 2.25               | 0.53  |
| 448 | Improved below-grade insulation   | Lodging                          | Space Heating                  | Renovation                                       | 2.25               | 0.53  |
| 449 | Pipe insulation - space heating   | Lodging                          | Space Heating                  | Retrofit   | 55.15              | 0.05  |
| 450 | Pipe insulation - space heating   | Lodging                          | Space Heating                  | New construction                                 | 44.35              | 0.03  |
| 451 | Pipe insulation - space heating   | Lodging                          | Space Heating                  | Renovation                                       | 44.35              | 0.03  |
| 452 | Energy Star washer  | Lodging                          | Water Heating                  | New construction                                 | 1.63               | (1.87)  |
| 453 | Energy Star washer  | Lodging                          | Water Heating                  | Remodel/Replacment                               | 1.92               | (2.55)  |
| 454 | Swimming pool/spa covers  | Lodging                          | Miscellaneous                  | Retrofit   | 3.97               | 0.38  |
| 455 | Swimming pool/spa covers  | Lodging                          | Miscellaneous                  | New construction                                 | 3.75               | 0.24  |
| 456 | Swimming pool/spa covers  | Lodging                          | Miscellaneous                  | Remodel/Replacment                               | 3.94               | 0.22  |
| 457 | Commissioning   | Lodging                          | Total                          | New construction                                 | 2.47               | (0.48)  |
| 458 | Commissioning   | Lodging                          | Total                          | Renovation                                       | 2.47               | (0.48)  |
| 459 | Commissioning   | Lodging                          | Total                          | Remodel/Replacment                               | 3.16               | (0.73)  |
| 460 | Retrocommissioning  | Lodging                          | Total                          | Retrofit   | 3.41               | (0.39)  |
| 461 | Integrated Design - High Performance (30% > code)                                     | Lodging                          | Total                          | New construction                                 | 1.60               | 0.51  |
| 462 | Integrated Design - High Performance (50% > code)                                     | Lodging                          | Total                          | New construction                                 | 0.48               | 3.17  |
| 463 | Steam trap Maintenance  | Lodging                          | Space Heating                  | Retrofit   | 3.09               | 0.38  |
| 464 | Oxygen Trim   | Lodging                          | Space Heating                  | Retrofit   | 44.00              | 0.06  |
| 465 | Oxygen Trim   | Lodging                          | Space Heating                  | New construction                                 | 49.79              | 0.02  |
| 466 | Oxygen Trim   | Lodging                          | Space Heating                  | Remodel/Replacment                               | 47.58              | 0.02  |
| 467 | Direct fired convection range/oven  | Restaurant                       | Cooking                        | New construction                                 | 2.99               | 0.28  |
| 468 | Direct fired convection range/oven  | Restaurant                       | Cooking                        | Remodel/Replacment                               | 2.99               | 0.28  |
| 469 | Exhaust Hood Makeup Air   | Restaurant                       | Space Heating                  | New construction                                 | 12.55              | (0.14)  |
| 470 | Exhaust Hood Makeup Air   | Restaurant                       | Space Heating                  | Remodel/Replacment                               | 11.90              | (0.13)  |
| 471 | High efficiency ENERGY STAR fryer   | Restaurant                       | Cooking                        | New construction                                 | 1.92               | 0.44  |
| 472 | High efficiency ENERGY STAR fryer   | Restaurant                       | Cooking                        | Remodel/Replacment                               | 1.92               | 0.44  |
| 473 | High efficiency ENERGY STAR steam cooker  | Restaurant                       | Cooking                        | Retrofit   | 1.04               | 1.57  |
| 474 | High efficiency ENERGY STAR steam cooker  | Restaurant                       | Cooking                        | New construction                                 | 13.25              | (2.23)  |
| 475 | High efficiency ENERGY STAR steam cooker  | Restaurant                       | Cooking                        | Remodel/Replacment                               | 13.25              | (2.23)  |

|     | A   | C                                | D                              | E  | F                  | G   |
|-----|---|----------------------------------|--------------------------------|--|--------------------|---|
| 1   | <b>Upstate Commercial Measures</b>  |                                  |                                |  |                    |   |
| 2   | <b>Total Resource Cost Test Benefit/Cost Ratio and Levelized Cost of Saved Energy</b> |                                  |                                |  |                    |   |
| 3   | <div style="border: 1px solid black; width: 100px; height: 15px;"></div>              |                                  |                                |  |                    |   |
| 4   |   |                                  |                                |  |                    |   |
| 5   | Measure Name  | Measure ID4<br>(e.g., Bldg type) | Measure ID5<br>(e.g., End Use) | Measure ID6<br>(e.g., Market: Retrofit, NC, ROB) | Total Resource BCR | TRC Levelized Cost per Saved Therm (\$/Therm) |
| 476 | Pre-Rinse Spray Valve   | Restaurant                       | Water Heating                  | Retrofit   | 28.82              | 0.00  |
| 477 | Refrigeration heat recovery   | Restaurant                       | Water Heating                  | Retrofit   | 3.19               | 0.51  |
| 478 | Refrigeration heat recovery   | Restaurant                       | Water Heating                  | New construction                                 | 2.86               | 0.27  |
| 479 | Refrigeration heat recovery   | Restaurant                       | Water Heating                  | Remodel/Replacment                               | 2.94               | 0.26  |
| 480 | Cooling system chilled water reset  | Restaurant                       | Cooling                        | Retrofit   | 1.16               | 1.40  |
| 481 | Cooling system chilled water reset  | Restaurant                       | Cooling                        | New construction                                 | 1.01               | 0.71  |
| 482 | Cooling system chilled water reset  | Restaurant                       | Cooling                        | Remodel/Replacment                               | 1.16               | 0.64  |
| 483 | Cooling system water side economizer  | Restaurant                       | Cooling                        | Retrofit   | 1.18               | 1.07  |
| 484 | Cooling system water side economizer  | Restaurant                       | Cooling                        | New construction                                 | 1.06               | 0.64  |
| 485 | Cooling system water side economizer  | Restaurant                       | Cooling                        | Remodel/Replacment                               | 1.19               | 0.48  |
| 486 | Condensing DHW stand-alone  | Restaurant                       | Water Heating                  | Retrofit   | 2.05               | 0.96  |
| 487 | Condensing DHW stand-alone  | Restaurant                       | Water Heating                  | New construction                                 | 2.95               | 0.30  |
| 488 | Condensing DHW stand-alone  | Restaurant                       | Water Heating                  | Remodel/Replacment                               | 3.39               | 0.26  |
| 489 | Faucet aerator  | Restaurant                       | Water Heating                  | Retrofit   | 16.44              | (3.62)  |
| 490 | Graywater heat exchanger/GFX  | Restaurant                       | Water Heating                  | New construction                                 | 2.21               | 0.39  |
| 491 | Graywater heat exchanger/GFX  | Restaurant                       | Water Heating                  | Remodel/Replacment                               | 2.54               | 0.34  |
| 492 | Indirect-fired DHW off space heating boiler   | Restaurant                       | Water Heating                  | Retrofit   | 1.80               | 1.25  |
| 493 | Indirect-fired DHW off space heating boiler   | Restaurant                       | Water Heating                  | New construction                                 | 2.19               | 0.40  |
| 494 | Indirect-fired DHW off space heating boiler   | Restaurant                       | Water Heating                  | Remodel/Replacment                               | 2.52               | 0.35  |
| 495 | Pipe insulation - water heating   | Restaurant                       | Water Heating                  | Retrofit   | 23.57              | 0.08  |
| 496 | Pipe insulation - water heating   | Restaurant                       | Water Heating                  | New construction                                 | 20.71              | 0.04  |
| 497 | Pipe insulation - water heating   | Restaurant                       | Water Heating                  | Renovation                                       | 20.71              | 0.04  |
| 498 | Tank insulation   | Restaurant                       | Water Heating                  | Retrofit   | 1.74               | 1.10  |
| 499 | Tank insulation   | Restaurant                       | Water Heating                  | New construction                                 | 1.53               | 0.57  |
| 500 | Tank insulation   | Restaurant                       | Water Heating                  | Remodel/Replacment                               | 1.76               | 0.50  |
| 501 | Air Sealing   | Restaurant                       | Space Heating                  | Retrofit   | 3.47               | 0.76  |
| 502 | Air Sealing   | Restaurant                       | Space Heating                  | New construction                                 | 8.32               | 0.10  |
| 503 | Air Sealing   | Restaurant                       | Space Heating                  | Renovation                                       | 8.32               | 0.10  |
| 504 | Improved heating system high efficiency unit - Tier 1                                 | Restaurant                       | Space Heating                  | New construction                                 | 1.52               | 0.78  |
| 505 | Improved heating system high efficiency unit - Tier 1                                 | Restaurant                       | Space Heating                  | Remodel/Replacment                               | 1.70               | 0.71  |
| 506 | Improved heating system condensing unit - Tier 2                                      | Restaurant                       | Space Heating                  | New construction                                 | 0.57               | 2.11  |
| 507 | Improved heating system condensing unit - Tier 2                                      | Restaurant                       | Space Heating                  | Remodel/Replacment                               | 0.63               | 1.89  |
| 508 | Programmable Thermostat   | Restaurant                       | Space Heating                  | Retrofit   | 11.58              | 0.23  |
| 509 | Programmable Thermostat   | Restaurant                       | Space Heating                  | Renovation                                       | 10.32              | 0.11  |
| 510 | Programmable Thermostat   | Restaurant                       | Space Heating                  | Remodel/Replacment                               | 11.85              | 0.10  |
| 511 | Demand-Controlled Ventilation (controller, sensor)                                    | Restaurant                       | Space Heating                  | Retrofit   | 7.84               | 0.31  |
| 512 | Demand-Controlled Ventilation (controller, sensor)                                    | Restaurant                       | Space Heating                  | New construction                                 | 5.13               | 0.23  |
| 513 | Demand-Controlled Ventilation (controller, sensor)                                    | Restaurant                       | Space Heating                  | Remodel/Replacment                               | 5.66               | 0.20  |
| 514 | Improved below-grade insulation   | Restaurant                       | Space Heating                  | New construction                                 | 2.57               | 0.47  |
| 515 | Improved below-grade insulation   | Restaurant                       | Space Heating                  | Renovation                                       | 2.57               | 0.47  |
| 516 | Improved roof insulation  | Restaurant                       | Space Heating                  | New construction                                 | 1.46               | 0.79  |
| 517 | Improved roof insulation  | Restaurant                       | Space Heating                  | Renovation                                       | 1.46               | 0.79  |
| 518 | Sensible Heat Recovery  | Restaurant                       | Space Heating                  | Retrofit   | 3.20               | 1.80  |
| 519 | Sensible Heat Recovery  | Restaurant                       | Space Heating                  | New construction                                 | 2.15               | 0.91  |
| 520 | Sensible Heat Recovery  | Restaurant                       | Space Heating                  | Remodel/Replacment                               | 2.35               | 0.89  |
| 521 | Pipe insulation - space heating   | Restaurant                       | Space Heating                  | Retrofit   | 55.57              | 0.05  |
| 522 | Pipe insulation - space heating   | Restaurant                       | Space Heating                  | New construction                                 | 50.04              | 0.02  |

|     | A   | C                                | D                              | E  | F                  | G   |
|-----|---|----------------------------------|--------------------------------|--|--------------------|---|
| 1   | <b>Upstate Commercial Measures</b>  |                                  |                                |  |                    |   |
| 2   | <b>Total Resource Cost Test Benefit/Cost Ratio and Levelized Cost of Saved Energy</b> |                                  |                                |  |                    |   |
| 3   | <b></b>   |                                  |                                |  |                    |   |
| 4   | <b></b>   |                                  |                                |  |                    |   |
| 5   | Measure Name  | Measure ID4<br>(e.g., Bldg type) | Measure ID5<br>(e.g., End Use) | Measure ID6<br>(e.g., Market: Retrofit, NC, ROB) | Total Resource BCR | TRC Levelized Cost per Saved Therm (\$/Therm) |
| 523 | Pipe insulation - space heating   | Restaurant                       | Space Heating                  | Renovation                                       | 50.04              | 0.02  |
| 524 | Commissioning   | Restaurant                       | Total                          | Renovation                                       | 2.55               | (0.39)  |
| 525 | Commissioning   | Restaurant                       | Total                          | Remodel/Replacment                               | 2.93               | (0.52)  |
| 526 | Retrocommissioning  | Restaurant                       | Total                          | Retrofit   | 3.21               | (0.18)  |
| 527 | Steam trap Maintenance  | Restaurant                       | Space Heating                  | Retrofit   | 1.35               | 0.86  |
| 528 | Oxygen Trim   | Restaurant                       | Space Heating                  | Retrofit   | 19.26              | 0.14  |
| 529 | Oxygen Trim   | Restaurant                       | Space Heating                  | New construction                                 | 49.79              | 0.02  |
| 530 | Oxygen Trim   | Restaurant                       | Space Heating                  | Remodel/Replacment                               | 29.94              | 0.04  |
| 531 | Exhaust Hood Makeup Air   | Other                            | Space Heating                  | New construction                                 | 9.35               | (0.14)  |
| 532 | Exhaust Hood Makeup Air   | Other                            | Space Heating                  | Remodel/Replacment                               | 11.85              | (0.17)  |
| 533 | High efficiency ENERGY STAR fryer   | Other                            | Cooking                        | New construction                                 | 1.92               | 0.44  |
| 534 | High efficiency ENERGY STAR fryer   | Other                            | Cooking                        | Remodel/Replacment                               | 1.92               | 0.44  |
| 535 | High efficiency ENERGY STAR steam cooker  | Other                            | Cooking                        | Retrofit   | 1.04               | 1.57  |
| 536 | High efficiency ENERGY STAR steam cooker  | Other                            | Cooking                        | New construction                                 | 13.25              | (2.23)  |
| 537 | High efficiency ENERGY STAR steam cooker  | Other                            | Cooking                        | Remodel/Replacment                               | 13.25              | (2.23)  |
| 538 | Pre-Rinse Spray Valve   | Other                            | Water Heating                  | Retrofit   | 32.24              | 0.00  |
| 539 | Refrigeration heat recovery   | Other                            | Water Heating                  | Retrofit   | 3.18               | 0.51  |
| 540 | Refrigeration heat recovery   | Other                            | Water Heating                  | New construction                                 | 2.07               | 0.39  |
| 541 | Refrigeration heat recovery   | Other                            | Water Heating                  | Remodel/Replacment                               | 3.17               | 0.24  |
| 542 | Cooling system chilled water reset  | Other                            | Cooling                        | Retrofit   | 1.15               | 1.40  |
| 543 | Cooling system chilled water reset  | Other                            | Cooling                        | Remodel/Replacment                               | 1.16               | 0.64  |
| 544 | Cooling system water side economizer  | Other                            | Cooling                        | Retrofit   | 1.18               | 1.06  |
| 545 | Cooling system water side economizer  | Other                            | Cooling                        | Remodel/Replacment                               | 1.19               | 0.48  |
| 546 | Condensing DHW stand-alone  | Other                            | Water Heating                  | Retrofit   | 2.97               | 0.66  |
| 547 | Condensing DHW stand-alone  | Other                            | Water Heating                  | New construction                                 | 2.86               | 0.31  |
| 548 | Condensing DHW stand-alone  | Other                            | Water Heating                  | Remodel/Replacment                               | 4.52               | 0.19  |
| 549 | Faucet aerator  | Other                            | Water Heating                  | Retrofit   | 8.68               | (3.30)  |
| 550 | Graywater heat exchanger/GFX  | Other                            | Water Heating                  | Remodel/Replacment                               | 1.31               | 0.67  |
| 551 | Indirect-fired DHW off space heating boiler   | Other                            | Water Heating                  | Retrofit   | 2.53               | 0.89  |
| 552 | Indirect-fired DHW off space heating boiler   | Other                            | Water Heating                  | New construction                                 | 2.13               | 0.41  |
| 553 | Indirect-fired DHW off space heating boiler   | Other                            | Water Heating                  | Remodel/Replacment                               | 3.36               | 0.26  |
| 554 | Instantaneous. High-Modulating Water Heater   | Other                            | Water Heating                  | Retrofit   | 2.96               | 0.66  |
| 555 | Instantaneous. High-Modulating Water Heater   | Other                            | Water Heating                  | New construction                                 | 4.86               | 0.18  |
| 556 | Instantaneous. High-Modulating Water Heater   | Other                            | Water Heating                  | Renovation                                       | 4.86               | 0.18  |
| 557 | Instantaneous. High-Modulating Water Heater   | Other                            | Water Heating                  | Remodel/Replacment                               | 7.68               | 0.11  |
| 558 | Low-flow shower heads   | Other                            | Water Heating                  | Retrofit   | 43.06              | (2.31)  |
| 559 | Low-flow shower heads   | Other                            | Water Heating                  | New construction                                 | 10.34              | (0.90)  |
| 560 | Low-flow shower heads   | Other                            | Water Heating                  | Remodel/Replacment                               | 16.32              | (0.97)  |
| 561 | Pipe insulation - water heating   | Other                            | Water Heating                  | Retrofit   | 23.47              | 0.08  |
| 562 | Pipe insulation - water heating   | Other                            | Water Heating                  | New construction                                 | 15.01              | 0.06  |
| 563 | Pipe insulation - water heating   | Other                            | Water Heating                  | Renovation                                       | 15.01              | 0.06  |
| 564 | Tank insulation   | Other                            | Water Heating                  | Retrofit   | 1.73               | 1.10  |
| 565 | Tank insulation   | Other                            | Water Heating                  | New construction                                 | 1.11               | 0.79  |
| 566 | Tank insulation   | Other                            | Water Heating                  | Remodel/Replacment                               | 1.75               | 0.50  |
| 567 | Air Sealing   | Other                            | Space Heating                  | Retrofit   | 9.03               | 0.16  |
| 568 | Air Sealing   | Other                            | Space Heating                  | New construction                                 | 2.57               | 0.42  |
| 569 | Air Sealing   | Other                            | Space Heating                  | Renovation                                       | 2.57               | 0.42  |

