Thermo Fisher Scientific E-liability Pilot Project Report

Background and Purpose

The E-liability Institute ("ELI") provides support and expertise to organizations interested in piloting the E-ledger method,[1] on a pro bono basis. As mutually agreed upon by the pilot organization and ELI, the purpose of this Report is to summarize the objectives, design, processes, and insights from the completed pilot project, for the pilot organization, the E-liability Institute, potential pilot organizations and partners, and the general public.

Project Objectives

Thermo Fisher Scientific ("Thermo Fisher") worked with ELI to pilot the E-liability method to better understand this method as compared to other carbon accounting methods. The primary objectives of the pilot included:

- Establishing a baseline understanding of the E-liability method for tracking emissions.
- Identifying the data required to robustly utilize said method and explore availability of such data across the value stream.
- Providing development opportunities for Thermo Fisher's Design for Sustainability team members to gain a broader perspective on various carbon accounting schemes.

Project Design and Scope

Thermo Fisher is the world leader in serving science, with annual revenue over USD $40 billion. Thermo Fisher's mission is to enable its customers to make the world healthier, cleaner and safer. A global company based in Waltham, Massachusetts, Thermo Fisher provides a combination of innovative technologies across four complementary segments: life science solutions, specialty diagnostics, analytical instruments, and laboratory products and biopharma services. Thermo Fisher is committed to protecting the planet and helping others do the same, and has committed to reach net-zero emissions by 2050. Its net-zero plan includes investments for impact, use of renewable electricity across its operations, engagement to amplify supplier progress, and the design of more sustainable products for its customers. To measure the impacts of these efforts, Thermo Fisher understands the importance of carbon accounting methodologies that provide increased visibility to system-level and product-level carbon reduction efforts.

[1] Kaplan and Ramanna, 2021; Kaplan and Ramanna, 2022; Kaplan, Ramanna, and Roston, 2023.

The pilot activity stemmed from discussions between the ELI and Thermo Fisher Global Sustainability leadership. Thermo Fisher committed three months of resourcing to explore the pilot objectives outlined above. The pilot focused on a single Thermo Fisher product offering, a 96-well Polymerase Chain Reaction (PCR) plate. The 96-well PCR plate is a widely used molecular biology tool for scientific research and molecular diagnostics. The PCR plate had also been utilized to pilot other carbon accounting techniques at the product level, and therefore was an attractive pilot candidate because the value chain and manufacturing steps were well understood and documented from earlier related work.

The Thermo Fisher team involved for this pilot included Global Product management and members of the Global Sustainability function; including the Senior Manager, Sustainable Materials; Senior Manager, Greener by design™ lead; and Environmental Sustainability Manager. These team members were integral to the outcome of the pilot and benefitted from having prior related experience in product carbon footprint (PCF), engaging supply chain partners for carbon-related data, and manufacturing facility energy use and greenhouse gas (GHG) emissions.

Processes and Results

How was data from beyond Thermo Fisher (i.e., upstream value chain) obtained?	The product bill of materials identified the components and raw materials associated with the PCR plate. Value chain data for the components and raw materials was obtained via communication with the respective Tier 1 distributors and suppliers. Outreach occurred via phone, electronic communication, and video conferences for over a month period. Where Tier 1 distributors did not have the requested data readily available, engagement with the Tier 2 suppliers was required. Where possible, Thermo Fisher worked directly with the Tier 2 suppliers to speed data acquisition.
How was data from Thermo Fisher production (i.e., manufacturing process, and electricity data) obtained?	Thermo Fisher collects energy data for all its sites globally. The manufacturing facility producing the PCR plate, including injection molding, product finishing, and assembly processes, operates on electricity only.
What existing data was leveraged as part of the pilot?	In conjunction with an earlier pilot to measure the product’s carbon footprint, the project team had mapped the main raw materials, and main direct and indirect activities associated with the production of the PCR plate.
What other methods (if any) were used for data collection?	For one raw material, emissions information was not provided by the supplier. As a result, an industry average emission factor was utilized for an equivalent material. Additionally, the latest UK Government GHG Conversion Factors for Company Reporting emission factors were applied to primary data for inbound transportation and waste.

What digital tools were used to aggregate and/or analyze data?	Thermo Fisher utilizes a cloud-base sustainability solution to collect and manage environmental sustainability data including calculation of GHG emissions.
What type of accounting was selected for modeling operational emissions?	For this exercise, the energy use from the manufacturing equipment, while the building operational emissions considered were limited to the cleanroom, where the PCR plates are manufactured. Operational emissions of the clean room space were modeled based on the energy intensity of the entire facility.
What type(s) of calculations and/or analyses were performed?	The estimated emissions of the PCR plate were calculated utilizing the E-liability method, to the level of granularity possible based on the data collection methods described above and availability of data. This output was then compared to previous exemplary PCF calculations from earlier pilots based on generally accepted carbon accounting principles from ISO and GHG protocol. The intent of this comparison was to understand similarities and differences between E-liabilities method and other PCF standards as well as what drove any differences.

