FINDING BALANCE *AGAIN*: IS IT AS EASY AS *1,2,3*?

Recently, I attended a conference where a speaker remarked – almost in passing – about how easy it is to get confused by references to Scope 1, Scope 2, and Scope 3 emissions in the multitude of guidance documents on greenhouse gas (GHG) measurement, reporting and disclosures. The speaker was right. It can all be very confusing; not to mention frustrating. However, this confusion can at least be partially alleviated with a recognition that these references merely describe specific applications of a process that chemical engineers deal with on a regular basis. That process is the process of *defining the system* that is being analyzed.

Typically, the first exposure chemical engineering students get to their designated major is a course on analyzing mass and energy balances. One of the key skills they learn is how to define the system whose balances are to be analyzed. A system can be single piece of equipment, a process unit, or even an entire plant. Once the system is defined, a box can be drawn around it, and the real work of balancing the materials and energy flowing into and out of the system can begin.

Similarly, one can conceptualize the emission scopes described in GHG guidance documents – such as those issued under the banner of the GHG Protocol or EPA's Center for Corporate Climate Leadership –by drawing boxes around the emission scopes, or *systems*, described in these publications. In the case of Scope 1 emissions, this can be as simple as drawing a box around one or more of an organization's manufacturing facilities. For Scope 2 emissions, this box can be expanded to include all or part of the utility operations that supply power for the organization's manufacturing facilities. For Scope 3 emissions, the box can be expanded even further to include an organization's transportation fleets, pipeline networks, and the manufacturing facilities of suppliers and customers.

Once these boxes are drawn, one can begin to gain a conceptual understanding of an organization's GHG emissions by relying on another key concept that students in a mass and energy balance class learn: *For steady state systems, whatever goes in must come out*. This concept – while fundamental, and perhaps even intuitive – is important because ultimately, GHG emissions are a critical part of the system's mass balances and are also directly related to the system's energy balances. This concept applies whether one is talking about carbon atoms, nitrogen atoms, or BTUs of energy. (See the article entitled *New Administration Readiness Check-up: Finding Balance* from the Inaugural Edition of The Cubical. The full article can be accessed by clicking here.)

An understanding of these basic concepts does not necessarily arm one with the tools necessary to measure and analyze an organization's GHG emissions in detail. However, such an understanding can make it easier to keep up when discussions about an organization's GHG emissions reporting and disclosures turn to deeper topics such as which carbon-containing molecules should be counted, or which customers or vendors should be included in an organization's Scope 3 emissions.