|     | A   | C                                | D                              | E  | F                  | G   |
|-----|---|----------------------------------|--------------------------------|--|--------------------|---|
| 1   | <b>Upstate Commercial Measures</b>  |                                  |                                |  |                    |   |
| 2   | <b>Total Resource Cost Test Benefit/Cost Ratio and Levelized Cost of Saved Energy</b> |                                  |                                |  |                    |   |
| 3   | <div style="border: 1px solid black; width: 100px; height: 15px;"></div>              |                                  |                                |  |                    |   |
| 4   |   |                                  |                                |  |                    |   |
| 5   | Measure Name  | Measure ID4<br>(e.g., Bldg type) | Measure ID5<br>(e.g., End Use) | Measure ID6<br>(e.g., Market: Retrofit, NC, ROB) | Total Resource BCR | TRC Levelized Cost per Saved Therm (\$/Therm) |
| 570 | Improved heating system high efficiency unit - Tie                                    | Other                            | Space Heating                  | Retrofit   | 0.83               | 3.61  |
| 571 | Improved heating system high efficiency unit - Tie                                    | Other                            | Space Heating                  | Remodel/Replacment                               | 1.34               | 0.90  |
| 572 | Improved heating system condensing unit - Tier 2                                      | Other                            | Space Heating                  | Retrofit   | 2.01               | 1.49  |
| 573 | Improved heating system condensing unit - Tier 2                                      | Other                            | Space Heating                  | Remodel/Replacment                               | 1.91               | 0.63  |
| 574 | Programmable Thermostat   | Other                            | Space Heating                  | Retrofit   | 22.42              | 0.09  |
| 575 | Programmable Thermostat   | Other                            | Space Heating                  | Renovation                                       | 1.65               | 0.71  |
| 576 | Programmable Thermostat   | Other                            | Space Heating                  | Remodel/Replacment                               | 2.61               | 0.45  |
| 577 | Demand-Controlled Ventilation (controller, sensor                                     | Other                            | Space Heating                  | Retrofit   | 17.64              | (0.11)  |
| 578 | Demand-Controlled Ventilation (controller, sensor                                     | Other                            | Space Heating                  | New construction                                 | 4.43               | 0.17  |
| 579 | Demand-Controlled Ventilation (controller, sensor                                     | Other                            | Space Heating                  | Remodel/Replacment                               | 6.86               | 0.07  |
| 580 | Improved below-grade insulation   | Other                            | Space Heating                  | New construction                                 | 2.00               | 0.60  |
| 581 | Improved below-grade insulation   | Other                            | Space Heating                  | Renovation                                       | 2.00               | 0.60  |
| 582 | Sensible Heat Recovery  | Other                            | Space Heating                  | Retrofit   | 4.54               | 1.46  |
| 583 | Sensible Heat Recovery  | Other                            | Space Heating                  | New construction                                 | 1.55               | 0.96  |
| 584 | Sensible Heat Recovery  | Other                            | Space Heating                  | Remodel/Replacment                               | 2.32               | 0.81  |
| 585 | Pipe insulation - space heating   | Other                            | Space Heating                  | Retrofit   | 55.38              | 0.05  |
| 586 | Pipe insulation - space heating   | Other                            | Space Heating                  | New construction                                 | 36.21              | 0.03  |
| 587 | Pipe insulation - space heating   | Other                            | Space Heating                  | Renovation                                       | 36.21              | 0.03  |
| 588 | Energy Star washer  | Other                            | Water Heating                  | New construction                                 | 1.38               | (1.15)  |
| 589 | Energy Star washer  | Other                            | Water Heating                  | Remodel/Replacment                               | 2.04               | (2.87)  |
| 590 | Swimming pool/spa covers  | Other                            | Miscellaneous                  | Retrofit   | 3.98               | 0.38  |
| 591 | Swimming pool/spa covers  | Other                            | Miscellaneous                  | New construction                                 | 3.55               | 0.25  |
| 592 | Swimming pool/spa covers  | Other                            | Miscellaneous                  | Remodel/Replacment                               | 3.96               | 0.22  |
| 593 | Commissioning   | Other                            | Total                          | New construction                                 | 1.90               | (0.07)  |
| 594 | Commissioning   | Other                            | Total                          | Renovation                                       | 1.90               | (0.07)  |
| 595 | Commissioning   | Other                            | Total                          | Remodel/Replacment                               | 3.00               | (0.58)  |
| 596 | Retrocommissioning  | Other                            | Total                          | Retrofit   | 3.27               | (0.24)  |
| 597 | Integrated Design - High Performance (30% > code                                      | Other                            | Total                          | New construction                                 | 1.55               | 0.57  |
| 598 | Steam trap Maintenance  | Other                            | Space Heating                  | Retrofit   | 1.82               | 0.64  |
| 599 | Oxygen Trim   | Other                            | Space Heating                  | Retrofit   | 26.41              | 0.10  |
| 600 | Oxygen Trim   | Other                            | Space Heating                  | New construction                                 | 49.79              | 0.02  |
| 601 | Oxygen Trim   | Other                            | Space Heating                  | Remodel/Replacment                               | 31.74              | 0.04  |
| 602 | Infrared Heater   | Other                            | Space Heating                  | Retrofit   | 26.69              | 0.11  |
| 603 | Infrared Heater   | Other                            | Space Heating                  | Remodel/Replacment                               | 106.39             | 0.01  |
| 604 | Faucet aerator  | Multifamily                      | Water Heating                  | Retrofit   | 9.97               | (3.38)  |
| 605 | Graywater heat exchanger/GFX  | Multifamily                      | Water Heating                  | New construction                                 | 1.18               | 0.74  |
| 606 | Graywater heat exchanger/GFX  | Multifamily                      | Water Heating                  | Remodel/Replacment                               | 1.51               | 0.58  |
| 607 | Low-flow shower heads   | Multifamily                      | Water Heating                  | Retrofit   | 9,999.00           | (2.44)  |
| 608 | Low-flow shower heads   | Multifamily                      | Water Heating                  | New construction                                 | 6.03               | (0.76)  |
| 609 | Low-flow shower heads   | Multifamily                      | Water Heating                  | Remodel/Replacment                               | 7.73               | (0.84)  |
| 610 | Pipe insulation - water heating   | Multifamily                      | Water Heating                  | Retrofit   | 27.34              | 0.07  |
| 611 | Pipe insulation - water heating   | Multifamily                      | Water Heating                  | New construction                                 | 21.33              | 0.04  |
| 612 | Pipe insulation - water heating   | Multifamily                      | Water Heating                  | Renovation                                       | 21.33              | 0.04  |
| 613 | Tank insulation   | Multifamily                      | Water Heating                  | Retrofit   | 2.02               | 0.94  |
| 614 | Tank insulation   | Multifamily                      | Water Heating                  | New construction                                 | 1.57               | 0.56  |
| 615 | Tank insulation   | Multifamily                      | Water Heating                  | Remodel/Replacment                               | 2.02               | 0.43  |
| 616 | Air Sealing   | Multifamily                      | Space Heating                  | Retrofit   | 2.88               | 1.03  |

|     | A   | C  | D                                      | E  | F                         | G  |
|-----|---|--|--|--|---------------------------|--|
| 1   | <b>Upstate Commercial Measures</b>  |  |  |  |                           |  |
| 2   | <b>Total Resource Cost Test Benefit/Cost Ratio and Levelized Cost of Saved Energy</b> |  |  |  |                           |  |
| 3   | <div style="border: 1px solid black; width: 100px; height: 15px;"></div>              |  |  |  |                           |  |
| 4   |   |  |  |  |                           |  |
| 5   | <b>Measure Name</b>   | <b>Measure ID4<br/>(e.g., Bldg type)</b> | <b>Measure ID5<br/>(e.g., End Use)</b> | <b>Measure ID6<br/>(e.g., Market: Retrofit, NC, ROB)</b> | <b>Total Resource BCR</b> | <b>TRC Levelized Cost per Saved Therm (\$/Therm)</b> |
| 617 | Air Sealing   | Multifamily                              | Space Heating                          | New construction   | 2.17                      | 0.55   |
| 618 | Air Sealing   | Multifamily                              | Space Heating                          | Renovation   | 2.17                      | 0.55   |
| 619 | Improved heating system high efficiency unit - Tier 2                                 | Multifamily                              | Space Heating                          | Retrofit   | 0.79                      | 3.81   |
| 620 | Improved heating system high efficiency unit - Tier 2                                 | Multifamily                              | Space Heating                          | New construction   | 3.51                      | 0.34   |
| 621 | Improved heating system high efficiency unit - Tier 2                                 | Multifamily                              | Space Heating                          | Remodel/Replacment                                       | 4.36                      | 0.27   |
| 622 | Improved heating system condensing unit - Tier 2                                      | Multifamily                              | Space Heating                          | Retrofit   | 6.47                      | 0.46   |
| 623 | Improved heating system condensing unit - Tier 2                                      | Multifamily                              | Space Heating                          | New construction   | 4.86                      | 0.25   |
| 624 | Improved heating system condensing unit - Tier 2                                      | Multifamily                              | Space Heating                          | Remodel/Replacment                                       | 6.04                      | 0.20   |
| 625 | Programmable Thermostat   | Multifamily                              | Space Heating                          | Retrofit   | 4.65                      | 0.57   |
| 626 | Programmable Thermostat   | Multifamily                              | Space Heating                          | Renovation   | 1.97                      | 0.60   |
| 627 | Programmable Thermostat   | Multifamily                              | Space Heating                          | Remodel/Replacment                                       | 2.53                      | 0.47   |
| 628 | Pipe insulation - space heating   | Multifamily                              | Space Heating                          | Retrofit   | 55.15                     | 0.05   |
| 629 | Pipe insulation - space heating   | Multifamily                              | Space Heating                          | New construction   | 44.35                     | 0.03   |
| 630 | Pipe insulation - space heating   | Multifamily                              | Space Heating                          | Renovation   | 44.35                     | 0.03   |
| 631 | Energy Star washer  | Multifamily                              | Water Heating                          | New construction   | 1.90                      | (2.51)   |
| 632 | Energy Star washer  | Multifamily                              | Water Heating                          | Remodel/Replacment                                       | 2.25                      | (3.09)   |
| 633 | Swimming pool/spa covers  | Multifamily                              | Miscellaneous                          | Retrofit   | 4.11                      | 0.37   |
| 634 | Swimming pool/spa covers  | Multifamily                              | Miscellaneous                          | Remodel/Replacment                                       | 4.08                      | 0.22   |
| 635 | Commissioning   | Multifamily                              | Total                                  | New construction   | 2.47                      | (0.48)   |
| 636 | Commissioning   | Multifamily                              | Total                                  | Renovation   | 2.47                      | (0.48)   |
| 637 | Commissioning   | Multifamily                              | Total                                  | Remodel/Replacment                                       | 3.16                      | (0.73)   |
| 638 | Retrocommissioning  | Multifamily                              | Total                                  | Retrofit   | 3.41                      | (0.39)   |
| 639 | Integrated Design - High Performance (30% > code)                                     | Multifamily                              | Total                                  | New construction   | 1.60                      | 0.51   |
| 640 | Integrated Design - High Performance (50% > code)                                     | Multifamily                              | Total                                  | New construction   | 0.48                      | 3.17   |
| 641 | Steam trap Maintenance  | Multifamily                              | Space Heating                          | Retrofit   | 3.09                      | 0.38   |
| 642 | Oxygen Trim   | Multifamily                              | Space Heating                          | Retrofit   | 44.00                     | 0.06   |
| 643 | Oxygen Trim   | Multifamily                              | Space Heating                          | New construction   | 49.79                     | 0.02   |
| 644 | Oxygen Trim   | Multifamily                              | Space Heating                          | Remodel/Replacment                                       | 47.58                     | 0.02   |
| 645 |   |  |  |  |                           |  |
| 646 |   |  |  |  |                           |  |
| 647 |   |  |  |  |                           |  |
| 648 |   |  |  |  |                           |  |
| 649 |   |  |  |  |                           |  |
| 650 |   |  |  |  |                           |  |
| 651 |   |  |  |  |                           |  |
| 652 |   |  |  |  |                           |  |
| 653 |   |  |  |  |                           |  |
| 654 |   |  |  |  |                           |  |
| 655 |   |  |  |  |                           |  |
| 656 |   |  |  |  |                           |  |
| 657 |   |  |  |  |                           |  |
| 658 |   |  |  |  |                           |  |
| 659 |   |  |  |  |                           |  |
| 660 |   |  |  |  |                           |  |
| 661 |   |  |  |  |                           |  |
| 662 |   |  |  |  |                           |  |
| 663 |   |  |  |  |                           |  |

**Subtracted Cost Effective Measures -- Upstate -- Low Avoided Costs**

| #   | Measure Name  | Measure ID4<br>(e.g., Bldg<br>type) | Measure ID5<br>(e.g., End Use) | Measure ID6<br>(e.g., Market: Retrofit,<br>NC, ROB) | Total<br>Resource<br>BCR | TRC Levelized<br>Cost per Saved<br>Therm (\$/Therm) |
|-----|---|-------------------------------------|--------------------------------|---|--------------------------|---|
| 16  | Cooling system chilled water reset                        | Office                              | Cooling                        | Retrofit  | 0.78                     | 1.42  |
| 18  | Cooling system chilled water reset                        | Office                              | Cooling                        | Remodel/Replacment                                  | 0.79                     | 0.65  |
| 54  | Improved heating system condensing unit - Tier 2          | Office                              | Space Heating                  | Retrofit  | 0.62                     | 3.60  |
| 70  | Improved wall insulation                                  | Office                              | Space Heating                  | New construction                                    | 0.80                     | 1.14  |
| 71  | Improved wall insulation                                  | Office                              | Space Heating                  | Renovation  | 0.80                     | 1.14  |
| 105 | High efficiency ENERGY STAR steam cooker                  | Retail                              | Cooking                        | Retrofit  | 0.97                     | 1.57  |
| 114 | Cooling system chilled water reset                        | Retail                              | Cooling                        | Retrofit  | 0.76                     | 1.44  |
| 116 | Cooling system chilled water reset                        | Retail                              | Cooling                        | Remodel/Replacment                                  | 0.77                     | 0.66  |
| 150 | Improved heating system high efficiency unit - Tier 1     | Retail                              | Space Heating                  | New construction                                    | 0.77                     | 1.17  |
| 151 | Improved heating system high efficiency unit - Tier 1     | Retail                              | Space Heating                  | Remodel/Replacment                                  | 0.96                     | 0.93  |
| 153 | Improved heating system condensing unit - Tier 2          | Retail                              | Space Heating                  | New construction                                    | 0.95                     | 0.94  |
| 154 | Improved heating system condensing unit - Tier 2          | Retail                              | Space Heating                  | Remodel/Replacment                                  | 1.19                     | 0.75  |
| 203 | High efficiency ENERGY STAR steam cooker                  | Grocery                             | Cooking                        | Retrofit  | 0.97                     | 1.57  |
| 212 | Cooling system chilled water reset                        | Grocery                             | Cooling                        | Retrofit  | 0.83                     | 1.37  |
| 214 | Cooling system chilled water reset                        | Grocery                             | Cooling                        | Remodel/Replacment                                  | 0.83                     | 0.63  |
| 247 | Improved heating system high efficiency unit - Tier 1     | Grocery                             | Space Heating                  | Retrofit  | 0.77                     | 2.92  |
| 250 | Improved heating system condensing unit - Tier 2          | Grocery                             | Space Heating                  | Retrofit  | 2.05                     | 1.10  |
| 251 | Improved heating system condensing unit - Tier 2          | Grocery                             | Space Heating                  | New construction                                    | 0.39                     | 2.29  |
| 252 | Improved heating system condensing unit - Tier 2          | Grocery                             | Space Heating                  | Remodel/Replacment                                  | 0.48                     | 1.86  |
| 310 | Cooling system chilled water reset                        | Warehouse                           | Cooling                        | Retrofit  | 0.82                     | 1.38  |
| 312 | Cooling system chilled water reset                        | Warehouse                           | Cooling                        | Remodel/Replacment                                  | 0.83                     | 0.63  |
| 345 | Improved heating system high efficiency unit - Tier 1     | Warehouse                           | Space Heating                  | Retrofit  | 0.59                     | 3.84  |
| 348 | Improved heating system condensing unit - Tier 2          | Warehouse                           | Space Heating                  | Retrofit  | 2.27                     | 0.99  |
| 371 | Sensible Heat Recovery                                    | Warehouse                           | Space Heating                  | New construction                                    | 0.96                     | 0.92  |
| 386 | Integrated Design - High Performance (50% > codes) Tier 2 | Warehouse                           | Total                          | New construction                                    | 0.38                     | 3.26  |
| 408 | Cooling system chilled water reset                        | Education                           | Cooling                        | Retrofit  | 0.70                     | 1.51  |
| 410 | Cooling system chilled water reset                        | Education                           | Cooling                        | Remodel/Replacment                                  | 0.71                     | 0.69  |
| 443 | Improved heating system high efficiency unit - Tier 1     | Education                           | Space Heating                  | Retrofit  | 0.81                     | 2.78  |
| 446 | Improved heating system condensing unit - Tier 2          | Education                           | Space Heating                  | Retrofit  | 3.78                     | 0.60  |
| 484 | Integrated Design - High Performance (50% > codes) Tier 2 | Education                           | Total                          | New construction                                    | 0.40                     | 3.17  |
| 497 | High efficiency ENERGY STAR steam cooker                  | Health                              | Cooking                        | Retrofit  | 0.97                     | 1.57  |
| 506 | Cooling system chilled water reset                        | Health                              | Cooling                        | Retrofit  | 0.83                     | 1.36  |
| 507 | Cooling system chilled water reset                        | Health                              | Cooling                        | New construction                                    | 0.73                     | 0.70  |
| 508 | Cooling system chilled water reset                        | Health                              | Cooling                        | Remodel/Replacment                                  | 0.84                     | 0.62  |
| 510 | Cooling system water side economizer                      | Health                              | Cooling                        | New construction                                    | 0.92                     | 0.65  |
| 566 | Sensible Heat Recovery                                    | Health                              | Space Heating                  | Retrofit  | -0.64                    | 2.33  |
| 582 | Integrated Design - High Performance (50% > codes) Tier 2 | Health                              | Total                          | New construction                                    | 9999.00                  | 0.00  |
| 595 | High efficiency ENERGY STAR steam cooker                  | Lodging                             | Cooking                        | Retrofit  | 0.97                     | 1.57  |
| 604 | Cooling system chilled water reset                        | Lodging                             | Cooling                        | Retrofit  | 0.77                     | 1.43  |
| 606 | Cooling system chilled water reset                        | Lodging                             | Cooling                        | Remodel/Replacment                                  | 0.78                     | 0.66  |
| 618 | Graywater heat exchanger/GFX                              | Lodging                             | Water Heating                  | New construction                                    | 0.75                     | 0.87  |
| 619 | Graywater heat exchanger/GFX                              | Lodging                             | Water Heating                  | Remodel/Replacment                                  | 0.97                     | 0.68  |
| 639 | Improved heating system high efficiency unit - Tier 1     | Lodging                             | Space Heating                  | Retrofit  | 0.59                     | 3.81  |
| 642 | Improved heating system condensing unit - Tier 2          | Lodging                             | Space Heating                  | Retrofit  | 4.85                     | 0.46  |
| 680 | Integrated Design - High Performance (50% > codes) Tier 2 | Lodging                             | Total                          | New construction                                    | 0.40                     | 3.17  |
| 693 | High efficiency ENERGY STAR steam cooker                  | Restaurant                          | Cooking                        | Retrofit  | 0.97                     | 1.57  |
| 702 | Cooling system chilled water reset                        | Restaurant                          | Cooling                        | Retrofit  | 0.80                     | 1.40  |
| 703 | Cooling system chilled water reset                        | Restaurant                          | Cooling                        | New construction                                    | 0.70                     | 0.71  |
| 704 | Cooling system chilled water reset                        | Restaurant                          | Cooling                        | Remodel/Replacment                                  | 0.81                     | 0.64  |
| 706 | Cooling system water side economizer                      | Restaurant                          | Cooling                        | New construction                                    | 0.93                     | 0.64  |
| 741 | Improved heating system condensing unit - Tier 2          | Restaurant                          | Space Heating                  | New construction                                    | 0.43                     | 2.11  |
| 742 | Improved heating system condensing unit - Tier 2          | Restaurant                          | Space Heating                  | Remodel/Replacment                                  | 0.47                     | 1.89  |
| 763 | Sensible Heat Recovery                                    | Restaurant                          | Space Heating                  | New construction                                    | 0.95                     | 0.91  |
| 889 | High efficiency ENERGY STAR steam cooker                  | Other                               | Cooking                        | Retrofit  | 0.97                     | 1.57  |
| 898 | Cooling system chilled water reset                        | Other                               | Cooling                        | Retrofit  | 0.80                     | 1.40  |
| 900 | Cooling system chilled water reset                        | Other                               | Cooling                        | Remodel/Replacment                                  | 0.80                     | 0.64  |
| 913 | Graywater heat exchanger/GFX                              | Other                               | Water Heating                  | Remodel/Replacment                                  | 0.98                     | 0.67  |
| 928 | Tank insulation   | Other                               | Water Heating                  | New construction                                    | 0.83                     | 0.79  |
| 933 | Improved heating system high efficiency unit - Tier 1     | Other                               | Space Heating                  | Retrofit  | 0.62                     | 3.61  |
| 935 | Improved heating system high efficiency unit - Tier 1     | Other                               | Space Heating                  | Remodel/Replacment                                  | 1.00                     | 0.90  |
| 936 | Improved heating system condensing unit - Tier 2          | Other                               | Space Heating                  | Retrofit  | 1.51                     | 1.49  |
| 938 | Improved heating system condensing unit - Tier 2          | Other                               | Space Heating                  | Remodel/Replacment                                  | 1.43                     | 0.63  |
| 959 | Sensible Heat Recovery                                    | Other                               | Space Heating                  | New construction                                    | 0.86                     | 0.96  |



