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SUSTAINABILITY + ALTERNATE AND RENEWABLE ENERGIES

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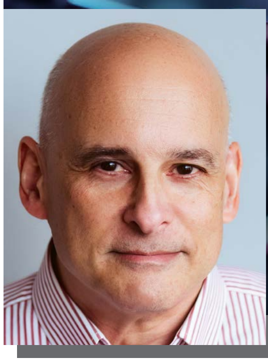
SUSTAINABILITY + ALTERNATE AND RENEWABLE ENERGIES

FEATURED STORIES

IN THIS ISSUE

NANOMATERIAL STANDARDS ARE CRITICAL TO RENEWABLE ENERGY ADVANCEMENT

Mike Leibowitz, Technical Fellow – NEMA
Secretary to IEC TC 55. Convenor of IEC TC 121/SC 121A/MT 20. USNC TAG Secretary to TC 2, TC 44, TC 109, TC 114, TC 121. Member of: USNC TAGs to IEC TC 113, SC 121A, and SC 121B; USNC CAPCC; USNC Rules & Procedures Committee.



Growth in the use of nanomaterials in renewable energy and energy storage applications is vital for the expansion of more efficient and long-lasting PV and wind energy systems and electric vehicle batteries. The ability to measure nanomaterial electrochemical properties, e.g., conductivity, resistivity, capacity, as well as density, performance, and cycling life is vital to ensure that the nanomaterials used function as they should, and can do so over a long period of time.

The use of electrochemical capacitors, which are used in renewables as well as EVs, high speed trains, aircraft, and electronics, are popular due to their ultra-fast charge/discharge capability, long cycle life, extended working temperature range, high reliability, and low maintenance. One type of electrochemical capacitor is the electric double layer capacitor (EDLC). Based on their energy storage mechanism, large specific surface materials such as nanoporous activated carbon, carbon aerogel, carbon nanotubes, carbon black, graphene, nanographene sheet, and vapor-grown carbon fiber are often used as the active material in EDLCs to optimize electrode conductivity, a vital property for EDLC electrochemical performance.

The performance of these carbon nanomaterials when used in EDLCs is largely based on the assembled device, such as a coin cell EDLC, a three-electrode cell EDLC, or a cylindrical cell EDLC. Coin cell EDLCs in particular are flexible, highly efficient, and adopted heavily by research and industry. Given their widespread use, there is need for internationally accepted standardized test methods to determine the electrochemical key control characteristics of the carbon nanomaterial used in EDLCs.

IEC TC 113 is in the process of developing a Technical Specification, IEC TS 62607-4-9, for these measurement techniques to provide end users internationally accepted methods for evaluating carbon nanomaterials from different vendors on a level playing field. Without reference to an international set of metrics for evaluating the properties of the nanocarbon material used in the EDLC, the EDLC producer does not have a standard uniform way of verifying the performance claims of different vendors and applying the results in their production and quality control systems.

In the energy storage space, lithium-ion batteries to date have been the dominant means of storing power. As growth in the use of anode and cathode nanomaterials grows to increase storage capacity, there is a need for standardized measurement techniques to evaluate water and metal impurity content to ensure these batteries operate safely, and to determine the carbon content in these nanomaterials to ensure proper conductivity, resistivity, capacity, performance, and cycling life. Overall, the characterization of the electrochemical properties of anode and cathode nanomaterials used in lithium-ion batteries will be vital for advancing battery technology. IEC Technical Specifications in the IEC 62607-4 series provide standard methodologies that end users can utilize to characterize the electrochemical properties of new anode and cathode nanomaterials and compare different types of nanomaterials during research, and to compare materials among different vendors.

U.S.-based suppliers and end users of these nanomaterials have the opportunity to impact this standardization work by joining the IEC TC 113 USNC Technical Advisory Group (TC 113 US TAG) and have a voice in how these key control characteristic measurements are established. Contact Mike Leibowitz, IEC TC 113 US TAG Secretary, at mike.leibowitz@nema.org to join.