Thermo Fisher produced a spreadsheet-based model calculating total emissions of the 96-well PCR plate from a previous PCF assessment activity and expanded upon it to incorporate elements of the E-liability method where possible. Differences existed between the previous PCF approach and that of E-liability, but many of the elements were found to be complementary. As further discussed in the section below, due to the lack of full E-ledgering inputs from the upstream supply chain actors, utility providers, and others, many aspects had to be modeled. Opportunities for differentiation in approach identified by the ELI team included incorporating emissions stemming from the allocation of capital goods emissions or administrative office emissions footprint – neither of which were included in earlier PCF pilot work. The final model completed under this exercise resulted in the following breakdown of the product's cradle-to-gate emissions.

Life Cycle Stage	**% of Cradle-to-Gate Emissions Calculated***
Raw materials and inbound transport	54%
Manufacturing (i.e., primarily electricity usage/Scope 2)	39%
Outbound transport to distribution center	7%

**Due to rounding, values may not aggregate to 100%*

Challenges, Questions, and Further Considerations

Data collection

Thermo Fisher reached out to the suppliers of the three primary materials for the 96-well PCR plate: resin, plastic resealable polybag, and carton. Thermo Fisher was able to obtain primary data from the resin and carton suppliers but was unable to for the resealable polybag. This challenge highlights the importance of having business partners who have a strong understanding and capability to provide PCF or e-ledgering inputs. Such an understanding is needed to maximize the potential of the E-liability method.

Data analysis

The data analysis process was conducted smoothly. The project team used spreadsheets to aggregate and calculate emissions per PCR plate while trialing the E-liability method. Independently, Thermo Fisher used a 3rd party life cycle analysis software solution to calculate PCF based on ISO and GHG Protocol methodologies. The project team observed similar results between the manual spreadsheet calculations and 3rd party solution. Having existing processes to collect primary data from facilities and manufacturing processes is paramount to executing either a PCF or E-liabilities emissions analysis.

Project management

The Thermo Fisher project team provided project management oversight with leadership support as needed. The team benefitted from regular touchpoints with the ELI staff. Thermo Fisher found value in having a cross-functional team with experience in supplier engagement, environmental data collection and reporting, product development, and manufacturing processes.

E-liability method exceptions

Electricity use from the manufacturing equipment was included, as was electricity consumption to support the cleanroom space. While it is understood that a cleanroom may have higher energy intensity than other space types, for purposes of this pilot, emissions of the cleanroom were modeled on a square footage basis from the overall facility electricity use. A future opportunity suggested by the ELI team to better align with the E-liability method was to use activity-based costing and allocating between different products that are manufactured in the cleanroom.

The modeled PCF excluded embodied emissions associated with the capital equipment used in the manufacturing process and building space not directly used for manufacturing (e.g., administrative offices). This is a noted methodology difference between generally accepted carbon accounting principles (e.g., ISO and GHG Protocol) and the concept of E-ledgering and the E-liability method.

Learnings and Insights

Thermo Fisher welcomed the opportunity to explore the differences between previous PCF pilot work and the methodology developed by ELI. Upon completion of the pilot, Thermo Fisher better understands these differences, and how the E-liability method could, if sufficiently scaled, be leveraged to more granularly understand and account for cradle-to-gate emissions.

Currently, Thermo Fisher uses an economic-intensity approach to allocate value chain emissions associated with customers' purchased goods and services. Though widely recognized as an acceptable approach in alignment with current emissions accounting frameworks, this is a highly aggregated approach. Widespread adoption of a PCF methodology, such as the E-liability method, could enable companies to assign cradle-to-gate emissions to customers based on the specific products and volumes they purchase. Thermo Fisher understands the growing importance of sustainability for its customers and is working toward a future where primary data is increasingly more comprehensive, however existing engagement in the supply chain suggests that significant challenges continue to exist in developing capability, expertise, and the required data sharing for fully robust emissions accounting and ledgering as described by E-liability.

Upon completion of the pilot, Thermo Fisher has taken the learnings from this pilot and is utilizing them as one of the inputs to inform the development of a scalable approach to generating PCF.

Specific to the product being analyzed, two “hot-spots” were identified as opportunities for emissions reductions associated with the cradle-to-gate life cycle of the 96-well PCR plate. Those hotspots were the emissions from the raw material plastic resin and the electricity used for manufacturing the product. These findings help support Thermo Fisher’s current areas of investment and focus with respect to decarbonization, including investment in renewable electricity for its manufacturing sites, development of its Greener by design™ capabilities to utilize more sustainable and lower-carbon raw materials, and capability building in its supply chain to assist suppliers in better measurement, management, and reduction of emissions.

The E-liability Institute also gained knowledge and insights from participation in this pilot. Similar to previous pilots, engaging suppliers continues to be a challenge. Thermo Fisher was able to engage two of three relevant suppliers associated with the pilot product. It is unclear what the participation barrier was for the third supplier, but potential issues may include lack of available data, a cost-benefit disparity associated with calculating and providing data, or fear of revealing trade secret or confidential information. The ELI team believes these challenges could potentially be addressed in the future through training, contracting, technology, or other regulatory or market-based incentives.

Thermo Fisher and other organizations have piloted the E-liability approach utilizing an individual product or limited number of products and services (the so-called E-liability version 1.0). The ELI team recognizes that to convince companies to scale their adoption of such an approach (both within their organizations and along their supply chains), the benefits (financial and non-financial) must outweigh the costs. As an example, if a product purchaser is willing to pay a premium for a lower-carbon product, then the manufacturer can compare the economic benefits (such as revenue growth or increased market share) and costs (efforts to accurately track carbon emissions, and investments to reduce emissions based on said tracking).