**Added Cost Effective Measures -- Upstate -- High Avoided Costs**

| #   | Measure Name  | Measure ID4<br>(e.g., Bldg<br>type) | Measure ID5<br>(e.g., End Use) | Measure ID6<br>(e.g., Market: Retrofit,<br>NC, ROB) | Total<br>Resource<br>BCR | TRC Levelized<br>Cost per Saved<br>Therm (\$/Therm) |
|-----|---|-------------------------------------|--------------------------------|---|--------------------------|---|
| 31  | Graywater heat exchanger/GFX                          | Office                              | Water Heating                  | Remodel/Replacment                                  | 1.10                     | 0.99  |
| 76  | Sensible Heat Recovery                                | Office                              | Space Heating                  | Retrofit  | 2.33                     | 2.71  |
| 115 | Cooling system chilled water reset                    | Retail                              | Cooling                        | New construction                                    | 1.15                     | 0.81  |
| 118 | Cooling system water side economizer                  | Retail                              | Cooling                        | New construction                                    | 1.09                     | 0.77  |
| 213 | Cooling system chilled water reset                    | Grocery                             | Cooling                        | New construction                                    | 1.21                     | 0.76  |
| 216 | Cooling system water side economizer                  | Grocery                             | Cooling                        | New construction                                    | 1.08                     | 0.77  |
| 270 | Improved roof insulation                              | Grocery                             | Space Heating                  | New construction                                    | 1.19                     | 1.29  |
| 271 | Improved roof insulation                              | Grocery                             | Space Heating                  | Renovation  | 1.19                     | 1.29  |
| 311 | Cooling system chilled water reset                    | Warehouse                           | Cooling                        | New construction                                    | 1.21                     | 0.77  |
| 314 | Cooling system water side economizer                  | Warehouse                           | Cooling                        | New construction                                    | 1.09                     | 0.77  |
| 325 | Graywater heat exchanger/GFX                          | Warehouse                           | Water Heating                  | Remodel/Replacment                                  | 1.12                     | 0.98  |
| 409 | Cooling system chilled water reset                    | Education                           | Cooling                        | New construction                                    | 1.10                     | 0.84  |
| 412 | Cooling system water side economizer                  | Education                           | Cooling                        | New construction                                    | 1.10                     | 0.74  |
| 560 | Improved wall insulation                              | Health                              | Space Heating                  | New construction                                    | 1.16                     | 1.23  |
| 561 | Improved wall insulation                              | Health                              | Space Heating                  | Renovation  | 1.16                     | 1.23  |
| 567 | Sensible Heat Recovery                                | Health                              | Space Heating                  | New construction                                    | 1.31                     | 1.37  |
| 568 | Sensible Heat Recovery                                | Health                              | Space Heating                  | Remodel/Replacment                                  | 1.45                     | 1.33  |
| 605 | Cooling system chilled water reset                    | Lodging                             | Cooling                        | New construction                                    | 1.16                     | 0.80  |
| 608 | Cooling system water side economizer                  | Lodging                             | Cooling                        | New construction                                    | 1.09                     | 0.76  |
| 662 | Improved roof insulation                              | Lodging                             | Space Heating                  | New construction                                    | 1.09                     | 1.37  |
| 663 | Improved roof insulation                              | Lodging                             | Space Heating                  | Renovation  | 1.09                     | 1.37  |
| 912 | Graywater heat exchanger/GFX                          | Other                               | Water Heating                  | New construction                                    | 1.04                     | 1.05  |
| 934 | Improved heating system high efficiency unit - Tier 1 | Other                               | Space Heating                  | New construction                                    | 1.10                     | 1.36  |
| 937 | Improved heating system condensing unit - Tier 2      | Other                               | Space Heating                  | New construction                                    | 1.56                     | 0.96  |

















**New York Upstate Natural Gas Sales ('000 dTh)**

| SALES_A   | 1        | 2         | 3          | 4           | 5           | 6           | 7           | 8           | 9           | 10          |  | TOTAL       |
|---|----------|-----------|------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|--|-------------|
|   | Office   | Retail    | Grocery    | Warehouse   | Education   | Health      | Lodging     | Restaurant  | Multifamily | Other       |  |             |
| <b>EXISTING END USE SALES FORECAST ('000 dTh), 2007 ESales_Up</b>   |          |           |            |             |             |             |             |             |             |             |  |             |
| 1 Space Heating   | 31,872   | 10,163    | 3,435      | 3,028       | 15,168      | 8,523       | 4,124       | 3,490       | 4,739       | 8,928       |  | 93469.64834 |
| 2 Water Heating   | 11,339   | 3,662     | 1,501      | 635         | 6,139       | 7,037       | 2,647       | 2,791       | 1,593       | 5,289       |  | 42633.38288 |
| 3 Cooking   | 0        | 2,410     | 1,031      | 114         | 3,165       | 2,831       | 679         | 3,851       | 156         | 3,754       |  | 17991.70074 |
| 4 Cooling   | 1,015    | 106       | 152        | 107         | 193         | 354         | 78          | 166         | 0           | 276         |  | 2445.919815 |
| 5 Miscellaneous   | 0        | 0         | 0          | 79          | 566         | 383         | 232         | 0           | 40          | 189         |  | 1489.270267 |
| 6 Total   | 44,227   | 16,342    | 6,118      | 3,963       | 25,232      | 19,127      | 7,759       | 10,298      | 6,529       | 18,436      |  | 158,030     |
| <b>New Construction Sales in 2007 ('000 dTh): NSALES_UP</b>   |          |           |            |             |             |             |             |             |             |             |  |             |
| 1 Space Heating   | 257.0    | 82.0      | 27.7       | 24.4        | 122.3       | 68.7        | 33.3        | 28.1        | 38.2        | 72.0        |  | 753.7874866 |
| 2 Water Heating   | 91.4     | 29.5      | 12.1       | 5.1         | 49.5        | 56.8        | 21.3        | 22.5        | 12.8        | 42.7        |  | 343.8176039 |
| 4 Cooling   | 0.0      | 19.4      | 8.3        | 0.9         | 25.5        | 22.8        | 5.5         | 31.1        | 1.3         | 30.3        |  | 145.0943608 |
| 5 Miscellaneous   | 8.2      | 0.9       | 1.2        | 0.9         | 1.6         | 2.9         | 0.6         | 1.3         | 0.0         | 2.2         |  | 19.72515979 |
| 6 Total   | 0.0      | 0.0       | 0.0        | 0.6         | 4.6         | 3.1         | 1.9         | 0.0         | 0.3         | 1.5         |  | 12          |
| 5 Miscellaneous   | 356.6659 | 131.7884  | 49.3379317 | 31.96188064 | 203.4809852 | 154.2536933 | 62.5734866  | 83.04896566 | 52.64964715 | 148.6738813 |  | 1,274       |
|   |          |           |            |             |             |             |             |             |             |             |  | 159,304     |
| <b>Growth Factors — Annual percents apply to 2007 gas sales to get each years new and existing sales.</b> |          |           |            |             |             |             |             |             |             |             |  |             |
| Existing  | Year     | 200800.0% | 200900.0%  | 201000.0%   | 201100.0%   | 201200.0%   | 201300.0%   | 201400.0%   | 201500.0%   | 201600.0%   |  | 2017        |
| 1 Office  |          | 100.9%    | 101.7%     | 102.6%      | 103.5%      | 104.4%      | 105.3%      | 106.3%      | 107.2%      | 108.1%      |  |             |
| 2 Retail  |          | 100.9%    | 101.7%     | 102.6%      | 103.5%      | 104.4%      | 105.3%      | 106.3%      | 107.2%      | 108.1%      |  |             |
| 3 Grocery   |          | 100.9%    | 101.7%     | 102.6%      | 103.5%      | 104.4%      | 105.3%      | 106.3%      | 107.2%      | 108.1%      |  |             |
| 4 Warehouse   |          | 100.9%    | 101.7%     | 102.6%      | 103.5%      | 104.4%      | 105.3%      | 106.3%      | 107.2%      | 108.1%      |  |             |
| 5 Education   |          | 100.9%    | 101.7%     | 102.6%      | 103.5%      | 104.4%      | 105.3%      | 106.3%      | 107.2%      | 108.1%      |  |             |
| 6 Health  |          | 100.9%    | 101.7%     | 102.6%      | 103.5%      | 104.4%      | 105.3%      | 106.3%      | 107.2%      | 108.1%      |  |             |
| 7 Lodging   |          | 100.9%    | 101.7%     | 102.6%      | 103.5%      | 104.4%      | 105.3%      | 106.3%      | 107.2%      | 108.1%      |  |             |
| 8 Restaurant  |          | 100.9%    | 101.7%     | 102.6%      | 103.5%      | 104.4%      | 105.3%      | 106.3%      | 107.2%      | 108.1%      |  |             |
| 9 Multifamily   |          | 100.9%    | 101.7%     | 102.6%      | 103.5%      | 104.4%      | 105.3%      | 106.3%      | 107.2%      | 108.1%      |  |             |
| 1000.0% Other   |          | 100.9%    | 101.7%     | 102.6%      | 103.5%      | 104.4%      | 105.3%      | 106.3%      | 107.2%      | 108.1%      |  |             |
| NC  |          |           |            |             |             |             |             |             |             |             |  |             |
| 1 Office  |          | 100.8%    | 101.6%     | 102.4%      | 103.2%      | 104.1%      | 105.1%      | 106.2%      | 107.2%      | 108.3%      |  |             |
| 2 Retail  |          | 100.8%    | 101.6%     | 102.4%      | 103.2%      | 104.1%      | 105.1%      | 106.2%      | 107.2%      | 108.3%      |  |             |
| 3 Grocery   |          | 100.8%    | 101.6%     | 102.4%      | 103.2%      | 104.1%      | 105.1%      | 106.2%      | 107.2%      | 108.3%      |  |             |
| 4 Warehouse   |          | 100.8%    | 101.6%     | 102.4%      | 103.2%      | 104.1%      | 105.1%      | 106.2%      | 107.2%      | 108.3%      |  |             |
| 5 Education   |          | 100.8%    | 101.6%     | 102.4%      | 103.2%      | 104.1%      | 105.1%      | 106.2%      | 107.2%      | 108.3%      |  |             |
| 6 Health  |          | 100.8%    | 101.6%     | 102.4%      | 103.2%      | 104.1%      | 105.1%      | 106.2%      | 107.2%      | 108.3%      |  |             |
| 7 Lodging   |          | 100.8%    | 101.6%     | 102.4%      | 103.2%      | 104.1%      | 105.1%      | 106.2%      | 107.2%      | 108.3%      |  |             |
| 8 Restaurant  |          | 100.8%    | 101.6%     | 102.4%      | 103.2%      | 104.1%      | 105.1%      | 106.2%      | 107.2%      | 108.3%      |  |             |
| 9 Multifamily   |          | 100.8%    | 101.6%     | 102.4%      | 103.2%      | 104.1%      | 105.1%      | 106.2%      | 107.2%      | 108.3%      |  |             |
| 10 Other  |          | 1.008     | 1.016064   | 1.024192512 | 1.032386052 | 1.04064514  | 1.051051592 | 1.061562108 | 1.072177729 | 1.082899506 |  |             |

| MEASURES # | Measure  | Life | Enduse        | Existing Life | NG Loadshape Name | Elec Loadshape Name |
|------------|--|------|---------------|---------------|-------------------|---------------------|
| 1          | Direct fired convection range/oven   | 8    | Cooking       | 8             | NG Base           | None                |
| 2          | Exhaust Hood Makeup Air  | 20   | Space Heating | 20            | NG Com Space Heat | Com Cooling         |
| 3          | High efficiency ENERGY STAR fryer  | 8    | Cooking       | 8             | NG Base           | None                |
| 4          | High efficiency ENERGY STAR steam cooker                                     | 10   | Cooking       | 10            | NG Base           | None                |
| 5          | High efficiency griddle  | 8    | Cooking       | 8             | NG Base           | None                |
| 6          | Pre-Rinse Spray Valve  | 5    | Water Heating | 5             | NG DHW            | None                |
| 7          | Refrigeration heat recovery  | 15   | Water Heating | 15            | NG DHW            | Com Refrigeration   |
| 8          |  |      |               |               |                   | None                |
| 9          | Cooling system chilled water reset   | 15   | Cooling       | 15            | NG Cooling        | Com Cooling         |
| 10         | Cooling system water side economizer   | 15   | Cooling       | 15            | NG Cooling        | Com Cooling         |
| 11         | Cooling system oversized cooling tower                                       | 20   | Cooling       | 20            | NG Cooling        | Com Cooling         |
| 12         | Condensing DHW stand-alone   | 15   | Water Heating | 15            | NG DHW            | None                |
| 13         | Faucet aerator   | 10   | Water Heating | 10            | NG DHW            | None                |
| 14         | Graywater heat exchanger/GFX   | 20   | Water Heating | 20            | NG DHW            | None                |
| 15         | Indirect-fired DHW off space heating boiler                                  | 25   | Water Heating | 25            | NG DHW            | None                |
| 16         | Instantaneous. High-Modulating Water Heater                                  | 15   | Water Heating | 15            | NG DHW            | None                |
| 17         | Low-flow shower heads  | 10   | Water Heating | 10            | NG DHW            | None                |
| 18         | Pipe insulation - water heating  | 15   | Water Heating | 15            | NG DHW            | None                |
| 19         | Tank insulation  | 15   | Water Heating | 15            | NG DHW            | None                |
| 20         | Air Sealing  | 20   | Space Heating | 20            | NG Com Space Heat | Com Ventilation     |
| 21         | Improved heating system high efficiency unit - Tier 1                        | 25   | Space Heating | 25            | NG Com Space Heat | Com Heating         |
| 22         | Improved heating system condensing unit - Tier 2                             | 25   | Space Heating | 25            | NG Com Space Heat | None                |
| 23         | Programmable Thermostat  | 10   | Space Heating | 10            | NG Com Space Heat | Com Cooling         |
| 24         | Demand-Controlled Ventilation (controller, sensor)                           | 15   | Space Heating | 15            | NG Com Space Heat | Com Cooling         |
| 25         | Outdoor Air Reset  | 2    | Space Heating | 2             | NG Com Space Heat | None                |
| 26         | High Performance Glazing double pane, low-E, low conductivity frame - Tier 1 | 30   | Space Heating | 30            | NG Com Space Heat | Com Cooling         |
| 27         | High Performance Glazing triple pane, low-E, low conductivity frame - Tier 2 | 30   | Space Heating | 30            | NG Com Space Heat | Com Cooling         |
| 28         | Improved wall insulation   | 30   | Space Heating | 30            | NG Com Space Heat | Com Cooling         |
| 29         | Improved below-grade insulation  | 30   | Space Heating | 30            | NG Com Space Heat | None                |
| 30         | Improved roof insulation   | 30   | Space Heating | 30            | NG Com Space Heat | Com Cooling         |
| 31         | Sensible Heat Recovery   | 15   | Space Heating | 15            | NG Com Space Heat | Com Economizer      |
| 32         | Pipe insulation - space heating  | 15   | Space Heating | 15            | NG Com Space Heat | None                |
| 33         | Energy Star washer   | 11   | Water Heating | 11            | NG DHW            | Com Water Heating   |
| 34         | Swimming pool/spa covers   | 5    | Miscellaneous | 5             | NG DHW            | None                |
| 35         | Commissioning  | 7    | Total         | 7             | NG Com Space Heat | Com Total Building  |
| 36         | Retrocommissioning   | 7    | Total         | 7             | NG Com Space Heat | Com Total Building  |
| 37         | Integrated Design - High Performance (30% > codes) - Tier 1                  | 25   | Total         | 25            | NG Com Space Heat | Com Total Building  |
| 38         | Integrated Design - High Performance (50% > codes) Tier 2                    | 25   | Total         | 25            | NG Com Space Heat | Com Total Building  |
| 39         | Steam trap Maintenance   | 1    | Space Heating | 1             | NG Com Space Heat | None                |
| 40         | Oxygen Trim  | 10   | Space Heating | 10            | NG Com Space Heat | None                |
| 41         | Infrared Heater  | 20   | Space Heating | 20            | NG Com Space Heat | None                |

## Development Of Measure Factors

**Applicability factors** represent the share of end-use level gas usage that is attributable to a particular technology. The analysis drew on a variety of sources to develop applicability factors for each measure by building type. In general, data on market shares for different types and sizes of technologies are weighted based on overall energy consumption or capacity. For example, the applicability factor for condensing boilers reflects the share of total commercial square feet heated by gas that uses hot water boilers of less than approximately 3 million British thermal units per hour (Btuh) capacity. This reflects that condensing boilers are only applicable for hydronic (not steam) systems, and are currently available only up to about 3 million Btuh capacity. Where possible, separate applicability factors for each building type were developed. Where building type data was not available, average data for the total commercial market was used for all building types. New York-specific data was used when available. Alternatively, data from the Northeast or Mid-Atlantic states were used if possible. These data reflect a variety of baseline and market assessment data, including studies done for Long Island Power Authority (LIPA), NYSERDA, proprietary analyses for a number of New York and New Jersey utilities, the Commercial Building Energy Consumption survey (CBECS) developed by EIA, ACEEE, and published market assessments and other potential studies.

**Feasibility factors** are the fraction of the applicable end use technically feasible for conversion to the high-efficiency technology. Feasibility is not reduced for economic or behavioral barriers. Rather, feasibility reflects only technical or physical constraints that would make measure adoption inappropriate. For example, it is not feasible to install refrigeration heat recovery to supplement domestic hot water usage in buildings that do not have walk-in or other large refrigeration systems and relatively constant hot water loads. In most cases, it is feasible to replace baseline technology with an efficient alternative, resulting in a 100% feasibility factor. These data are based on various studies or engineering judgment. Major sources of data include a number of proprietary U.S. potential studies conducted in the past 5-years.

**Measure savings factors** are calculated based on individual measure data and assumptions about existing stock efficiency (for retrofit measures), standard practice for construction and purchases (for market-driven measures), and high-efficiency options. Measure-savings characteristics were developed using public and private information sources, including NYSERDA, CBECS, California Energy Commission, Efficiency Vermont, American Council for an Energy Efficient Economy (ACEEE), Lawrence Berkeley Laboratory (LBL), National Fenestration Rating Council (NFRC), various Northeastern U.S. baseline and market assessment studies, recent gas potential studies, and communications with manufacturers and vendors. Measure savings are expressed in % of baseline energy usage.