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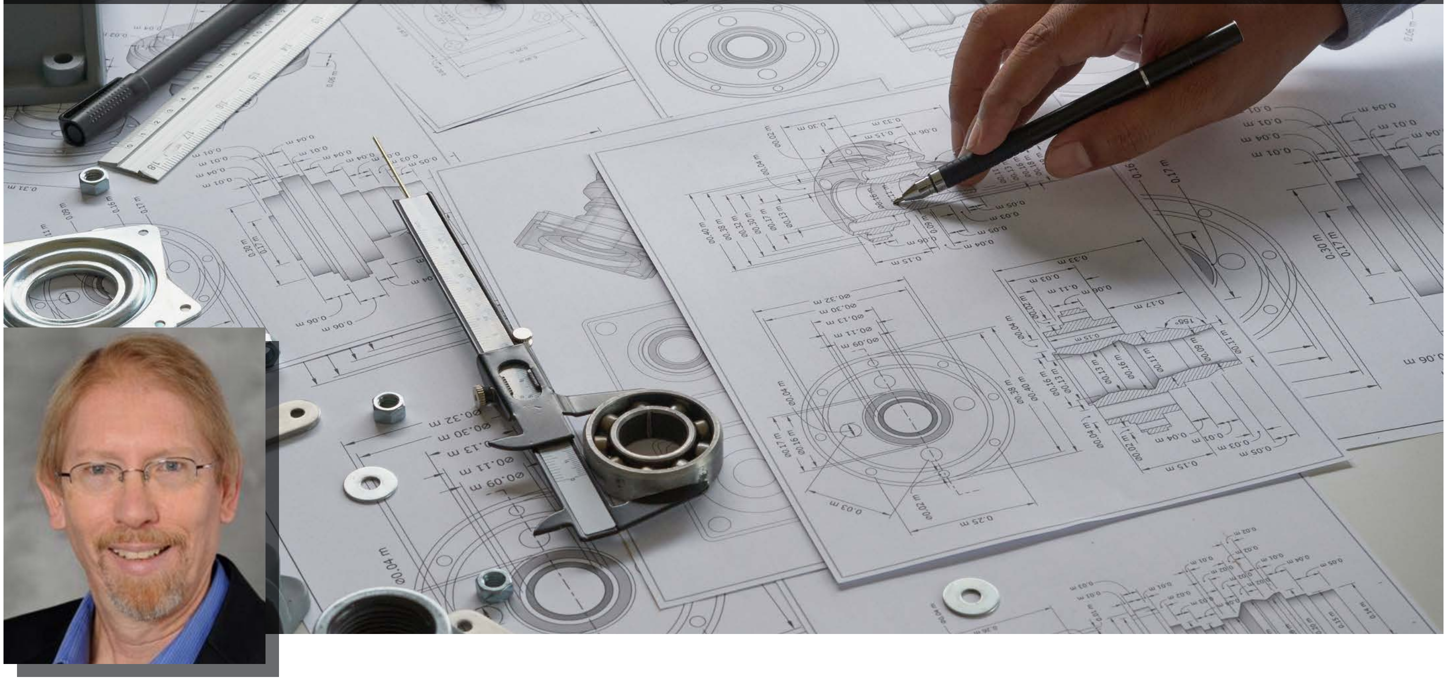
GRASPING FOR SUSTAINABILITY? STANDARDS COME TO THE RESCUE!

Roger L. Franz – Member of USNC TAG to IEC TC 111



INTRODUCTION

The UN Sustainability Goals are broad in scope. In this piece, however, we focus on three areas related specifically to product design, as numbered by the UN:

The UN goal on Climate Action is largely in response to studies published by the Intergovernmental Panel on Climate Change, the sixth and most recent report, dated March 2023.

All of this is not new, even though recently the heat has been turned up, so to speak. It was back in 1987 that the UN Brundtland Commission Report first defined global sustainability.

From a standards perspective, moving ahead again to the year 2010, ANSI/IEC 62430-2010, *American National Standard for Environmentally Conscious Design for Electrical and Electronic Products*, provided guidance to electrical and electronic product engineers. This standard was then updated several years later to IEC 62430:2019, *Environmentally conscious design (ECD) - Principles, requirements and guidance*.

IMPORTANT TAKE-AWAYS FROM IEC 62430:2019

Many of the requirements here are about governance and record keeping in product design for a manufacturing enterprise. While a product engineer would no doubt comply with a company's processes and procedures, the IEC Standard provides several more specific directions to a product engineer on what to consider from an awareness perspective, like Life Cycle Thinking, as shown in sections 4, 4.1 and 4.2.

