GUIDELINES FOR SPECIFYING WEATHERSHIFT™ FUTURE WEATHER FILES ARGOS ANALYTICS, LLC

February 2017

Each set of WeatherShift future weather files contains three files for the specified location, time period and emission scenario (RCP), one each at the 10th, 50th and 90th percentiles of warming for that period. They are derived from a larger ensemble of climate projections and the 50th percentile file represents the warming midpoint for that ensemble. In other words, half of the projections are cooler and half are warmer. Because of inherent uncertainty with respect to future climate conditions, there is no way to know which of the files will most closely match actual climate conditions during the specified period so a risk management approach to cooling and heating system design is appropriate. In most cases, this will entail making use of more than one set of files.

The uncertainty has three main sources. The first is that there is no way of knowing what future emissions of Greenhouse gases (GHG) will be. For the Fifth Assessment projections, the IPCC defined several scenarios, referred to as Representative Concentration Pathways or RCPs. The two RCPs that were mandatory were RCP 4.5 and 8.5. RCP 4.5 can be thought of as a moderately aggressive mitigation scenario with GHG concentrations stabilizing shortly after 2100. As a point of reference, the current pledges for reduced emissions under the Paris climate agreement are less than those required for RCP 4.5. RCP 8.5 can be thought of as “business as usual” with emissions continuing to rise throughout the 21st century.

The other two sources of uncertainty are differences between the climate models that generated the projections and the natural variability of the climate. The latter stems from the chaotic nature of the climate system, sometimes referred to as “the butterfly effect”, which means that very small differences in initial conditions can lead to large differences in future conditions. As a result of natural variability, there would be a substantial range in possible future climate conditions even if we knew precisely what future emissions would be and if we had a perfect model of the climate. This is the reason that we use multiple projections from multiple climate models, referred to as a multimodel ensemble, to explore the range of future possibilities.

When using TMY3 files as a starting point, obtaining a set of files for 2020 for RCP 8.5 is recommended to provide data for current climate conditions, since the historical weather data used to construct those files was recorded from 1976-2005 for most TMY3 files and is now approximately 25 years out of date.

The choice of future time period should be based on the design life of the building in question. For buildings with a design life of 25 years or less, obtaining a set of files for the time period closest to the end of that interval for RCP 8.5 is recommended, as the difference between projections for RCP 4.5 and RCP 8.5 is not that great over that period. For cooling systems, running simulations at both the 50th and 90th percentiles will provide insight into system performance for both midpoint and upper tail warming. For heating systems, running simulations at both the 10th and 50th percentiles will provide insight into system performance for both lower tail and midpoint warming.

For buildings with a design life greater than 25 years, obtaining a set of files for the time period closest to the end of that interval for both RCP 8.5 and RCP 4.5 is recommended, since the difference between projections for the two becomes increasingly greater over time. For cooling systems, running simulations at both the 50th and 90th percentiles for RCP 8.5 will provide insight into system performance for both midpoint and upper tail warming based on the higher future emissions it assumes. For heating systems, running simulations at both the 10th and 50th percentiles for RCP 4.5 will provide insight into system performance for both lower tail and midpoint warming based on relatively lower future emissions it assumes.