**Baseline adjustment factors** were used to adjust long term savings downward for retrofit measures. The initial savings for retrofit measures is the difference between the typical existing stock efficiency and the high-efficiency alternative. However, the long-term savings are the difference between the typical baseline efficiency of new construction and equipment and the high-efficiency alternative, which is typically lower. If retrofits were not considered, the existing stock eventually would get replaced with new baseline efficiency measures anyway. In most cases, the current baseline efficiency is more efficient than the average existing stock. For example, clothes washing equipment meeting U.S. Energy Policy Act (EPA) efficiency levels are baseline for new clothes washer purchases. However, the average efficiency of clothes washers existing today in commercial buildings falls short of EPA levels. The baseline adjustment factor adjusts the savings downward in future years for retrofit measures. The analysis assumes the vintage of all measures replaced in retrofit markets is half of its estimated measure life. Therefore, the baseline adjustment applies in the year immediately following half of the measure life. Baseline adjustment factors were developed based on the relative baseline efficiencies of new and existing stock, from current and historical technology, baseline and market assessment studies. Baseline adjustment factors are expressed in % of first year energy savings.

**Electric and water savings factors** (kWh/Dth-yr) and (gallons/Dth-yr) were developed based on engineering calculations or simulation modeling to calculate non-gas resource impacts.

**Annual to peak-day ratios** were used to estimate the measure peak-day impacts. The analysis relies on 8,760 hourly end-use and building-type specific load shape data to estimate these ratios, separately for each building type and measure. Load shape data is from Regional Economic Research.

**Measure lives** were developed from various sources including prior potential studies, NYSERDA, DOE, EPA, ACEEE, ASHRAE, Efficiency Vermont, NFRC, equipment manufacturers and professional judgment. The estimated measure lives reflect both engineering service life and estimated remodel activity.

**Measure costs** for each of the 40 technologies were developed based on a variety of sources, including but not limited to proprietary studies or data from northeastern United States utilities, R.S. Means, Efficiency Vermont, Grainger, and a California Energy Commission database of equipment costs, and discussions with equipment vendors. Measure costs obtained outside the Northeast region were adjusted based on R.S. Means location factors to better reflect New York costs. Retrofit measure costs include the total material and labor cost. Market-driven measure costs reflect the incremental material and labor cost of high efficiency as compared to standard practice.

Measure costs per Dth annual savings (\$/Dth) were developed for each building type for each of the 40 technologies analyzed, based on building-type-specific data, and the market applied to.

**O&M cost** impacts are considered in addition to measure installation costs. These reflect any incremental effects on O&M costs for each measure over its lifetime. O&M cost impacts reflect changes in measure and replacement component lives and costs for both the high- and standard-efficiency options.

**Deferral credits** were captured to properly estimate the long-term societal costs of retrofit measures. Related to O&M costs, the analysis accounts for the time value of permanently deferring the equipment purchase cycle for early-retirement (retrofit) measures. For example, a high-efficiency space heating unit typically lasts 25-years. If an existing space heating unit expected to last another 10-years is retrofitted with a new, high-efficiency model, the customer no longer has to purchase a new one in 10-years. Rather, the next space heating purchase will be in 25-years. Thus, all future space heating purchases have now been shifted out by fifteen years in perpetuity. This deferral of future capital investments provides a societal benefit by lowering present-value replacement costs. This societal value is captured through a “deferral credit.” The analysis assumed the remaining life of all existing measures to be retrofitted was, on average, equal to one half of the total measure life (for example, for an HVAC unit with a 25- year life, it was assumed the average existing unit was 12.5-years old and would normally be replaced 12.5-years hence).

**Base-case penetrations** were used to estimate the current and future market penetration of measures without any program intervention. The potential efficiency for any given measure is a function of the size of the market, the measure characteristics and the base-case penetration that would occur absent any market intervention. Base-case penetrations for each of the 40 technologies were separately estimated. In some cases, differing estimates by building-type are used, but in many cases, this level of disaggregation was not supported by the data. The base-case represents the existing and forecast measure penetrations that are assumed to underlie the forecast, which assumes no gas program interventions, but does take into account current and expected codes and standards, as well as current and expected New York electric efficiency programs. For retrofit measures, 5% of existing stock is assumed to likely be modified for retrofit reasons over the 10-year planning horizon (equivalent to assuming a 5% freeridership for the economic potential). Base-case penetrations for each of the market-driven measures were estimated to reflect expectations about likely market adoptions, based on expert judgment, review of market assessments, and knowledge of likely codes and standards changes over the planning period.

**“Not complete” factors** were used to eliminate any opportunities in the retrofit market where efficient equipment already exists rather than relying on base-case penetrations. These factors represent the remaining share of existing stock that has not already adopted the efficient measures. In other words, if 10% of existing buildings have condensing furnaces, the not complete factor for this measure would be 90%. Therefore, for retrofit measures base-case penetrations start at 0%.

**Competing Technologies** are accounted for with the economic potential penetrations. For the economic potential, by definition, 100% penetration is assumed whenever a measure is applicable and feasible. However, some of the technologies modeled are mutually exclusive -- that is, one or the other could be installed, but not both. For example, water heaters can be replaced with a stand-alone unit, an integrated system off a boiler, or point-of-use heaters. When two or more measures compete with one another, the adoption of the measure offering the highest per-unit savings or greatest anticipated cost-effectiveness is counted first. The penetration of the next competing measure was then estimated based on the remaining potential, taking into account the applicability, feasibility, and achievable penetration of the first measure. In other words, if 100% of water heaters could be replaced with condensing stand-alone units (and this measure is considered first), then 0% penetration opportunity remains for the other competing measures.

**Interactions factors** were used to account for interactions among measures. Individual measure savings are not additive. Because of interactions between measures, the total potential for all measures is less than the sum of individual measure opportunities taken independently. For example, installing high performance windows will reduce heating load and therefore lower the savings opportunities from installing a condensing boiler. Interaction factors are separately estimated for retrofit, existing building market-driven, and new construction markets. This is because some measures only apply to one market. For example, integrated high efficiency design applies only for new construction, retrocommissioning applies only for retrofit. As a result, the measures that interact with each other differ for each market. The measures within a group that interact, typically by end-use, are ranked based on priority. Although some measures, like commissioning, interact with all end uses. This ranking is based on per unit savings, or judgment about what measures are typically most cost-effective and likely to offer the greatest customer benefit. Each subsequent interacting measure is then adjusted for the potential savings captured by the prior measure.

It should be noted that the rank order does not affect ultimate total potential savings. However, it does effect the per measure savings and cost-effectiveness. A measure further down in the ranking would still cost the same amount to install, but is assumed to save less because of prior measures already assumed to be installed.

Note that both competing measure issues and interactions are not considered for the program scenario potential estimate. This is because the program scenario is sufficiently lower than likely maximum achievable potential that penetrations are not high enough to assume most customers are pursuing numerous measures at once.

| APPLICABILITY |  | 1      | 2      | 3       | 4         | 5         | 6      | 7       | 8          | 9           | 10    |
|---------------|--|--------|--------|---------|-----------|-----------|--------|---------|------------|-------------|-------|
|               |  | Office | Retail | Grocery | Warehouse | Education | Health | Lodging | Restaurant | Multifamily | Other |
| 1             | Direct fired convection range/oven   | 0%     | 18%    | 18%     | 0%        | 18%       | 18%    | 18%     | 18%        | 0%          | 0%    |
| 2             | Exhaust Hood Makeup Air  | 1%     | 2%     | 3%      | 6%        | 1%        | 1%     | 1%      | 20%        | 0%          | 1%    |
| 3             | High efficiency ENERGY STAR fryer  | 54%    | 46%    | 46%     | 54%       | 46%       | 46%    | 46%     | 46%        | 0%          | 78%   |
| 4             | High efficiency ENERGY STAR steam cooker                                     | 0%     | 6%     | 6%      | 0%        | 0%        | 6%     | 5%      | 6%         | 0%          | 5%    |
| 5             | High efficiency griddle  | 46%    | 10%    | 10%     | 46%       | 10%       | 10%    | 10%     | 10%        | 0%          | 17%   |
| 6             | Pre-Rinse Spray Valve  | 1%     | 1%     | 10%     | 1%        | 2%        | 2%     | 2%      | 40%        | 0%          | 1%    |
| 7             | Refrigeration heat recovery  | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 0%          | 100%  |
| 8             |  |        |        |         |           |           |        |         |            |             |       |
| 9             | Cooling system chilled water reset   | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  |
| 10            | Cooling system water side economizer   | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  |
| 11            | Cooling system oversized cooling tower                                       | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  |
| 12            | Condensing DHW stand-alone   | 62%    | 62%    | 62%     | 62%       | 62%       | 62%    | 62%     | 62%        | 0%          | 62%   |
| 13            | Faucet aerator   | 50%    | 60%    | 5%      | 60%       | 15%       | 15%    | 5%      | 5%         | 5%          | 26%   |
| 14            | Graywater heat exchanger/GFX   | 2%     | 0%     | 0%      | 2%        | 33%       | 2%     | 20%     | 50%        | 20%         | 13%   |
| 15            | Indirect-fired DHW off space heating boiler                                  | 21%    | 6%     | 16%     | 6%        | 32%       | 36%    | 33%     | 16%        | 0%          | 20%   |
| 16            | Instantaneous. High-Modulating Water Heater                                  | 62%    | 62%    | 62%     | 62%       | 62%       | 62%    | 62%     | 62%        | 0%          | 62%   |
| 17            | Low-flow shower heads  | 2%     | 0%     | 0%      | 2%        | 33%       | 2%     | 20%     | 0%         | 20%         | 13%   |
| 18            | Pipe insulation - water heating  | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  |
| 19            | Tank insulation  | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  |
| 20            | Air Sealing  | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  |
| 21            | Improved heating system high efficiency unit - Tier 1                        | 48%    | 48%    | 48%     | 48%       | 48%       | 48%    | 48%     | 48%        | 48%         | 48%   |
| 22            | Improved heating system condensing unit - Tier 2                             | 48%    | 48%    | 48%     | 48%       | 48%       | 48%    | 48%     | 48%        | 48%         | 48%   |
| 23            | Programmable Thermostat  | 74%    | 74%    | 74%     | 74%       | 74%       | 74%    | 74%     | 74%        | 74%         | 74%   |
| 24            | Demand-Controlled Ventilation (controller, sensor)                           | 10%    | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  |
| 25            | Outdoor Air Reset  | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  |
| 26            | High Performance Glazing double pane, low-E, low conductivity frame - Tier 1 | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  |
| 27            | High Performance Glazing triple pane, low-E, low conductivity frame - Tier 2 | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  |
| 28            | Improved wall insulation   | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  |
| 29            | Improved below-grade insulation  | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  |
| 30            | Improved roof insulation   | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  |
| 31            | Sensible Heat Recovery   | 74%    | 74%    | 74%     | 74%       | 74%       | 74%    | 74%     | 74%        | 74%         | 74%   |
| 32            | Pipe insulation - space heating  | 48%    | 48%    | 48%     | 48%       | 48%       | 48%    | 48%     | 48%        | 48%         | 48%   |
| 33            | Energy Star washer   | 0%     | 0%     | 0%      | 0%        | 1%        | 0%     | 1%      | 0%         | 1%          | 0%    |
| 34            | Swimming pool/spa covers   | 0%     | 0%     | 0%      | 0%        | 70%       | 20%    | 90%     | 0%         | 90%         | 20%   |
| 35            | Commissioning  | 71%    | 71%    | 71%     | 71%       | 71%       | 71%    | 71%     | 71%        | 71%         | 71%   |
| 36            | Retrocommissioning   | 54%    | 54%    | 54%     | 54%       | 54%       | 54%    | 54%     | 54%        | 54%         | 54%   |
| 37            | Integrated Design - High Performance (30% > codes) - Tier 1                  | 93%    | 93%    | 93%     | 93%       | 93%       | 93%    | 93%     | 93%        | 93%         | 93%   |
| 38            | Integrated Design - High Performance (50% > codes) Tier 2                    | 93%    | 93%    | 93%     | 93%       | 93%       | 93%    | 93%     | 93%        | 93%         | 93%   |
| 39            | Steam trap Maintenance   | 26%    | 26%    | 26%     | 26%       | 26%       | 26%    | 26%     | 26%        | 26%         | 26%   |
| 40            | Oxygen Trim  | 48%    | 48%    | 48%     | 48%       | 48%       | 48%    | 48%     | 48%        | 48%         | 48%   |
| 41            | Infrared Heater  | 0%     | 0%     | 50%     | 75%       | 0%        | 0%     | 0%      | 0%         | 0%          | 50%   |

| FEASIBILITY |  | 1      | 2      | 3       | 4         | 5         | 6      | 7       | 8          | 9           | 10    |
|-------------|--|--------|--------|---------|-----------|-----------|--------|---------|------------|-------------|-------|
|             |  | Office | Retail | Grocery | Warehouse | Education | Health | Lodging | Restaurant | Multifamily | Other |
| 1           | Direct fired convection range/oven   | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  |
| 2           | Exhaust Hood Makeup Air  | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  |
| 3           | High efficiency ENERGY STAR fryer  | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  |
| 4           | High efficiency ENERGY STAR steam cooker                                     | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  |
| 5           | High efficiency griddle  | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  |
| 6           | Pre-Rinse Spray Valve  | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  |
| 7           | Refrigeration heat recovery  | 10%    | 5%     | 80%     | 10%       | 15%       | 80%    | 20%     | 80%        | 0%          | 5%    |
| 8           |  |        |        |         |           |           |        |         |            |             |       |
| 9           | Cooling system chilled water reset   | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  |
| 10          | Cooling system water side economizer   | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  |
| 11          | Cooling system oversized cooling tower                                       | 75%    | 75%    | 75%     | 75%       | 75%       | 75%    | 75%     | 75%        | 75%         | 75%   |
| 12          | Condensing DHW stand-alone   | 56%    | 56%    | 56%     | 56%       | 56%       | 56%    | 56%     | 56%        | 56%         | 56%   |
| 13          | Faucet aerator   | 95%    | 95%    | 25%     | 95%       | 50%       | 25%    | 50%     | 25%        | 50%         | 75%   |
| 14          | Graywater heat exchanger/GFX   | 50%    | 50%    | 50%     | 50%       | 50%       | 50%    | 50%     | 50%        | 50%         | 50%   |
| 15          | Indirect-fired DHW off space heating boiler                                  | 39%    | 39%    | 39%     | 39%       | 39%       | 39%    | 39%     | 39%        | 39%         | 39%   |
| 16          | Instantaneous. High-Modulating Water Heater                                  | 10%    | 10%    | 0%      | 10%       | 10%       | 10%    | 0%      | 0%         | 0%          | 10%   |
| 17          | Low-flow shower heads  | 95%    | 95%    | 95%     | 95%       | 95%       | 95%    | 95%     | 95%        | 95%         | 95%   |
| 18          | Pipe insulation - water heating  | 50%    | 50%    | 50%     | 50%       | 50%       | 50%    | 50%     | 50%        | 50%         | 50%   |
| 19          | Tank insulation  | 50%    | 50%    | 50%     | 50%       | 50%       | 50%    | 50%     | 50%        | 50%         | 50%   |
| 20          | Air Sealing  | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  |
| 21          | Improved heating system high efficiency unit - Tier 1                        | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  |
| 22          | Improved heating system condensing unit - Tier 2                             | 22%    | 22%    | 22%     | 22%       | 22%       | 22%    | 22%     | 22%        | 22%         | 21%   |
| 23          | Programmable Thermostat  | 100%   | 100%   | 100%    | 100%      | 100%      | 0%     | 100%    | 100%       | 100%        | 100%  |
| 24          | Demand-Controlled Ventilation (controller, sensor)                           | 100%   | 100%   | 100%    | 100%      | 100%      | 0%     | 0%      | 100%       | 0%          | 100%  |
| 25          | Outdoor Air Reset  | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  |
| 26          | High Performance Glazing double pane, low-E, low conductivity frame - Tier 1 | 75%    | 75%    | 75%     | 75%       | 75%       | 75%    | 75%     | 75%        | 75%         | 75%   |
| 27          | High Performance Glazing triple pane, low-E, low conductivity frame - Tier 2 | 75%    | 75%    | 0%      | 0%        | 75%       | 75%    | 75%     | 75%        | 75%         | 75%   |
| 28          | Improved wall insulation   | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  |
| 29          | Improved below-grade insulation  | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 0%          | 100%  |
| 30          | Improved roof insulation   | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  |
| 31          | Sensible Heat Recovery   | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 0%      | 100%       | 0%          | 100%  |
| 32          | Pipe insulation - space heating  | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  |
| 33          | Energy Star washer   | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  |
| 34          | Swimming pool/spa covers   | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  |
| 35          | Commissioning  | 71%    | 71%    | 71%     | 71%       | 71%       | 71%    | 71%     | 71%        | 71%         | 71%   |
| 36          | Retrocommissioning   | 54%    | 54%    | 54%     | 54%       | 54%       | 54%    | 54%     | 54%        | 54%         | 54%   |
| 37          | Integrated Design - High Performance (30% > codes) - Tier 1                  | 80%    | 80%    | 80%     | 80%       | 80%       | 50%    | 80%     | 50%        | 80%         | 100%  |
| 38          | Integrated Design - High Performance (50% > codes) Tier 2                    | 13%    | 13%    | 5%      | 5%        | 13%       | 0%     | 9%      | 0%         | 9%          | 80%   |
| 39          | Steam trap Maintenance   | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  |
| 40          | Oxygen Trim  | 42%    | 42%    | 42%     | 42%       | 42%       | 42%    | 42%     | 42%        | 42%         | 42%   |
| 41          | Infrared Heater  | 0%     | 0%     | 65%     | 100%      | 0%        | 0%     | 0%      | 0%         | 0%          | 35%   |