(see following page)

4 PRINCIPLES OF ENVIRONMENTALLY CONSCIOUS DESIGN (ECD)*

4.1 GENERAL

The application of the following principles is fundamental to implement ECD:

» life cycle thinking
» ECD as a policy of the organization

4.2 LIFE CYCLE THINKING

Life cycle thinking includes, but is not limited to, the following elements:

» having an objective to reduce the overall adverse environmental impacts of the product while still taking into account other aspects such as safety and quality
» identifying the significant environmental aspects of the product
» considering the trade-offs between different environmental aspects throughout all life cycle stages

EXAMPLE 1: The trade-off between energy and material use when replacing an old product with a new one.

» considering the trade-offs of a specific environmental aspect between life cycle stages

EXAMPLE 2: Consider an automobile; selecting lightweight materials (e.g. high-alloy steel or aluminum) could require more energy to be expended in the manufacturing stage, but the trade-off would be lower fuel consumption during the use stage (due to the lower mass).

NOTE: When a product is part of a system, the environmental performance of that product, during one or more life cycle stages, can be altered by other products in that system.

In order to include life cycle thinking within ECD, the above elements are considered as early as possible in the design and development, since that is when the greatest opportunities exist to make improvement to the product and to reduce any consequential adverse environmental impact.

The key actions supporting life cycle thinking include: beginning with an objective to reduce environmental impact; identifying and considering design options across the product's life cycle; and doing so early in design and development.

Performing a formal design review is another key requirement as listed in section 5.5.2. Many companies already incorporate design reviews at one or more stages of new product development, but IEC 62430 spells it out with respect to the environmental impact considerations.

5.5.2 DESIGN REVIEW*

The organization shall establish, implement, and maintain a process to review the ability to further reduce significant environmental impacts of products.

These reviews shall be conducted at planned intervals or when necessary, to ensure that each life cycle stage is considered, taking into account changes in both internal and external factors (such as revised relevant stakeholder requirements).

Improvement actions shall be determined and implemented based on knowledge gained through the review if:

» the environmental objectives have not been met, or;
» the environmental objectives are no longer appropriate or valid.

IEC 62430 provides a useful table of specific areas where Design for Sustainability can engage.

TABLE A.1 – EXAMPLES OF PRODUCT-RELATED ENVIRONMENTAL IMPROVEMENT STRATEGIES*

Design focus area	Options for design improvement
Design for material sourcing	Consider reducing weight and volume of product
	Increase the reuse of products via manufacturing
	Increase the use of recycled materials to replace virgin materials
	Increase the reuse of components and sub-assemblies
	Reduce the use of scarce materials
	Minimize/eliminate the use of substances hazardous to health or the environment
	Decrease the need for consumables
	Decrease the quantity of energy (e.g. electricity, oil) used throughout the product's life cycle
	Specify materials that emit low or zero volatile organic compounds (VOCs) throughout the product's life cycle
	Use materials with a low environmental footprint
Design for manufacture	Reduce energy consumption
	Reduce consumption of natural resources, e.g. water
	Reduce process waste
	Use internally recovered or recycled materials from process waste
	Reduce emissions to air, water, and soil during manufacture
	Consider reducing number of parts
	Reduce use of hazardous process chemicals (e.g. volatile solvents)
Design for transport and distribution	Minimize product size and weight
	Optimize shape and volume for maximum packing density
	Optimize transport/distribution in relation to energy efficiency and emissions
	In concert with choice of transportation used, maximize reuse of packaging where possible
	Reduce embodied energy in packaging
	Use packaging that emits low or zero VOCs
	Increase use of recycled materials in packaging
	Increase the sharing rate (ride share options) of commuting cars
Design for use (including installation and maintenance)	Reduce energy consumption in use
	Reduce consumption of natural resources, including water, in use
	Optimize quantity and nature of consumables
	Maximize product lifetime by designing for durability and reliability
	Maximize product lifetime by designing for ease of maintenance
	Maximize product lifetime by designing for repairability
	Maximize product lifetime by designing for refurbishment/remanufacturing
	Reduce emissions to air, water, and soil
	Minimize/eliminate hazardous substances during use

Each Design Focus Area in Table A.1. contains specific environmental improvement strategies. These may be summarized under each area as follows; text following the bold titles are comments based on the author's experience and are not a part of the IEC 62430 standard.

