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Review of Carrier CO₂NSERVATION Meter Model

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TIAX LLC has conducted a thorough review of the models used to calculate the ongoing reduction of CO₂ equivalent (CO_{2e}) greenhouse gas emissions that can be attributed to the high efficiency refrigeration and space cooling and heating products that Carrier produces and sells globally, as displayed by the CO₂NSERVATION Meter on the Carrier web site home page. As elaborated below, we have found that the CO₂NSERVATION Meter provides a good, conservative estimate of the CO_{2e} emission reductions that are attributable to the high efficiency products that Carrier has sold since 2000 in several product categories – residential air conditioners, heat pumps and gas furnaces; packaged commercial rooftop air conditioners; HVAC chillers; supermarket refrigeration systems; and transport refrigeration systems.

A CO_{2e} emissions and emissions reduction model has been developed by Carrier for each of these product lines. The common approach to each of these models begins with defining the baseline efficiency, estimating the average capacity and annual operating hours and calculating the resulting energy consumption (electric energy, natural gas, or Diesel fuel, as appropriate) for baseline efficiency and premium efficiency products. Then annual energy savings is determined for each year's production, beginning in 2000, based on the actual sales of baseline and premium efficiency products. Since these products have lifetimes in excess of 15 years, the annual energy savings for each year of product sales are summed through the present. The resulting reduction of CO_{2e} emissions that can be attributed to reduced energy consumption is determined by multiplying the energy savings by CO_{2e} emission factors that are appropriate for the energy source and geographic region. Specifically for each of these steps:

- Definition of the baseline efficiency – this has been based on the legally established minimum efficiency where there is an applicable efficiency standard – these exist for residential cooling and heating equipment and commercial air conditioning equipment (e.g, NAECA minimum efficiency, ASHRAE 90.1 minimum efficiency). For products where minimum efficiency standards have not been set, the baseline efficiency is based on the baseline or entry tier Carrier product.
- Average capacity and annual operating hours have been estimated based on either or both of customer survey data and well vetted models that have been used to support broader standards development, e.g., ASHRAE 90.1 mechanical systems efficiency standards.
- Actual sales data by product and by geographic region has been used throughout
- The CO_{2e} emission factors that have been used have been taken from authoritative sources and include the emissions attributable to the full cycle of fuel production, processing, and transport and on-site combustion. The CO_{2e} emission factors for electric energy use include the preceding up to the power plant plus the impact of transmission and distribution losses.


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