| <b>% of retrofit measures not complete</b> |  | <b>1</b>      | <b>2</b>      | <b>3</b>       | <b>4</b>         | <b>5</b>         | <b>6</b>      | <b>7</b>       | <b>8</b>          | <b>9</b>           | <b>10</b>    |
|--|--|---------------|---------------|----------------|------------------|------------------|---------------|----------------|-------------------|--------------------|--------------|
| <b>RET_Not</b>                             | <b>Complete</b>  | <b>Office</b> | <b>Retail</b> | <b>Grocery</b> | <b>Warehouse</b> | <b>Education</b> | <b>Health</b> | <b>Lodging</b> | <b>Restaurant</b> | <b>Multifamily</b> | <b>Other</b> |
| 1  | Direct fired convection range/oven   |               |               |                |                  |                  |               |                |                   |                    |              |
| 2  | Exhaust Hood Makeup Air  |               |               |                |                  |                  |               |                |                   |                    |              |
| 3  | High efficiency ENERGY STAR fryer  |               |               |                |                  |                  |               |                |                   |                    |              |
| 4  | High efficiency ENERGY STAR steam cooker                                     | 96%           | 96%           | 96%            | 96%              | 96%              | 96%           | 96%            | 96%               | 96%                | 96%          |
| 5  | High efficiency griddle  |               |               |                |                  |                  |               |                |                   |                    |              |
| 6  | Pre-Rinse Spray Valve  | 40%           | 40%           | 40%            | 40%              | 40%              | 40%           | 40%            | 40%               | 40%                | 40%          |
| 7  | Refrigeration heat recovery  | 96%           | 96%           | 96%            | 96%              | 96%              | 96%           | 96%            | 96%               | 96%                | 96%          |
| 8  |  |               |               |                |                  |                  |               |                |                   |                    |              |
| 9  | Cooling system chilled water reset   | 80%           | 80%           | 80%            | 80%              | 80%              | 80%           | 80%            | 80%               | 80%                | 80%          |
| 10   | Cooling system water side economizer   | 80%           | 80%           | 80%            | 80%              | 80%              | 80%           | 80%            | 80%               | 80%                | 80%          |
| 11   | Cooling system oversized cooling tower                                       | 80%           | 80%           | 80%            | 80%              | 80%              | 80%           | 80%            | 80%               | 80%                | 80%          |
| 12   | Condensing DHW stand-alone   | 95%           | 95%           | 95%            | 95%              | 95%              | 95%           | 95%            | 95%               | 95%                | 95%          |
| 13   | Faucet aerator   | 10%           | 10%           | 10%            | 10%              | 10%              | 10%           | 10%            | 10%               | 10%                | 10%          |
| 14   | Graywater heat exchanger/GFX   | 99%           | 99%           | 99%            | 99%              | 99%              | 99%           | 99%            | 99%               | 99%                | 99%          |
| 15   | Indirect-fired DHW off space heating boiler                                  | 100%          | 100%          | 100%           | 100%             | 100%             | 100%          | 100%           | 100%              | 100%               | 100%         |
| 16   | Instantaneous. High-Modulating Water Heater                                  | 93%           | 89%           | 100%           | 94%              | 99%              | 92%           | 100%           | 97%               | 100%               | 93%          |
| 17   | Low-flow shower heads  | 50%           | 50%           | 50%            | 50%              | 50%              | 50%           | 50%            | 50%               | 50%                | 50%          |
| 18   | Pipe insulation - water heating  | 50%           | 73%           | 70%            | 76%              | 14%              | 33%           | 49%            | 75%               | 49%                | 59%          |
| 19   | Tank insulation  | 89%           | 76%           | 100%           | 100%             | 25%              | 25%           | 25%            | 86%               | 25%                | 25%          |
| 20   | Air Sealing  | 100%          | 100%          | 100%           | 100%             | 100%             | 100%          | 100%           | 100%              | 100%               | 100%         |
| 21   | Improved heating system high efficiency unit - Tier 1                        | 80%           | 80%           | 80%            | 80%              | 80%              | 80%           | 80%            | 80%               | 80%                | 80%          |
| 22   | Improved heating system condensing unit - Tier 2                             | 98%           | 98%           | 98%            | 98%              | 98%              | 98%           | 98%            | 98%               | 98%                | 98%          |
| 23   | Programmable Thermostat  | 49%           | 79%           | 78%            | 38%              | 49%              | 49%           | 34%            | 50%               | 34%                | 42%          |
| 24   | Demand-Controlled Ventilation (controller, sensor)                           | 98%           | 98%           | 98%            | 98%              | 98%              | 98%           | 98%            | 98%               | 98%                | 98%          |
| 25   | Outdoor Air Reset  | 53%           | 79%           | 80%            | 78%              | 17%              | 75%           | 57%            | 100%              | 57%                | 17%          |
| 26   | High Performance Glazing double pane, low-E, low conductivity frame - Tier 1 |               |               |                |                  |                  |               |                |                   |                    |              |
| 27   | High Performance Glazing triple pane, low-E, low conductivity frame - Tier 2 |               |               |                |                  |                  |               |                |                   |                    |              |
| 28   | Improved wall insulation   |               |               |                |                  |                  |               |                |                   |                    |              |
| 29   | Improved below-grade insulation  |               |               |                |                  |                  |               |                |                   |                    |              |
| 30   | Improved roof insulation   |               |               |                |                  |                  |               |                |                   |                    |              |
| 31   | Sensible Heat Recovery   | 90%           | 90%           | 76%            | 69%              | 74%              | 90%           | 62%            | 78%               | 50%                | 50%          |
| 32   | Pipe insulation - space heating  | 25%           | 25%           | 25%            | 25%              | 25%              | 25%           | 25%            | 25%               | 25%                | 25%          |
| 33   | Energy Star washer   |               |               |                |                  |                  |               |                |                   |                    |              |
| 34   | Swimming pool/spa covers   | 0%            | 0%            | 0%             | 0%               | 27%              | 50%           | 80%            | 0%                | 80%                | 63%          |
| 35   | Commissioning  |               |               |                |                  |                  |               |                |                   |                    |              |
| 36   | Retrocommissioning   | 100%          | 100%          | 100%           | 100%             | 100%             | 100%          | 100%           | 100%              | 100%               | 100%         |
| 37   | Integrated Design - High Performance (30% > codes) - Tier 1                  |               |               |                |                  |                  |               |                |                   |                    |              |
| 38   | Integrated Design - High Performance (50% > codes) Tier 2                    |               |               |                |                  |                  |               |                |                   |                    |              |
| 39   | Steam trap Maintenance   | 100%          | 100%          | 100%           | 100%             | 100%             | 100%          | 100%           | 100%              | 100%               | 100%         |
| 40   | Oxygen Trim  | 90%           | 90%           | 90%            | 90%              | 90%              | 90%           | 90%            | 90%               | 90%                | 90%          |
| 41   | Infrared Heater  | 100%          | 100%          | 100%           | 94%              | 100%             | 100%          | 100%           | 100%              | 100%               | 93%          |







| Annual dTh saved/Peak day dTh saved |  |             |             |             |             |             |             |             |             |             |             |
|-------------------------------------|--|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| kWh_kW_ratio                        | 1  | 2           | 3           | 4           | 5           | 6           | 7           | 8           | 9           | 10          |             |
|                                     | Office   | Retail      | Grocery     | Warehouse   | Education   | Health      | Lodging     | Restaurant  | Multifamily | Other       |             |
| 1                                   | Direct fired convection range/oven   | 268         | 351         | 363         | 281         | 226         | 351         | 365         | 363         | 365         | 343         |
| 2                                   | Exhaust Hood Makeup Air  | 95          | 81          | 90          | 102         | 75          | 95          | 85          | 96          | 85          | 101         |
| 3                                   | High efficiency ENERGY STAR fryer  | 268         | 351         | 363         | 281         | 226         | 351         | 365         | 363         | 365         | 343         |
| 4                                   | High efficiency ENERGY STAR steam cooker                                     | 268         | 351         | 363         | 281         | 226         | 351         | 365         | 363         | 365         | 343         |
| 5                                   | High efficiency griddle  | 268         | 351         | 363         | 281         | 226         | 351         | 365         | 363         | 365         | 343         |
| 6                                   | Pre-Rinse Spray Valve  | 261         | 464         | 267         | 571         | 201         | 260         | 266         | 267         | 266         | 258         |
| 7                                   | Refrigeration heat recovery  | 261         | 464         | 267         | 571         | 201         | 260         | 266         | 267         | 266         | 258         |
| 8                                   |  |             |             |             |             |             |             |             |             |             |             |
| 9                                   | Cooling system chilled water reset   | 999,999,999 | 999,999,999 | 999,999,999 | 999,999,999 | 999,999,999 | 999,999,999 | 999,999,999 | 999,999,999 | 999,999,999 | 999,999,999 |
| 10                                  | Cooling system water side economizer   | 999,999,999 | 999,999,999 | 999,999,999 | 999,999,999 | 999,999,999 | 999,999,999 | 999,999,999 | 999,999,999 | 999,999,999 | 999,999,999 |
| 11                                  | Cooling system oversized cooling tower                                       | 999,999,999 | 999,999,999 | 999,999,999 | 999,999,999 | 999,999,999 | 999,999,999 | 999,999,999 | 999,999,999 | 999,999,999 | 999,999,999 |
| 12                                  | Condensing DHW stand-alone   | 261         | 464         | 267         | 571         | 201         | 260         | 266         | 267         | 266         | 258         |
| 13                                  | Faucet aerator   | 261         | 464         | 267         | 571         | 201         | 260         | 266         | 267         | 266         | 258         |
| 14                                  | Graywater heat exchanger/GFX   | 261         | 464         | 267         | 571         | 201         | 260         | 266         | 267         | 266         | 258         |
| 15                                  | Indirect-fired DHW off space heating boiler                                  | 261         | 464         | 267         | 571         | 201         | 260         | 266         | 267         | 266         | 258         |
| 16                                  | Instantaneous. High-Modulating Water Heater                                  | 261         | 464         | 267         | 571         | 201         | 260         | 266         | 267         | 266         | 258         |
| 17                                  | Low-flow shower heads  | 261         | 464         | 267         | 571         | 201         | 260         | 266         | 267         | 266         | 258         |
| 18                                  | Pipe insulation - water heating  | 261         | 464         | 267         | 571         | 201         | 260         | 266         | 267         | 266         | 258         |
| 19                                  | Tank insulation  | 261         | 464         | 267         | 571         | 201         | 260         | 266         | 267         | 266         | 258         |
| 20                                  | Air Sealing  | 95          | 81          | 90          | 102         | 75          | 95          | 85          | 96          | 85          | 101         |
| 21                                  | Improved heating system high efficiency unit - Tier 1                        | 95          | 81          | 90          | 102         | 75          | 95          | 85          | 96          | 85          | 101         |
| 22                                  | Improved heating system condensing unit - Tier 2                             | 95          | 81          | 90          | 102         | 75          | 95          | 85          | 96          | 85          | 101         |
| 23                                  | Programmable Thermostat  | 95          | 81          | 90          | 102         | 75          | 95          | 85          | 96          | 85          | 101         |
| 24                                  | Demand-Controlled Ventilation (controller, sensor)                           | 95          | 81          | 90          | 102         | 75          | 95          | 85          | 96          | 85          | 101         |
| 25                                  | Outdoor Air Reset  | 95          | 81          | 90          | 102         | 75          | 95          | 85          | 96          | 85          | 101         |
| 26                                  | High Performance Glazing double pane, low-E, low conductivity frame - Tier 1 | 95          | 81          | 90          | 102         | 75          | 95          | 85          | 96          | 85          | 101         |
| 27                                  | High Performance Glazing triple pane, low-E, low conductivity frame - Tier 2 | 95          | 81          | 90          | 102         | 75          | 95          | 85          | 96          | 85          | 101         |
| 28                                  | Improved wall insulation   | 95          | 81          | 90          | 102         | 75          | 95          | 85          | 96          | 85          | 101         |
| 29                                  | Improved below-grade insulation  | 95          | 81          | 90          | 102         | 75          | 95          | 85          | 96          | 85          | 101         |
| 30                                  | Improved roof insulation   | 95          | 81          | 90          | 102         | 75          | 95          | 85          | 96          | 85          | 101         |
| 31                                  | Sensible Heat Recovery   | 95          | 81          | 90          | 102         | 75          | 95          | 85          | 96          | 85          | 101         |
| 32                                  | Pipe insulation - space heating  | 95          | 81          | 90          | 102         | 75          | 95          | 85          | 96          | 85          | 101         |
| 33                                  | Energy Star washer   | 261         | 464         | 267         | 571         | 201         | 260         | 266         | 267         | 266         | 258         |
| 34                                  | Swimming pool/spa covers   | 261         | 464         | 267         | 571         | 201         | 260         | 266         | 267         | 266         | 258         |
| 35                                  | Commissioning  | 95          | 81          | 90          | 102         | 75          | 95          | 85          | 96          | 85          | 101         |
| 36                                  | Retrocommissioning   | 95          | 81          | 90          | 102         | 75          | 95          | 85          | 96          | 85          | 101         |
| 37                                  | Integrated Design - High Performance (30% > codes) - Tier 1                  | 95          | 81          | 90          | 102         | 75          | 95          | 85          | 96          | 85          | 101         |
| 38                                  | Integrated Design - High Performance (50% > codes) Tier 2                    | 95          | 81          | 90          | 102         | 75          | 95          | 85          | 96          | 85          | 101         |
| 39                                  | Steam trap Maintenance   | 95          | 81          | 90          | 102         | 75          | 95          | 85          | 96          | 85          | 101         |
| 40                                  | Oxygen Trim  | 95          | 81          | 90          | 102         | 75          | 95          | 85          | 96          | 85          | 101         |
| 41                                  | Infrared Heater  | 95          | 81          | 90          | 102         | 75          | 95          | 85          | 96          | 85          | 101         |















| % replacement/remodel interaction or overlap factor |  |        |         |           |           |        |         |            |             |       |      |    |              | rank order | interacts with |
|---|--|--------|---------|-----------|-----------|--------|---------|------------|-------------|-------|------|----|--------------|------------|----------------|
| MD_Interactions                                     | 1  | 2      | 3       | 4         | 5         | 6      | 7       | 8          | 9           | 10    |      |    |              |            |                |
|   | Office   | Retail | Grocery | Warehouse | Education | Health | Lodging | Restaurant | Multifamily | Other |      |    |              |            |                |
| 1   | Direct fired convection range/oven   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  | 100% | 0  |              |            |                |
| 2   | Exhaust Hood Makeup Air  | 93%    | 83%     | 65%       | 79%       | 70%    | 94%     | 94%        | 78%         | 94%   | 76%  | 10 | 2a,3,9       |            |                |
| 3   | High efficiency ENERGY STAR fryer  | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  | 100% | 0  |              |            |                |
| 4   | High efficiency ENERGY STAR steam cooker                                     | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  | 100% | 0  |              |            |                |
| 5   | High efficiency griddle  | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  | 100% | 0  |              |            |                |
| 6   | Pre-Rinse Spray Valve  | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  | 100% | 0  |              |            |                |
| 7   | Refrigeration heat recovery  | 85%    | 87%     | 86%       | 87%       | 79%    | 84%     | 81%        | 78%         | 95%   | 84%  | 8  | ,1,2,4,6,7   |            |                |
| 8   |  |        |         |           |           |        |         |            |             |       |      |    |              |            |                |
| 9   | Cooling system chilled water reset   | 95%    | 95%     | 95%       | 95%       | 95%    | 95%     | 95%        | 95%         | 95%   | 95%  | 5  | ,2a,3        |            |                |
| 10  | Cooling system water side economizer   | 95%    | 95%     | 95%       | 95%       | 95%    | 95%     | 95%        | 95%         | 95%   | 95%  | 4  | ,2a,3        |            |                |
| 11  | Cooling system oversized cooling tower                                       | 97%    | 97%     | 97%       | 97%       | 97%    | 97%     | 97%        | 97%         | 97%   | 97%  | 3  | ,2a          |            |                |
| 12  | Condensing DHW stand-alone   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  | 100% | 1  |              |            |                |
| 13  | Faucet aerator   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  | 100% |    |              |            |                |
| 14  | Graywater heat exchanger/GFX   | 87%    | 88%     | 87%       | 88%       | 85%    | 85%     | 85%        | 87%         | 100%  | 87%  | 4  | ,1,2         |            |                |
| 15  | Indirect-fired DHW off space heating boiler                                  | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  | 100% | 2  |              |            |                |
| 16  | Instantaneous, High-Modulating Water Heater                                  | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  | 100% | 3  |              |            |                |
| 17  | Low-flow shower heads  | 86%    | 88%     | 87%       | 88%       | 80%    | 85%     | 82%        | 79%         | 96%   | 84%  | 5  | ,1,2,4       |            |                |
| 18  | Pipe insulation - water heating  | 87%    | 88%     | 87%       | 88%       | 85%    | 85%     | 85%        | 87%         | 100%  | 87%  | 7  | ,1,2         |            |                |
| 19  | Tank insulation  | 87%    | 88%     | 87%       | 88%       | 85%    | 85%     | 85%        | 87%         | 100%  | 87%  | 6  | ,1,2         |            |                |
| 20  | Air Sealing  | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  | 100% | 0  |              |            |                |
| 21  | Improved heating system high efficiency unit - Tier 1                        | 97%    | 97%     | 97%       | 97%       | 97%    | 97%     | 97%        | 97%         | 97%   | 97%  | 3  | 2a           |            |                |
| 22  | Improved heating system condensing unit - Tier 2                             | 97%    | 97%     | 97%       | 97%       | 97%    | 97%     | 97%        | 97%         | 97%   | 97%  | 3  | 2a           |            |                |
| 23  | Programmable Thermostat  | 94%    | 94%     | 95%       | 94%       | 94%    | 94%     | 94%        | 95%         | 94%   | 94%  | 4  | ,2a,3        |            |                |
| 24  | Demand-Controlled Ventilation (controller, sensor)                           | 94%    | 94%     | 95%       | 94%       | 94%    | 94%     | 94%        | 95%         | 94%   | 94%  | 5  | ,2a,3        |            |                |
| 25  | Outdoor Air Reset  | 93%    | 83%     | 65%       | 79%       | 70%    | 94%     | 94%        | 78%         | 94%   | 76%  | 7  | ,2a,3,4,5    |            |                |
| 26  | High Performance Glazing double pane, low-E, low conductivity frame - Tier 1 | 92%    | 83%     | 64%       | 79%       | 70%    | 94%     | 94%        | 78%         | 94%   | 75%  | 12 | ,2a,3,5,9    |            |                |
| 27  | High Performance Glazing triple pane, low-E, low conductivity frame - Tier 2 | 92%    | 83%     | 64%       | 79%       | 70%    | 94%     | 94%        | 78%         | 94%   | 75%  | 12 | ,2a,3,5,9    |            |                |
| 28  | Improved wall insulation   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  | 100% |    |              |            |                |
| 29  | Improved below-grade insulation  | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  | 100% |    |              |            |                |
| 30  | Improved roof insulation   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  | 100% |    |              |            |                |
| 31  | Sensible Heat Recovery   | 92%    | 82%     | 64%       | 78%       | 69%    | 93%     | 93%        | 77%         | 93%   | 75%  | 8  | 2a,3,4,5,7   |            |                |
| 32  | Pipe insulation - space heating  | 92%    | 82%     | 64%       | 78%       | 69%    | 93%     | 93%        | 77%         | 93%   | 75%  | 9  | 2a,3,4,5,7   |            |                |
| 33  | Energy Star washer   | 83%    | 85%     | 84%       | 84%       | 77%    | 81%     | 79%        | 76%         | 92%   | 81%  | 9  | 2a,1,2,4,6,7 |            |                |
| 34  | Swimming pool/spa covers   | 83%    | 85%     | 84%       | 84%       | 82%    | 82%     | 82%        | 84%         | 96%   | 83%  | 10 | 2a,1,2,6,7   |            |                |
| 35  | Commissioning  | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  | 100% | 2a | 0            |            |                |
| 36  | Retrocommissioning   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  | 100% | 0  |              |            |                |
| 37  | Integrated Design - High Performance (30% > codes) - Tier 1                  | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  | 100% | 0  | 0            |            |                |
| 38  | Integrated Design - High Performance (50% > codes) Tier 2                    | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  | 100% | 0  | 0            |            |                |
| 39  | Steam trap Maintenance   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  | 100% | 0  |              |            |                |
| 40  | Oxygen Trim  | 91%    | 65%     | 52%       | 72%       | 62%    | 87%     | 96%        | 60%         | 96%   | 64%  | 11 | 2a,4,5,7,8,9 |            |                |
| 41  | Infrared Heater  | 96%    | 85%     | 66%       | 81%       | 73%    | 97%     | 97%        | 80%         | 97%   | 78%  | 13 | 2a,4,5       |            |                |