- **Design for material sourcing:** It is generally reported that some 80% or so of a product's carbon footprint is related to material selection. Trade-offs between material choices that can satisfy product performance and reliability requirements, and at the same time conserve the use of materials and their environmental impact, are covered here.
- **Design for manufacture:** Use of resources, not the least of which are related to energy consumption during production, and infrastructure of the factories themselves, figure into this section.
- **Design for transport and distribution:** The distance and mode of transportation has clear impacts and opportunities for optimization.
- **Design for use (including installation and maintenance):** The environmental scope of the product may be defined as raw materials through manufacturing only (Cradle to Gate). But if the use phase is considered, it may have significant impacts to the overall product life cycle. For example, fuel or electricity using products may have a significant use phase impact—not so much for a passive product such as furniture.
- **Design for end of life:** Again, depending on the environmental scope being considered, the recovery of original materials to re-enter the circular economy is considered here. Ideally, if some portions of a larger product can be redeployed for additional service in the field, that can reduce or at least delay loss of resources. Recycling as a material back to the circular economy is the next choice, which is being done today with examples like single-use food containers made of recyclable plastics such as PET, or to some degree with electronics products where copper and precious metals can be recovered and remade into new products to reduce the impact of mining new metals.

THE ECOSYSTEM OF ENVIRONMENTAL STANDARDS

Standards are inter-related even when published by different standards organizations. For example, in the IEC 62430 Bibliography, we find these related ISO standards:†

> ISO 14001:2015, *Environmental management system – Requirements with guidance for use*
>
> ISO 14006:2011, *Environmental management systems – Guidelines for incorporating ecodesign*
>
> ISO 14020, *Environmental labels and declarations – General principles*
>
> ISO 14040: 2006, *Environmental management – Life cycle assessment – Principles and framework*

ISO 14006, *Guideline for incorporating ecodesign*, also calls into play certain actions by product designers. One of its first sections is similar to the IEC standard, such as in "Section 0.3 – Life cycle thinking and trade-offs." Further details of ISO 14006 are not reviewed here; however, this illustration about the interplay of standards from ISO 14006 shows how the various standards are related:†

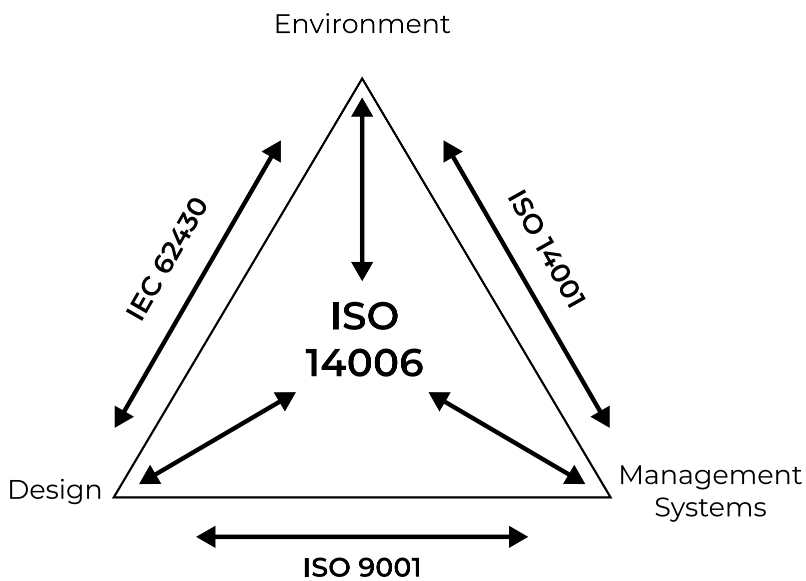


Figure 1 — Relationship between ISO 14001, ISO 9001, IEC 62430, and ISO 14006, and the functional areas of knowledge

You can readily see the interaction of standards for ecodesign, management systems, and environment.

In addition to the above, one of the key standards focusing on carbon footprint reporting is:

ISO 14067:2018, *Greenhouse gases – Carbon footprint of products – Requirements and guidelines for quantification.*

ISO 14067 metrics are used to compare scores of final products, using formal LCA techniques that the individual product design engineer may or may not directly use, since LCA requires specific expertise.