| Interaction interim factors (prod of %savings, applicability, feasibility, and max pen) |                                       |        |         |           |           |        |         |            |             |       |     |
|---|---------------------------------------|--------|---------|-----------|-----------|--------|---------|------------|-------------|-------|-----|
| MD interim interactions   | 1                                     | 2      | 3       | 4         | 5         | 6      | 7       | 8          | 9           | 10    |     |
|   | Office                                | Retail | Grocery | Warehouse | Education | Health | Lodging | Restaurant | Multifamily | Other |     |
| 1   | Direct fired convection range/oven    | 0%     | 5%      | 5%        | 0%        | 5%     | 5%      | 5%         | 0%          | 0%    | 0%  |
| 2   | Exhaust Hood Makeup Air               | 0%     | 1%      | 1%        | 2%        | 0%     | 0%      | 6%         | 0%          | 0%    | 0%  |
| 3   | High efficiency ENERGY STAR           | 14%    | 12%     | 12%       | 14%       | 12%    | 12%     | 12%        | 0%          | 20%   |     |
| 4   | High efficiency ENERGY STAR           | 0%     | 2%      | 2%        | 0%        | 2%     | 2%      | 2%         | 0%          | 2%    |     |
| 5   | High efficiency griddle               | 3%     | 1%      | 1%        | 3%        | 1%     | 1%      | 1%         | 0%          | 1%    |     |
| 6   | Pre-Rinse Spray Valve                 |        |         |           |           |        |         |            |             |       |     |
| 7   | Refrigeration heat recovery           | 0%     | 0%      | 10%       | 7%        | 3%     | 2%      | 34%        | 0%          | 0%    |     |
| 8   |                                       |        |         |           |           |        |         |            |             |       |     |
| 9   | Cooling system chilled water re       | -1%    | -1%     | -1%       | -1%       | -1%    | -1%     | -1%        | -1%         | -1%   |     |
| 10  | Cooling system water side economizer  | 15%    | 15%     | 15%       | 15%       | 15%    | 15%     | 15%        | 15%         | 15%   |     |
| 11  | Cooling system oversized coils        | 2%     | 2%      | 2%        | 2%        | 2%     | 2%      | 2%         | 2%          | 2%    |     |
| 12  | Condensing DHW stand-alone            | 11%    | 11%     | 11%       | 11%       | 11%    | 11%     | 11%        | 0%          | 11%   |     |
| 13  | Faucet aerator                        |        |         |           |           |        |         |            |             |       |     |
| 14  | Graywater heat exchanger/GF) )        | 0%     | 0%      | 0%        | 0%        | 6%     | 0%      | 4%         | 10%         | 4%    | 3%  |
| 15  | Indirect-fired DHW off space heating  | 2%     | 1%      | 2%        | 1%        | 4%     | 4%      | 4%         | 2%          | 0%    | 2%  |
| 16  | Instantaneous, High-Modulating        | -0.04% | 0%      | 0%        | 0%        | 0%     | 0%      | 0%         | 0%          | 0%    | 0%  |
| 17  | Low-flow shower heads                 | 1%     | 0%      | 0%        | 1%        | 10%    | 1%      | 6%         | 0%          | 6%    | 4%  |
| 18  | Pipe insulation - water heating       | 1%     | 1%      | 1%        | 1%        | 1%     | 1%      | 1%         | 1%          | 1%    | 1%  |
| 19  | Tank insulation                       | 0%     | 0%      | 0%        | 0%        | 0%     | 0%      | 0%         | 0%          | 0%    | 0%  |
| 20  | Air Sealing                           | 21%    | 12%     | 1%        | 7%        | 14%    | 3%      | 7%         | 13%         | 7%    | 14% |
| 21  | Improved heating system high capacity | 3%     | 2%      | 2%        | 2%        | 2%     | 2%      | 2%         | 2%          | 2%    | 2%  |
| 22  | Improved heating system condensing    | 1%     | 1%      | 0%        | 1%        | 1%     | 1%      | 0%         | 1%          | 1%    | 1%  |
| 23  | Programmable Thermostat               | 1%     | 1%      | 1%        | 6%        | 2%     | 0%      | 0%         | 1%          | 0%    | 1%  |
| 24  | Demand-Controlled Ventilation         | 0%     | 11%     | 31%       | 11%       | 23%    | 0%      | 0%         | 17%         | 0%    | 19% |
| 25  | Outdoor Air Reset                     | 1%     | 1%      | 1%        | 1%        | 1%     | 1%      | 1%         | 1%          | 1%    | 1%  |
| 26  | High Performance Glazing double       | 3%     | 1%      | 0%        | 1%        | 2%     | 4%      | 3%         | 3%          | 3%    | 3%  |
| 27  | High Performance Glazing triple       | 11%    | 4%      | 0%        | 0%        | 7%     | 9%      | 4%         | 7%          | 10%   | 6%  |
| 28  | Improved wall insulation              | 3%     | 3%      | 2%        | 3%        | 1%     | 4%      | 2%         | 2%          | 2%    | 3%  |
| 29  | Improved below-grade insulating       | 1%     | 2%      | 1%        | 3%        | 1%     | 0%      | 1%         | 2%          | 0%    | 1%  |
| 30  | Improved roof insulation              | 3%     | 2%      | 5%        | 7%        | 4%     | 2%      | 2%         | 4%          | 2%    | 3%  |
| 31  | Sensible Heat Recovery                | 4%     | 23%     | 20%       | 10%       | 13%    | 9%      | 0%         | 24%         | 0%    | 17% |
| 32  | Pipe insulation - space heating       | 0%     | 0%      | 0%        | 0%        | 0%     | 0%      | 0%         | 0%          | 0%    | 0%  |
| 33  | Energy Star washer                    | 0%     | 0%      | 0%        | 0%        | 0%     | 0%      | 0%         | 0%          | 0%    | 0%  |
| 34  | Swimming pool/spa covers              | 0%     | 0%      | 0%        | 0%        | 17%    | 5%      | 22%        | 0%          | 22%   | 5%  |
| 35  | Commissioning                         | 3%     | 3%      | 3%        | 3%        | 3%     | 3%      | 3%         | 3%          | 3%    | 3%  |
| 36  | Retrocommissioning                    | 0%     | 0%      | 0%        | 0%        | 0%     | 0%      | 0%         | 0%          | 0%    | 0%  |
| 37  | Integrated Design - High Performance  | 21%    | 21%     | 21%       | 21%       | 21%    | 13%     | 21%        | 13%         | 21%   | 26% |
| 38  | Integrated Design - High Performance  | 2%     | 2%      | 1%        | 1%        | 2%     | 0%      | 2%         | 0%          | 2%    | 15% |
| 39  | Steam trap Maintenance                | 0%     | 0%      | 0%        | 0%        | 0%     | 0%      | 0%         | 0%          | 0%    | 0%  |
| 40  | Oxygen Trim                           | 1%     | 1%      | 1%        | 1%        | 1%     | 1%      | 1%         | 1%          | 1%    | 1%  |
| 41  | Infrared Heater                       | 0%     | 0%      | 1%        | 3%        | 0%     | 0%      | 0%         | 0%          | 0%    | 1%  |



**Interaction interim factors (prod of %savings, applicability, feasibility, and max pen)**

| NC Interim Interactions | 10                               |        |         |           |           |        |         |            |             |       |     |
|-------------------------|----------------------------------|--------|---------|-----------|-----------|--------|---------|------------|-------------|-------|-----|
|                         | 1                                | 2      | 3       | 4         | 5         | 6      | 7       | 8          | 9           | 10    |     |
|                         | Office                           | Retail | Grocery | Warehouse | Education | Health | Lodging | Restaurant | Multifamily | Other |     |
| 1                       | Direct fired convection range/ov | 0%     | 5%      | 5%        | 0%        | 5%     | 5%      | 5%         | 5%          | 0%    | 0%  |
| 2                       | Exhaust Hood Makeup Air          | 0%     | 1%      | 1%        | 2%        | 0%     | 0%      | 0%         | 6%          | 0%    | 0%  |
| 3                       | High efficiency ENERGY STAR      | 14%    | 12%     | 12%       | 14%       | 12%    | 12%     | 12%        | 12%         | 0%    | 20% |
| 4                       | High efficiency ENERGY STAR      | 0%     | 2%      | 2%        | 0%        | 0%     | 2%      | 2%         | 2%          | 0%    | 2%  |
| 5                       | High efficiency griddle          | 3%     | 1%      | 1%        | 3%        | 1%     | 1%      | 1%         | 1%          | 0%    | 1%  |
| 6                       | Pre-Rinse Spray Valve            |        |         |           |           |        |         |            |             |       |     |
| 7                       | Refrigeration heat recovery      | 0%     | 0%      | 10%       | 7%        | 3%     | 2%      | 1%         | 34%         | 0%    | 0%  |
| 8                       |                                  |        |         |           |           |        |         |            |             |       |     |
| 9                       | Cooling system chilled water re  | -1%    | -1%     | -1%       | -1%       | -1%    | -1%     | -1%        | -1%         | -1%   | -1% |
| 10                      | Cooling system water side econ   | 15%    | 15%     | 15%       | 15%       | 15%    | 15%     | 15%        | 15%         | 15%   | 15% |
| 11                      | Cooling system oversized coolin  | 2%     | 2%      | 2%        | 2%        | 2%     | 2%      | 2%         | 2%          | 2%    | 2%  |
| 12                      | Condensing DHW stand-alone       | 11%    | 11%     | 11%       | 11%       | 11%    | 11%     | 11%        | 11%         | 0%    | 11% |
| 13                      | Faucet aerator                   |        |         |           |           |        |         |            |             |       |     |
| 14                      | Graywater heat exchanger/GF>     | 0%     | 0%      | 0%        | 0%        | 6%     | 0%      | 4%         | 10%         | 4%    | 3%  |
| 15                      | Indirect-fired DHW off space he  | 2%     | 1%      | 2%        | 1%        | 4%     | 4%      | 4%         | 2%          | 0%    | 2%  |
| 16                      | Instantaneous. High-Modulating   | -0.04% | 0%      | 0%        | 0%        | 0%     | 0%      | 0%         | 0%          | 0%    | 0%  |
| 17                      | Low-flow shower heads            | 1%     | 0%      | 0%        | 1%        | 10%    | 1%      | 6%         | 0%          | 6%    | 4%  |
| 18                      | Pipe insulation - water heating  | 1%     | 1%      | 1%        | 1%        | 1%     | 1%      | 1%         | 1%          | 1%    | 1%  |
| 19                      | Tank insulation                  | 0%     | 0%      | 0%        | 0%        | 0%     | 0%      | 0%         | 0%          | 0%    | 0%  |
| 20                      | Air Sealing                      | 21%    | 12%     | 1%        | 7%        | 14%    | 3%      | 7%         | 13%         | 7%    | 14% |
| 21                      | Improved heating system high e   | 3%     | 2%      | 2%        | 2%        | 2%     | 2%      | 2%         | 2%          | 2%    | 2%  |
| 22                      | Improved heating system cond     | 1%     | 1%      | 0%        | 1%        | 1%     | 1%      | 1%         | 0%          | 1%    | 1%  |
| 23                      | Programmable Thermostat          | 1%     | 1%      | 1%        | 6%        | 2%     | 0%      | 0%         | 1%          | 0%    | 1%  |
| 24                      | Demand-Controlled Ventilation    | 0%     | 11%     | 31%       | 11%       | 23%    | 0%      | 0%         | 17%         | 0%    | 19% |
| 25                      | Outdoor Air Reset                | 1%     | 1%      | 1%        | 1%        | 1%     | 1%      | 1%         | 1%          | 1%    | 1%  |
| 26                      | High Performance Glazing dou     | 3%     | 1%      | 0%        | 1%        | 2%     | 4%      | 3%         | 3%          | 3%    | 3%  |
| 27                      | High Performance Glazing tripl   | 11%    | 4%      | 0%        | 0%        | 7%     | 9%      | 4%         | 7%          | 10%   | 6%  |
| 28                      | Improved wall insulation         | 3%     | 3%      | 2%        | 3%        | 1%     | 4%      | 2%         | 2%          | 2%    | 3%  |
| 29                      | Improved below-grade insulatio   | 1%     | 2%      | 1%        | 3%        | 1%     | 0%      | 1%         | 2%          | 0%    | 1%  |
| 30                      | Improved roof insulation         | 3%     | 2%      | 5%        | 7%        | 4%     | 2%      | 2%         | 4%          | 2%    | 3%  |
| 31                      | Sensible Heat Recovery           | 4%     | 23%     | 20%       | 10%       | 13%    | 9%      | 0%         | 24%         | 0%    | 17% |
| 32                      | Pipe insulation - space heating  | 0%     | 0%      | 0%        | 0%        | 0%     | 0%      | 0%         | 0%          | 0%    | 0%  |
| 33                      | Energy Star washer               | 0%     | 0%      | 0%        | 0%        | 0%     | 0%      | 0%         | 0%          | 0%    | 0%  |
| 34                      | Swimming pool/spa covers         | 0%     | 0%      | 0%        | 0%        | 17%    | 5%      | 22%        | 0%          | 22%   | 5%  |
| 35                      | Commissioning                    | 3%     | 3%      | 3%        | 3%        | 3%     | 3%      | 3%         | 3%          | 3%    | 3%  |
| 36                      | Retrocommissioning               | 0%     | 0%      | 0%        | 0%        | 0%     | 0%      | 0%         | 0%          | 0%    | 0%  |
| 37                      | Integrated Design - High Perfor  | 21%    | 21%     | 21%       | 21%       | 21%    | 13%     | 21%        | 13%         | 21%   | 26% |
| 38                      | Integrated Design - High Perfor  | 2%     | 2%      | 1%        | 1%        | 2%     | 0%      | 2%         | 0%          | 2%    | 15% |
| 39                      | Steam trap Maintenance           | 0%     | 0%      | 0%        | 0%        | 0%     | 0%      | 0%         | 0%          | 0%    | 0%  |
| 40                      | Oxygen Trim                      | 1%     | 1%      | 1%        | 1%        | 1%     | 1%      | 1%         | 1%          | 1%    | 1%  |
| 41                      | Infrared Heater                  | 0%     | 0%      | 1%        | 3%        | 0%     | 0%      | 0%         | 0%          | 0%    | 1%  |



| % retrofit interaction or overlap factor |  |        |        |         |           |           |        |         |            |             |       | rank order | interacts with |
|--|--|--------|--------|---------|-----------|-----------|--------|---------|------------|-------------|-------|------------|----------------|
| RET                                      | Interactions   | 1      | 2      | 3       | 4         | 5         | 6      | 7       | 8          | 9           | 10    |            |                |
|  |  | Office | Retail | Grocery | Warehouse | Education | Health | Lodging | Restaurant | Multifamily | Other |            |                |
| 1  | Direct fired convection range/oven   | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  | 0          |                |
| 2  | Exhaust Hood Makeup Air  | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  | 0          | 0              |
| 3  | High efficiency ENERGY STAR fryer  | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  | 0          |                |
| 4  | High efficiency ENERGY STAR steam cooker                                     | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  | 0          |                |
| 5  | High efficiency griddle  | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  | 0          |                |
| 6  | Pre-Rinse Spray Valve  | 84%    | 86%    | 84%     | 85%       | 77%       | 82%    | 79%     | 76%        | 94%         | 82%   | 10         | ,1,2,4,7,8     |
| 7  | Refrigeration heat recovery  | 84%    | 86%    | 84%     | 85%       | 83%       | 82%    | 83%     | 84%        | 98%         | 84%   | 9          | ,1,2,7,8       |
| 8  |  |        |        |         |           |           |        |         |            |             |       |            |                |
| 9  | Cooling system chilled water reset   | 95%    | 95%    | 95%     | 95%       | 95%       | 95%    | 95%     | 95%        | 95%         | 95%   | 3          | 1a,1           |
| 10                                       | Cooling system water side economizer   | 95%    | 95%    | 95%     | 95%       | 95%       | 95%    | 95%     | 95%        | 95%         | 95%   | 2          | 1a,1           |
| 11                                       | Cooling system oversized cooling tower                                       | 98%    | 98%    | 98%     | 98%       | 98%       | 98%    | 98%     | 98%        | 98%         | 98%   | 1          | 1a             |
| 12                                       | Condensing DHW stand-alone   | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  | 1          |                |
| 13                                       | Faucet aerator   | 85%    | 87%    | 86%     | 87%       | 79%       | 84%    | 81%     | 78%        | 96%         | 84%   | 6          | ,1,2,3,4       |
| 14                                       | Graywater heat exchanger/GFX   | 86%    | 87%    | 86%     | 87%       | 84%       | 84%    | 84%     | 86%        | 100%        | 86%   | 4          | ,1,2           |
| 15                                       | Indirect-fired DHW off space heating boiler                                  | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  | 2          |                |
| 16                                       | Instantaneous, High-Modulating Water Heater                                  | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  | 3          |                |
| 17                                       | Low-flow shower heads  | 85%    | 87%    | 86%     | 87%       | 79%       | 84%    | 81%     | 78%        | 96%         | 84%   | 5          | ,1,2,4         |
| 18                                       | Pipe insulation - water heating  | 86%    | 87%    | 86%     | 87%       | 84%       | 84%    | 84%     | 86%        | 100%        | 86%   | 8          | ,1,2           |
| 19                                       | Tank insulation  | 86%    | 87%    | 86%     | 87%       | 84%       | 84%    | 84%     | 86%        | 100%        | 86%   | 7          | ,1,2           |
| 20                                       | Air Sealing  | 88%    | 76%    | 53%     | 59%       | 58%       | 93%    | 93%     | 64%        | 93%         | 78%   | 6          | 1a,2,3,4,5     |
| 21                                       | Improved heating system high efficiency unit - Tier 1                        | 98%    | 98%    | 98%     | 98%       | 98%       | 98%    | 98%     | 98%        | 98%         | 98%   | 2          | 1a             |
| 22                                       | Improved heating system condensing unit - Tier 2                             | 98%    | 98%    | 98%     | 98%       | 98%       | 98%    | 98%     | 98%        | 98%         | 98%   | 2          | 1a             |
| 23                                       | Programmable Thermostat  | 95%    | 96%    | 95%     | 96%       | 95%       | 95%    | 95%     | 96%        | 95%         | 95%   | 3          | 1a,2           |
| 24                                       | Demand-Controlled Ventilation (controller, sensor)                           | 90%    | 91%    | 92%     | 70%       | 86%       | 95%    | 95%     | 92%        | 95%         | 90%   | 4          | 1a,2,3         |
| 25                                       | Outdoor Air Reset  | 90%    | 78%    | 54%     | 60%       | 60%       | 95%    | 95%     | 65%        | 95%         | 79%   | 5          | 1a,2,3,4       |
| 26                                       | High Performance Glazing double pane, low-E, low conductivity frame - Tier 1 | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  | 0          | 0              |
| 27                                       | High Performance Glazing triple pane, low-E, low conductivity frame - Tier 2 | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  | 0          | 0              |
| 28                                       | Improved wall insulation   | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  | 0          | 0              |
| 29                                       | Improved below-grade insulation  | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  | 0          | 0              |
| 30                                       | Improved roof insulation   | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  | 0          | 0              |
| 31                                       | Sensible Heat Recovery   | 69%    | 66%    | 53%     | 54%       | 50%       | 90%    | 86%     | 55%        | 86%         | 66%   | 7          | 1a,2,3,4,5,6   |
| 32                                       | Pipe insulation - space heating  | 93%    | 94%    | 93%     | 94%       | 93%       | 93%    | 93%     | 94%        | 93%         | 93%   | 8          | 1a,2,5         |
| 33                                       | Energy Star washer   | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  | 0          | 0              |
| 34                                       | Swimming pool/spa covers   | 86%    | 87%    | 86%     | 87%       | 84%       | 84%    | 84%     | 86%        | 100%        | 86%   | 10         | 1,2            |
| 35                                       | Commissioning  | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  | 0          | 0              |
| 36                                       | Retrocommissioning   | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  | 1a         |                |
| 37                                       | Integrated Design - High Performance (30% > codes) - Tier 1                  | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  | 0          | 0              |
| 38                                       | Integrated Design - High Performance (50% > codes) Tier 2                    | 100%   | 100%   | 100%    | 100%      | 100%      | 100%   | 100%    | 100%       | 100%        | 100%  | 0          | 0              |
| 39                                       | Steam trap Maintenance   | 69%    | 48%    | 39%     | 45%       | 44%       | 83%    | 90%     | 39%        | 90%         | 53%   | 10         | 1a,3,4,6,7,8,9 |
| 40                                       | Oxygen Trim  | 67%    | 47%    | 40%     | 48%       | 43%       | 82%    | 88%     | 39%        | 88%         | 53%   | 9          | 1a,3,4,5,6,7,8 |
| 41                                       | Infrared Heater  | 94%    | 94%    | 95%     | 72%       | 89%       | 98%    | 98%     | 95%        | 98%         | 93%   | 11         | 1a,3           |

**Interaction interim factors (prod of %savings, applicability, feasibility, and max pen)**

| RET | interim interactions               | 1      | 2      | 3       | 4         | 5         | 6      | 7       | 8          | 9           | 10    |
|-----|------------------------------------|--------|--------|---------|-----------|-----------|--------|---------|------------|-------------|-------|
|     |                                    | Office | Retail | Grocery | Warehouse | Education | Health | Lodging | Restaurant | Multifamily | Other |
| 1   | Direct fired convection range/oven |        |        |         |           |           |        |         |            |             |       |
| 2   | Exhaust Hood Makeup Air            | 0%     | 0%     | 0%      | 0%        | 0%        | 0%     | 0%      | 0%         | 0%          | 0%    |
| 3   | High efficiency ENERGY STAR        | 0%     | 0%     | 0%      | 0%        | 0%        | 0%     | 0%      | 0%         | 0%          | 0%    |
| 4   | High efficiency ENERGY STAR        | 0%     | 3%     | 3%      | 0%        | 0%        | 3%     | 2%      | 3%         | 0%          | 2%    |
| 5   | High efficiency griddle            | 0%     | 0%     | 0%      | 0%        | 0%        | 0%     | 0%      | 0%         | 0%          | 0%    |
| 6   | Pre-Rinse Spray Valve              | 0%     | 0%     | 5%      | 0%        | 1%        | 1%     | 1%      | 19%        | 0%          | 0%    |
| 7   | Refrigeration heat recovery        | 1%     | 0%     | 11%     | 8%        | 3%        | 2%     | 1%      | 38%        | 0%          | 0%    |
| 8   |                                    |        |        |         |           |           |        |         |            |             |       |
| 9   | Cooling system chilled water re    | 0%     | 0%     | 0%      | 0%        | 0%        | 0%     | 0%      | 0%         | 0%          | 0%    |
| 10  | Cooling system water side ecor     | 22%    | 22%    | 22%     | 22%       | 22%       | 22%    | 22%     | 22%        | 22%         | 22%   |
| 11  | Cooling system oversized cooli     | 4%     | 4%     | 4%      | 4%        | 4%        | 4%     | 4%      | 4%         | 4%          | 4%    |
| 12  | Condensing DHW stand-alone         | 12%    | 12%    | 12%     | 12%       | 12%       | 12%    | 12%     | 0%         | 0%          | 12%   |
| 13  | Faucet aerator                     | 35%    | 43%    | 1%      | 43%       | 4%        | 2%     | 2%      | 1%         | 2%          | 10%   |
| 14  | Graywater heat exchanger/GF)       | 0%     | 0%     | 0%      | 0%        | 7%        | 0%     | 4%      | 10%        | 4%          | 3%    |
| 15  | Indirect-fired DHW off space he    | 2%     | 1%     | 2%      | 1%        | 4%        | 4%     | 4%      | 2%         | 0%          | 2%    |
| 16  | Instantaneous. High-Modulatin      | 0.00%  | 0%     | 0%      | 0%        | 0%        | 0%     | 0%      | 0%         | 0%          | 0%    |
| 17  | Low-flow shower heads              | 1%     | 0%     | 0%      | 1%        | 16%       | 1%     | 10%     | 0%         | 10%         | 6%    |
| 18  | Pipe insulation - water heating    | 1%     | 1%     | 1%      | 1%        | 1%        | 1%     | 1%      | 1%         | 1%          | 1%    |
| 19  | Tank insulation                    | 1%     | 1%     | 1%      | 1%        | 1%        | 1%     | 1%      | 1%         | 1%          | 1%    |
| 20  | Air Sealing                        | 22%    | 13%    | 1%      | 8%        | 14%       | 3%     | 7%      | 14%        | 7%          | 14%   |
| 21  | Improved heating system high       | 3%     | 2%     | 2%      | 2%        | 3%        | 3%     | 3%      | 2%         | 3%          | 2%    |
| 22  | Improved heating system condi      | 1%     | 1%     | 1%      | 1%        | 1%        | 1%     | 1%      | 1%         | 1%          | 1%    |
| 23  | Programmable Thermostat            | 5%     | 4%     | 4%      | 26%       | 9%        | 0%     | 0%      | 4%         | 0%          | 6%    |
| 24  | Demand-Controlled Ventilation      | 0%     | 15%    | 41%     | 15%       | 31%       | 0%     | 0%      | 29%        | 0%          | 12%   |
| 25  | Outdoor Air Reset                  | 2%     | 2%     | 2%      | 2%        | 2%        | 2%     | 2%      | 2%         | 2%          | 2%    |
| 26  | High Performance Glazing dou       | 0%     | 0%     | 0%      | 0%        | 0%        | 0%     | 0%      | 0%         | 0%          | 0%    |
| 27  | High Performance Glazing tripl     | 0%     | 0%     | 0%      | 0%        | 0%        | 0%     | 0%      | 0%         | 0%          | 0%    |
| 28  | Improved wall insulation           | 0%     | 0%     | 0%      | 0%        | 0%        | 0%     | 0%      | 0%         | 0%          | 0%    |
| 29  | Improved below-grade insulatic     | 0%     | 0%     | 0%      | 0%        | 0%        | 0%     | 0%      | 0%         | 0%          | 0%    |
| 30  | Improved roof insulation           | 0%     | 0%     | 0%      | 0%        | 0%        | 0%     | 0%      | 0%         | 0%          | 0%    |
| 31  | Sensible Heat Recovery             | 5%     | 30%    | 26%     | 13%       | 17%       | 12%    | 0%      | 31%        | 0%          | 22%   |
| 32  | Pipe insulation - space heating    | 1%     | 1%     | 1%      | 1%        | 1%        | 1%     | 1%      | 1%         | 1%          | 1%    |
| 33  | Energy Star washer                 | 0%     | 0%     | 0%      | 0%        | 0%        | 0%     | 0%      | 0%         | 0%          | 0%    |
| 34  | Swimming pool/spa covers           | 0%     | 0%     | 0%      | 0%        | 42%       | 12%    | 54%     | 0%         | 54%         | 12%   |
| 35  | Commissioning                      | 0%     | 0%     | 0%      | 0%        | 0%        | 0%     | 0%      | 0%         | 0%          | 0%    |
| 36  | Retrocommissioning                 | 2%     | 2%     | 2%      | 2%        | 2%        | 2%     | 2%      | 2%         | 2%          | 2%    |
| 37  | Integrated Design - High Perfor    | 0%     | 0%     | 0%      | 0%        | 0%        | 0%     | 0%      | 0%         | 0%          | 0%    |
| 38  | Integrated Design - High Perfor    | 0%     | 0%     | 0%      | 0%        | 0%        | 0%     | 0%      | 0%         | 0%          | 0%    |
| 39  | Steam trap Maintenance             | 1%     | 1%     | 1%      | 1%        | 1%        | 1%     | 1%      | 1%         | 1%          | 1%    |
| 40  | Oxygen Trim                        | 1%     | 1%     | 1%      | 1%        | 1%        | 1%     | 1%      | 1%         | 1%          | 1%    |
| 41  | Infrared Heater                    | 0%     | 0%     | 4%      | 9%        | 0%        | 0%     | 0%      | 0%         | 0%          | 2%    |

| Elect_Loadshapes |                    | % of Annual Energy Savings |                            |                              |                           |                               |                              | Coincidence Factors              |                                  |
|------------------|--------------------|----------------------------|----------------------------|------------------------------|---------------------------|-------------------------------|------------------------------|----------------------------------|----------------------------------|
|                  |                    | Summer On-<br>Peak Energy  | Summer Off-<br>Peak Energy | Summer<br>Shoulder<br>Energy | Winter On-<br>Peak Energy | Winter Off-<br>Peak<br>Energy | Winter<br>Shoulder<br>Energy | Summer<br>Generation<br>Capacity | Winter<br>Generation<br>Capacity |
| 1                | Com Cooling        | 21%                        | 49%                        | 25%                          | 0%                        | 4%                            | 0%                           | 99%                              | 4%                               |
| 2                | Com Refrigeration  | 5%                         | 38%                        | 8%                           | 6%                        | 37%                           | 6%                           | 92%                              | 86%                              |
| 3                | Com Ventilation    | 5%                         | 32%                        | 7%                           | 7%                        | 43%                           | 7%                           | 90%                              | 94%                              |
| 4                | Com Heating        | 0%                         | 1%                         | 0%                           | 14%                       | 66%                           | 18%                          | 1%                               | 69%                              |
| 5                | Com Economizer     | 25%                        | 45%                        | 28%                          | 0%                        | 1%                            | 0%                           | 62%                              | 0%                               |
| 6                | Com Water Heating  | 6%                         | 33%                        | 8%                           | 10%                       | 37%                           | 7%                           | 69%                              | 85%                              |
| 7                | Com Total Building | 8%                         | 38%                        | 11%                          | 6%                        | 32%                           | 5%                           | 78%                              | 45%                              |







| Market Driven Achievable Penetrations |  | Net Penetrations (Penetration above baseline) |      |      |      |      |       |       |      |      |      |
|---------------------------------------|--|---|------|------|------|------|-------|-------|------|------|------|
| MD_PEN_TECH                           |  | 1   | 2    | 3    | 4    | 5    | 6     | 7     | 8    | 9    | 10   |
|                                       |  | 2007  | 2008 | 2009 | 2010 | 2011 | 2012  | 2013  | 2014 | 2015 | 2016 |
| 1                                     | Direct fired convection range/oven   | 0.05  | 0.1  | 0.16 | 0.23 | 0.3  | 0.15  | 0.16  | 0.17 | 0.18 | 0.19 |
| 2                                     | Exhaust Hood Makeup Air  | 0.05  | 0.1  | 0.16 | 0.23 | 0.3  | 0.2   | 0.22  | 0.24 | 0.26 | 0.28 |
| 3                                     | High efficiency ENERGY STAR fryer  | 0.05  | 0.1  | 0.16 | 0.23 | 0.3  | 0.15  | 0.16  | 0.17 | 0.18 | 0.19 |
| 4                                     | High efficiency ENERGY STAR steam cooker                                     | 0.05  | 0.1  | 0.16 | 0.23 | 0.3  | 0.15  | 0.16  | 0.17 | 0.18 | 0.19 |
| 5                                     | High efficiency griddle  |   |      |      |      |      |       |       |      |      |      |
| 6                                     | Pre-Rinse Spray Valve  |   |      |      |      |      |       |       |      |      |      |
| 7                                     | Refrigeration heat recovery  | 0.02  | 0.04 | 0.06 | 0.08 | 0.1  | 0.02  | 0.03  | 0.04 | 0.05 | 0.06 |
| 8                                     |  |   |      |      |      |      |       |       |      |      |      |
| 9                                     | Cooling system chilled water reset   | 0.04  | 0.08 | 0.12 | 0.16 | 0.2  | 0.08  | 0.09  | 0.1  | 0.11 | 0.12 |
| 10                                    | Cooling system water side economizer   | 0.04  | 0.08 | 0.12 | 0.16 | 0.2  | 0.08  | 0.09  | 0.1  | 0.11 | 0.12 |
| 11                                    | Cooling system oversized cooling tower                                       |   |      |      |      |      |       |       |      |      |      |
| 12                                    | Condensing DHW stand-alone   | 0.05  | 0.1  | 0.16 | 0.23 | 0.3  | 0.15  | 0.16  | 0.17 | 0.18 | 0.19 |
| 13                                    | Faucet aerator   |   |      |      |      |      |       |       |      |      |      |
| 14                                    | Graywater heat exchanger/GFX   | 0.02  | 0.04 | 0.06 | 0.08 | 0.1  | 0.02  | 0.03  | 0.04 | 0.05 | 0.06 |
| 15                                    | Indirect-fired DHW off space heating boiler                                  | 0.05  | 0.1  | 0.16 | 0.23 | 0.3  | 0.15  | 0.16  | 0.17 | 0.18 | 0.19 |
| 16                                    | Instantaneous, High-Modulating Water Heater                                  | 0.02  | 0.04 | 0.06 | 0.08 | 0.1  | 0.02  | 0.03  | 0.04 | 0.05 | 0.06 |
| 17                                    | Low-flow shower heads  | 0.04  | 0.08 | 0.12 | 0.16 | 0.2  | 0.08  | 0.09  | 0.1  | 0.11 | 0.12 |
| 18                                    | Pipe insulation - water heating  | 0.04  | 0.08 | 0.12 | 0.16 | 0.2  | 0.1   | 0.12  | 0.14 | 0.16 | 0.18 |
| 19                                    | Tank insulation  | 0.03  | 0.05 | 0.07 | 0.1  | 0.12 | 0.075 | 0.085 | 0.09 | 0.1  | 0.1  |
| 20                                    | Air Sealing  | 0.04  | 0.08 | 0.12 | 0.16 | 0.2  | 0.08  | 0.09  | 0.1  | 0.11 | 0.12 |
| 21                                    | Improved heating system high efficiency unit - Tier 1                        | 0.05  | 0.1  | 0.16 | 0.23 | 0.3  | 0.15  | 0.16  | 0.17 | 0.18 | 0.19 |
| 22                                    | Improved heating system condensing unit - Tier 2                             | 0.05  | 0.1  | 0.16 | 0.23 | 0.3  | 0.15  | 0.16  | 0.17 | 0.18 | 0.19 |
| 23                                    | Programmable Thermostat  | 0.03  | 0.05 | 0.07 | 0.1  | 0.12 | 0.075 | 0.085 | 0.09 | 0.1  | 0.1  |
| 24                                    | Demand-Controlled Ventilation (controller, sensor)                           | 0.05  | 0.1  | 0.16 | 0.23 | 0.3  | 0.15  | 0.16  | 0.17 | 0.18 | 0.19 |
| 25                                    | Outdoor Air Reset  | 0.05  | 0.1  | 0.16 | 0.23 | 0.3  | 0.15  | 0.16  | 0.17 | 0.18 | 0.19 |
| 26                                    | High Performance Glazing double pane, low-E, low conductivity frame - Tier 1 | 0.05  | 0.1  | 0.16 | 0.23 | 0.3  | 0.15  | 0.16  | 0.17 | 0.18 | 0.19 |
| 27                                    | High Performance Glazing triple pane, low-E, low conductivity frame - Tier 2 | 0.02  | 0.04 | 0.06 | 0.08 | 0.1  | 0.02  | 0.03  | 0.04 | 0.05 | 0.06 |
| 28                                    | Improved wall insulation   | 0.01  | 0.02 | 0.03 | 0.04 | 0.05 | 0.01  | 0.02  | 0.03 | 0.04 | 0.05 |
| 29                                    | Improved below-grade insulation  | 0.01  | 0.02 | 0.03 | 0.04 | 0.05 | 0.01  | 0.02  | 0.03 | 0.04 | 0.05 |
| 30                                    | Improved roof insulation   | 0.01  | 0.02 | 0.03 | 0.04 | 0.05 | 0.01  | 0.02  | 0.03 | 0.04 | 0.05 |
| 31                                    | Sensible Heat Recovery   | 0.04  | 0.08 | 0.12 | 0.16 | 0.2  | 0.08  | 0.09  | 0.1  | 0.11 | 0.12 |
| 32                                    | Pipe insulation - space heating  | 0.03  | 0.05 | 0.07 | 0.1  | 0.12 | 0.075 | 0.085 | 0.09 | 0.1  | 0.1  |
| 33                                    | Energy Star washer   | 0.05  | 0.1  | 0.16 | 0.23 | 0.3  | 0.15  | 0.16  | 0.17 | 0.18 | 0.19 |
| 34                                    | Swimming pool/spa covers   | 0.03  | 0.05 | 0.08 | 0.11 | 0.13 | 0.05  | 0.06  | 0.07 | 0.08 | 0.09 |
| 35                                    | Commissioning  | 0.02  | 0.04 | 0.06 | 0.08 | 0.1  | 0.02  | 0.03  | 0.04 | 0.05 | 0.06 |
| 36                                    | Retrocommissioning   |   |      |      |      |      |       |       |      |      |      |
| 37                                    | Integrated Design - High Performance (30% > codes) - Tier 1                  | 0.03  | 0.05 | 0.08 | 0.11 | 0.13 | 0.05  | 0.06  | 0.07 | 0.08 | 0.09 |
| 38                                    | Integrated Design - High Performance (50% > codes) Tier 2                    | 0.01  | 0.02 | 0.03 | 0.04 | 0.05 | 0.01  | 0.02  | 0.03 | 0.04 | 0.05 |
| 39                                    | Steam trap Maintenance   |   |      |      |      |      |       |       |      |      |      |
| 40                                    | Oxygen Trim  | 0.04  | 0.08 | 0.12 | 0.16 | 0.2  | 0.08  | 0.09  | 0.1  | 0.11 | 0.12 |
| 41                                    | Infrared Heater  | 0.05  | 0.1  | 0.16 | 0.23 | 0.3  | 0.15  | 0.16  | 0.17 | 0.18 | 0.19 |