To round out the suite of environmental standards, Material Declarations are important for not only resource management, but the management and control of regulated substances and other substances of concern that could be harmful to life and the environment. The IEC 62430 bibliography lists this standard:

IEC 62474, *Material declaration for products of and for the electrotechnical industry*

IEC 62474 is a business-to-business reporting standard to ensure ease of information sharing and consistency across the supply chain. It specifies a means to report substances and materials in a machine-readable XML (Extensible Markup Language) format. IEC 62474 is accompanied by a list of reportable substances that may be found in electrical and electronic products, the IEC 62474 database on material declaration.

To round out the standards ecosystem, as a participant in the IPC Materials Declaration Task Group, I need to also mention the IPC-1752A Materials Declaration Management standard. Its purpose is the same as IEC 62474 and uses an XML format. Interaction between IPC and IEC has ensured that the two standards are very similar, although not quite identical. Both rely on software for implementation.

WHAT DID YOU LEARN IN SCHOOL?

Design for Sustainability is now a mainstream requirement coming from governments, regulators, and customers. Much of this is new to mechanical or electrical product designers, although some engineering programs are increasingly adding courses on environmental aspects to traditional engineering curricula. It is probably fair to say that Design for Environment may be new to most engineers who have graduated from traditional engineering school programs, depending on location—with the important caveat that European universities have been developing strong environmental product engineering programs for some time now.

"Inevitably, mechanical engineers must also be sustainability engineers."
- Michael Johnson, ASME, Aug. 11, 2022.

Electrical and electronic engineering has always been the domain of power management and will continue to remain so, more than ever now with electrification supplanting the burning of fossil fuels. Standards related to electrical power efficiency have largely been the domain of the IEEE (Institute of Electrical and Electronic Engineers) Standards Association, as well as extending to the IEEE 1680 series on environmental assessment of electronics products.

CONCLUSIONS

This article has summarized some of the specific ways that IEC 62430 and related standards can be applied today to the pressing needs of climate action. These actions can readily be extended to reduce other environmental impacts as well, for example emissions to air and water, and reduction in the use of toxic substances.

Consideration of eco-design standards may be built into aids like checklists for design reviews and goals formally specified in product requirements documents. Legislation like the European Green Deal and Circular Economy Action Plan will move such actions from conformance to voluntary standards to compliance with legal requirements. The number of requests we see growing across the supply chain for sustainable reporting will continue to increase.

Standards are critical to our sustainable future.

SETTING A HIGHER STANDARD TO GET RID OF GREENWASHING

Caitlin D'Onofrio, Sustainability Program Manager – UL Standards & Engagement

As a globally influential standards development organization (SDO) working in partnership with national and regional stakeholders around the world, UL Standards & Engagement (ULSE) is dedicated to incorporating sustainability and sustainable practices into our diverse portfolio of standards and documents. Our Sustainability program strives to provide a higher level of focus to our contribution to and impact on global sustainability through standardization, while also proactively addressing industry trends and emerging technologies.

One specific trend we have focused on in recent years is the circular economy—a term often used to describe the sustainability efforts of companies as they shift away from a linear approach in favour of a circular production model to mitigate their effects on the triple planetary crisis on climate, biodiversity, and pollution. This circular model keeps materials and products in a circular loop system longer, to help eliminate waste, reuse materials, and lower the greenhouse gases caused by the energy needed to make these products.

In the past, it has been difficult for companies to quantify their circular performance—often leading to greenwashing, which occurs when companies advertise incorrect or generic environmental claims of a product's circular performance. To help prevent greenwashing and provide consumers with a reliable metric for analyzing a company's sustainable practices and products, ULSE collaborated with industry stakeholders to develop and publish UL 3600, the Standard for Measuring and Reporting Circular Economy Aspects of Products, Sites, and Organizations.