| New Construction Achievable Penetrations |  | 0.24 | 0.24 | 0.24 | 0.24 | 0.24 | 0.24 | 0.24 | 0.24 | 0.24 | 0.24 | 0.24    | 0.24 | 0.24 | 0.24 ←scaler |  |
|--|--|------|------|------|------|------|------|------|------|------|------|---------|------|------|--------------|--|
| NC_PEN_TECH                              |  | 1    | 2    | 3    | 4    | 5    | 6    | 7    | 8    | 9    | 10   | 11      | 10   | 11   | Market       |  |
|  |  | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | Max Pen |      |      | Acceptance   |  |
| 1  | Direct fired convection range/oven   | 6%   | 9%   | 13%  | 18%  | 22%  | 22%  | 26%  | 30%  | 34%  | 39%  | 39%     |      |      | H            |  |
| 2  | Exhaust Hood Makeup Air  | 41%  | 44%  | 48%  | 52%  | 55%  | 55%  | 57%  | 60%  | 62%  | 65%  | 65%     |      |      | H            |  |
| 3  | High efficiency ENERGY STAR fryer  | 6%   | 9%   | 13%  | 18%  | 22%  | 22%  | 26%  | 30%  | 34%  | 39%  | 39%     |      |      | H            |  |
| 4  | High efficiency ENERGY STAR steam cooker                                     | 6%   | 9%   | 13%  | 18%  | 22%  | 22%  | 26%  | 30%  | 34%  | 39%  | 39%     |      |      | H            |  |
| 5  | High efficiency griddle  | 5%   | 8%   | 10%  | 14%  | 17%  | 18%  | 23%  | 27%  | 31%  | 35%  | 35%     |      |      | nce          |  |
| 6  | Pre-Rinse Spray Valve  | 0%   | 0%   | 0%   | 0%   | 0%   | 0%   | 0%   | 0%   | 0%   | 0%   | 0%      |      |      |              |  |
| 7  | Refrigeration heat recovery  | 5%   | 7%   | 8%   | 10%  | 11%  | 10%  | 12%  | 13%  | 14%  | 15%  | 15%     |      |      | L            |  |
| 8  |  | 0%   | 0%   | 0%   | 0%   | 0%   | 0%   | 0%   | 0%   | 0%   | 0%   | 0%      |      |      |              |  |
| 9  | Cooling system chilled water reset   | 34%  | 35%  | 37%  | 40%  | 42%  | 39%  | 39%  | 40%  | 41%  | 42%  | 42%     |      |      | H            |  |
| 10                                       | Cooling system water side economizer   | 34%  | 35%  | 37%  | 40%  | 42%  | 39%  | 39%  | 40%  | 41%  | 42%  | 42%     |      |      | H            |  |
| 11                                       | Cooling system oversized cooling tower                                       | 50%  | 52%  | 53%  | 55%  | 56%  | 55%  | 57%  | 58%  | 59%  | 60%  | 60%     |      |      | L            |  |
| 12                                       | Condensing DHW stand-alone   | 6%   | 8%   | 9%   | 11%  | 13%  | 10%  | 10%  | 11%  | 11%  | 11%  | 13%     |      |      | H            |  |
| 13                                       | Faucet aerator   | 0%   | 0%   | 0%   | 0%   | 0%   | 0%   | 0%   | 0%   | 0%   | 0%   | 0%      |      |      |              |  |
| 14                                       | Graywater heat exchanger/GFX   | 2%   | 3%   | 4%   | 6%   | 7%   | 5%   | 6%   | 7%   | 9%   | 10%  | 10%     |      |      | M            |  |
| 15                                       | Indirect-fired DHW off space heating boiler                                  | 1%   | 3%   | 6%   | 9%   | 11%  | 9%   | 10%  | 11%  | 12%  | 14%  | 14%     |      |      | H            |  |
| 16                                       | Instantaneous, High-Modulating Water Heater                                  | 1%   | 2%   | 3%   | 4%   | 5%   | 4%   | 5%   | 6%   | 7%   | 9%   | 9%      |      |      | L            |  |
| 17                                       | Low-flow shower heads  | 31%  | 34%  | 37%  | 40%  | 43%  | 42%  | 44%  | 46%  | 49%  | 51%  | 51%     |      |      | M            |  |
| 18                                       | Pipe insulation - water heating  | 46%  | 47%  | 49%  | 51%  | 52%  | 49%  | 49%  | 49%  | 49%  | 50%  | 52%     |      |      | H            |  |
| 19                                       | Tank insulation  | 76%  | 76%  | 77%  | 77%  | 78%  | 77%  | 77%  | 77%  | 77%  | 77%  | 78%     |      |      | H            |  |
| 20                                       | Air Sealing  | 1%   | 3%   | 6%   | 9%   | 11%  | 9%   | 10%  | 11%  | 12%  | 14%  | 14%     |      |      | H            |  |
| 21                                       | Improved heating system high efficiency unit - Tier 1                        | 1%   | 4%   | 9%   | 14%  | 18%  | 18%  | 21%  | 24%  | 27%  | 31%  | 31%     |      |      | H            |  |
| 22                                       | Improved heating system condensing unit - Tier 2                             | 6%   | 8%   | 9%   | 11%  | 13%  | 10%  | 10%  | 11%  | 11%  | 11%  | 13%     |      |      | H            |  |
| 23                                       | Programmable Thermostat  | 78%  | 78%  | 79%  | 79%  | 80%  | 79%  | 79%  | 79%  | 79%  | 79%  | 80%     |      |      | H            |  |
| 24                                       | Demand-Controlled Ventilation (controller, sensor)                           | 11%  | 15%  | 20%  | 25%  | 29%  | 29%  | 32%  | 35%  | 38%  | 42%  | 42%     |      |      | H            |  |
| 25                                       | Outdoor Air Reset  | 36%  | 38%  | 41%  | 45%  | 48%  | 47%  | 49%  | 52%  | 55%  | 59%  | 59%     |      |      | H            |  |
| 26                                       | High Performance Glazing double pane, low-E, low conductivity frame - Tier 1 | 25%  | 28%  | 32%  | 36%  | 40%  | 40%  | 43%  | 47%  | 51%  | 56%  | 56%     |      |      | H            |  |
| 27                                       | High Performance Glazing triple pane, low-E, low conductivity frame - Tier 2 | 1%   | 2%   | 3%   | 4%   | 5%   | 4%   | 5%   | 6%   | 7%   | 9%   | 9%      |      |      | L            |  |
| 28                                       | Improved wall insulation   | 0%   | 1%   | 1%   | 2%   | 2%   | 0%   | 1%   | 1%   | 1%   | 1%   | 2%      |      |      | L            |  |
| 29                                       | Improved below-grade insulation  | 1%   | 2%   | 3%   | 5%   | 6%   | 3%   | 3%   | 3%   | 4%   | 4%   | 6%      |      |      | MH           |  |
| 30                                       | Improved roof insulation   | 0%   | 1%   | 1%   | 2%   | 2%   | 0%   | 1%   | 1%   | 1%   | 1%   | 2%      |      |      | L            |  |
| 31                                       | Sensible Heat Recovery   | 16%  | 18%  | 21%  | 24%  | 27%  | 26%  | 29%  | 32%  | 36%  | 40%  | 40%     |      |      | M            |  |
| 32                                       | Pipe insulation - space heating  | 76%  | 77%  | 78%  | 79%  | 80%  | 79%  | 80%  | 81%  | 81%  | 82%  | 82%     |      |      | H            |  |
| 33                                       | Energy Star washer   | 21%  | 52%  | 59%  | 66%  | 72%  | 79%  | 100% | 100% | 100% | 100% | 100%    |      |      | H            |  |
| 34                                       | Swimming pool/spa covers   | 51%  | 53%  | 56%  | 59%  | 61%  | 61%  | 63%  | 66%  | 68%  | 70%  | 70%     |      |      | LM           |  |
| 35                                       | Commissioning  | 0%   | 2%   | 3%   | 5%   | 7%   | 7%   | 11%  | 14%  | 17%  | 21%  | 21%     |      |      | L            |  |
| 36                                       | Retrocommissioning   | 0%   | 0%   | 0%   | 0%   | 0%   | 0%   | 0%   | 0%   | 0%   | 0%   | 0%      |      |      |              |  |
| 37                                       | Integrated Design - High Performance (30% > codes) - Tier 1                  | 1%   | 3%   | 5%   | 7%   | 10%  | 9%   | 12%  | 15%  | 19%  | 23%  | 23%     |      |      | M            |  |
| 38                                       | Integrated Design - High Performance (50% > codes) Tier 2                    | 0%   | 1%   | 2%   | 2%   | 3%   | 3%   | 3%   | 4%   | 5%   | 6%   | 6%      |      |      | VL           |  |
| 39                                       | Steam trap Maintenance   | 0%   | 0%   | 0%   | 0%   | 0%   | 0%   | 0%   | 0%   | 0%   | 0%   | 0%      |      |      |              |  |
| 40                                       | Oxygen Trim  | 26%  | 28%  | 30%  | 32%  | 34%  | 32%  | 33%  | 34%  | 36%  | 37%  | 37%     |      |      | M            |  |
| 41                                       | Infrared Heater  | 1%   | 2%   | 4%   | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100%    |      |      | H            |  |



| New Construction Achievable Penetrations |  | Net Penetrations (Penetration above baseline) |      |      |      |      |       |       |      |      |      |
|--|--|---|------|------|------|------|-------|-------|------|------|------|
| NC_PEN_TECH                              |  | 1   | 2    | 3    | 4    | 5    | 6     | 7     | 8    | 9    | 10   |
| 1  | Direct fired convection range/oven   | 0.05  | 0.1  | 0.16 | 0.23 | 0.3  | 0.15  | 0.16  | 0.17 | 0.18 | 0.19 |
| 2  | Exhaust Hood Makeup Air  | 0.05  | 0.1  | 0.16 | 0.23 | 0.3  | 0.2   | 0.22  | 0.24 | 0.26 | 0.28 |
| 3  | High efficiency ENERGY STAR fryer  | 0.05  | 0.1  | 0.16 | 0.23 | 0.3  | 0.15  | 0.16  | 0.17 | 0.18 | 0.19 |
| 4  | High efficiency ENERGY STAR steam cooker                                     | 0.05  | 0.1  | 0.16 | 0.23 | 0.3  | 0.15  | 0.16  | 0.17 | 0.18 | 0.19 |
| 5  | High efficiency griddle  | 0.02  | 0.04 | 0.06 | 0.08 | 0.1  | 0.02  | 0.03  | 0.04 | 0.05 | 0.06 |
| 6  | Pre-Rinse Spray Valve  |   |      |      |      |      |       |       |      |      |      |
| 7  | Refrigeration heat recovery  | 0.02  | 0.04 | 0.06 | 0.08 | 0.1  | 0.02  | 0.03  | 0.04 | 0.05 | 0.06 |
| 8  |  |   |      |      |      |      |       |       |      |      |      |
| 9  | Cooling system chilled water reset   | 0.05  | 0.1  | 0.16 | 0.23 | 0.3  | 0.15  | 0.16  | 0.17 | 0.18 | 0.19 |
| 10                                       | Cooling system water side economizer   | 0.05  | 0.1  | 0.16 | 0.23 | 0.3  | 0.15  | 0.16  | 0.17 | 0.18 | 0.19 |
| 11                                       | Cooling system oversized cooling tower                                       | 0.02  | 0.04 | 0.06 | 0.08 | 0.1  | 0.02  | 0.03  | 0.04 | 0.05 | 0.06 |
| 12                                       | Condensing DHW stand-alone   | 0.05  | 0.1  | 0.16 | 0.23 | 0.3  | 0.15  | 0.16  | 0.17 | 0.18 | 0.19 |
| 13                                       | Faucet aerator   |   |      |      |      |      |       |       |      |      |      |
| 14                                       | Graywater heat exchanger/GFX   | 0.04  | 0.08 | 0.12 | 0.16 | 0.2  | 0.08  | 0.09  | 0.1  | 0.11 | 0.12 |
| 15                                       | Indirect-fired DHW off space heating boiler                                  | 0.05  | 0.1  | 0.16 | 0.23 | 0.3  | 0.15  | 0.16  | 0.17 | 0.18 | 0.19 |
| 16                                       | Instantaneous, High-Modulating Water Heater                                  | 0.02  | 0.04 | 0.06 | 0.08 | 0.1  | 0.02  | 0.03  | 0.04 | 0.05 | 0.06 |
| 17                                       | Low-flow shower heads  | 0.04  | 0.08 | 0.12 | 0.16 | 0.2  | 0.08  | 0.09  | 0.1  | 0.11 | 0.12 |
| 18                                       | Pipe insulation - water heating  | 0.05  | 0.1  | 0.16 | 0.23 | 0.3  | 0.15  | 0.16  | 0.17 | 0.18 | 0.19 |
| 19                                       | Tank insulation  | 0.03  | 0.05 | 0.07 | 0.1  | 0.12 | 0.075 | 0.085 | 0.09 | 0.1  | 0.1  |
| 20                                       | Air Sealing  | 0.05  | 0.1  | 0.16 | 0.23 | 0.3  | 0.15  | 0.16  | 0.17 | 0.18 | 0.19 |
| 21                                       | Improved heating system high efficiency unit - Tier 1                        | 0.05  | 0.1  | 0.16 | 0.23 | 0.3  | 0.15  | 0.16  | 0.17 | 0.18 | 0.19 |
| 22                                       | Improved heating system condensing unit - Tier 2                             | 0.05  | 0.1  | 0.16 | 0.23 | 0.3  | 0.15  | 0.16  | 0.17 | 0.18 | 0.19 |
| 23                                       | Programmable Thermostat  | 0.03  | 0.05 | 0.07 | 0.1  | 0.12 | 0.075 | 0.085 | 0.09 | 0.1  | 0.1  |
| 24                                       | Demand-Controlled Ventilation (controller, sensor)                           | 0.05  | 0.1  | 0.16 | 0.23 | 0.3  | 0.15  | 0.16  | 0.17 | 0.18 | 0.19 |
| 25                                       | Outdoor Air Reset  | 0.05  | 0.1  | 0.16 | 0.23 | 0.3  | 0.15  | 0.16  | 0.17 | 0.18 | 0.19 |
| 26                                       | High Performance Glazing double pane, low-E, low conductivity frame - Tier 1 | 0.05  | 0.1  | 0.16 | 0.23 | 0.3  | 0.15  | 0.16  | 0.17 | 0.18 | 0.19 |
| 27                                       | High Performance Glazing triple pane, low-E, low conductivity frame - Tier 2 | 0.02  | 0.04 | 0.06 | 0.08 | 0.1  | 0.02  | 0.03  | 0.04 | 0.05 | 0.06 |
| 28                                       | Improved wall insulation   | 0.02  | 0.04 | 0.06 | 0.08 | 0.1  | 0.02  | 0.03  | 0.04 | 0.05 | 0.06 |
| 29                                       | Improved below-grade insulation  | 0.04  | 0.09 | 0.14 | 0.2  | 0.25 | 0.12  | 0.13  | 0.14 | 0.15 | 0.16 |
| 30                                       | Improved roof insulation   | 0.02  | 0.04 | 0.06 | 0.08 | 0.1  | 0.02  | 0.03  | 0.04 | 0.05 | 0.06 |
| 31                                       | Sensible Heat Recovery   | 0.04  | 0.08 | 0.12 | 0.16 | 0.2  | 0.08  | 0.09  | 0.1  | 0.11 | 0.12 |
| 32                                       | Pipe insulation - space heating  | 0.03  | 0.05 | 0.07 | 0.1  | 0.12 | 0.075 | 0.085 | 0.09 | 0.1  | 0.1  |
| 33                                       | Energy Star washer   | 0.05  | 0.1  | 0.16 | 0.23 | 0.3  | 0.15  | 0.16  | 0.17 | 0.18 | 0.19 |
| 34                                       | Swimming pool/spa covers   | 0.03  | 0.05 | 0.08 | 0.11 | 0.13 | 0.05  | 0.06  | 0.07 | 0.08 | 0.09 |
| 35                                       | Commissioning  | 0.02  | 0.04 | 0.06 | 0.08 | 0.1  | 0.02  | 0.03  | 0.04 | 0.05 | 0.06 |
| 36                                       | Retrocommissioning   |   |      |      |      |      |       |       |      |      |      |
| 37                                       | Integrated Design - High Performance (30% > codes) - Tier 1                  | 0.04  | 0.08 | 0.12 | 0.16 | 0.2  | 0.08  | 0.09  | 0.1  | 0.11 | 0.12 |
| 38                                       | Integrated Design - High Performance (50% > codes) Tier 2                    | 0.01  | 0.02 | 0.03 | 0.04 | 0.05 | 0.01  | 0.02  | 0.03 | 0.04 | 0.05 |
| 39                                       | Steam trap Maintenance   |   |      |      |      |      |       |       |      |      |      |
| 40                                       | Oxygen Trim  | 0.04  | 0.08 | 0.12 | 0.16 | 0.2  | 0.08  | 0.09  | 0.1  | 0.11 | 0.12 |
| 41                                       | Infrared Heater  | 0.05  | 0.1  | 0.16 | 0.23 | 0.3  | 0.15  | 0.16  | 0.17 | 0.18 | 0.19 |



| Retrofit Achievable Penetrations |  | Net Penetrations (Penetration above baseline) |        |        |       |        |
|----------------------------------|--|---|--------|--------|-------|--------|
| RET_PEN_TECH                     |  | 1   | 2      | 3      | 4     | 5      |
|                                  |  | 2007  | 2008   | 2009   | 2010  | 2011   |
| 1                                | Direct fired convection range/oven   |   |        |        |       |        |
| 2                                | Exhaust Hood Makeup Air  |   |        |        |       |        |
| 3                                | High efficiency ENERGY STAR fryer  |   |        |        |       |        |
| 4                                | High efficiency ENERGY STAR steam cooker                                     | 0.00125                                       | 0.0025 | 0.0035 | 0.005 | 0.0075 |
| 5                                | High efficiency griddle  |   |        |        |       |        |
| 6                                | Pre-Rinse Spray Valve  | 0.005   | 0.01   | 0.015  | 0.02  | 0.03   |
| 7                                | Refrigeration heat recovery  | 0.0025  | 0.0035 | 0.0045 | 0.005 | 0.005  |
| 8                                |  |   |        |        |       |        |
| 9                                | Cooling system chilled water reset   | 0.005   | 0.01   | 0.015  | 0.02  | 0.03   |
| 10                               | Cooling system water side economizer   | 0.0035  | 0.005  | 0.0075 | 0.01  | 0.0125 |
| 11                               | Cooling system oversized cooling tower                                       | 0.00125                                       | 0.0025 | 0.0035 | 0.005 | 0.0075 |
| 12                               | Condensing DHW stand-alone   | 0.0035  | 0.005  | 0.0075 | 0.01  | 0.0125 |
| 13                               | Faucet aerator   | 0.005   | 0.01   | 0.015  | 0.02  | 0.03   |
| 14                               | Graywater heat exchanger/GFX   | 0.00125                                       | 0.0025 | 0.0035 | 0.005 | 0.0075 |
| 15                               | Indirect-fired DHW off space heating boiler                                  | 0.0035  | 0.005  | 0.0075 | 0.01  | 0.0125 |
| 16                               | Instantaneous, High-Modulating Water Heater                                  | 0.0035  | 0.005  | 0.0075 | 0.01  | 0.0125 |
| 17                               | Low-flow shower heads  | 0.005   | 0.01   | 0.015  | 0.02  | 0.03   |
| 18                               | Pipe insulation - water heating  | 0.0035  | 0.005  | 0.0075 | 0.01  | 0.0125 |
| 19                               | Tank insulation  | 0.005   | 0.01   | 0.015  | 0.02  | 0.03   |
| 20                               | Air Sealing  | 0.005   | 0.01   | 0.015  | 0.02  | 0.03   |
| 21                               | Improved heating system high efficiency unit - Tier 1                        | 0.00125                                       | 0.0025 | 0.0035 | 0.005 | 0.0075 |
| 22                               | Improved heating system condensing unit - Tier 2                             | 0.00125                                       | 0.0025 | 0.0035 | 0.005 | 0.0075 |
| 23                               | Programmable Thermostat  | 0.005   | 0.01   | 0.015  | 0.02  | 0.03   |
| 24                               | Demand-Controlled Ventilation (controller, sensor)                           | 0.005   | 0.01   | 0.015  | 0.02  | 0.03   |
| 25                               | Outdoor Air Reset  | 0.005   | 0.01   | 0.015  | 0.02  | 0.03   |
| 26                               | High Performance Glazing double pane, low-E, low conductivity frame - Tier 1 |   |        |        |       |        |
| 27                               | High Performance Glazing triple pane, low-E, low conductivity frame - Tier 2 |   |        |        |       |        |
| 28                               | Improved wall insulation   |   |        |        |       |        |
| 29                               | Improved below-grade insulation  |   |        |        |       |        |
| 30                               | Improved roof insulation   |   |        |        |       |        |
| 31                               | Sensible Heat Recovery   | 0.0025  | 0.0035 | 0.0045 | 0.005 | 0.005  |
| 32                               | Pipe insulation - space heating  | 0.0035  | 0.005  | 0.0075 | 0.01  | 0.0125 |
| 33                               | Energy Star washer   |   |        |        |       |        |
| 34                               | Swimming pool/spa covers   | 0.0025  | 0.0035 | 0.0045 | 0.005 | 0.005  |
| 35                               | Commissioning  |   |        |        |       |        |
| 36                               | Retrocommissioning   | 0.005   | 0.01   | 0.015  | 0.02  | 0.03   |
| 37                               | Integrated Design - High Performance (30% > codes) - Tier 1                  |   |        |        |       |        |
| 38                               | Integrated Design - High Performance (50% > codes) Tier 2                    |   |        |        |       |        |
| 39                               | Steam trap Maintenance   | 0.005   | 0.01   | 0.015  | 0.02  | 0.03   |
| 40                               | Oxygen Trim  | 0.0035  | 0.005  | 0.0075 | 0.01  | 0.0125 |
| 41                               | Infrared Heater  | 0.0025  | 0.0035 | 0.0045 | 0.005 | 0.005  |