HOW UL 3600 CAN HELP COMPANIES SUBSTANTIATE SUSTAINABILITY CLAIMS

UL 3600 is the first standard that assists companies in evaluating circular economy efforts and measuring corporate sustainability at the site, product, and/or company level. The standard provides a gauge of circularity of a company's material flows and social governance, and it also provides a report, which is a comprehensive assessment of a company's circular economy initiatives of material flow, and its corporate social responsibility elements. These factors include evaluating worker safety and health, as well as diversity, equity, and inclusion (DE&I) in the company's workforce—to help encourage continuous improvement and reporting on environmental, social, and corporate governance (ESG) to stakeholders.

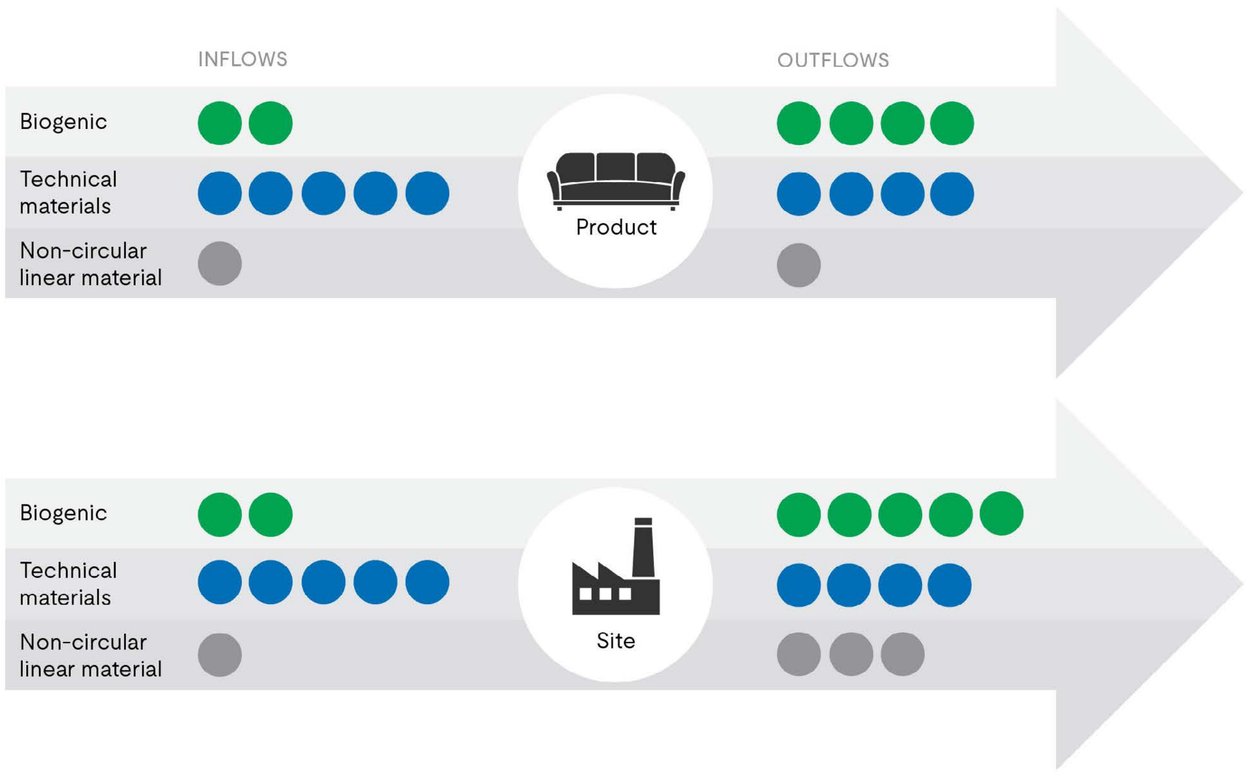
The UL 3600 report creates a framework for a company to publicly share its sustainability and safety performance, enabling consumers and stakeholders to assess the company's commitment to the circular economy and its impact on the environment and human health. The report also provides a benchmark for a company to compare its performance against its peers, which can help it differentiate itself from competitors and build a reputation as a leader in sustainability and safety.

The circular economy report is compiled by using methods and metrics outlined in UL 3600. Aspects include, but are not limited to, material flows and the impacts of those flows. The standard is split into two major parts: measuring the material flows (measurement methods) and measuring the impacts of those flows (analytics). The metrics and measures are focused on materials and the flow of those materials as a result of the activities of an organization and from any products manufactured by the organization. In addition to the materials and flows, activities and impacts from those materials and flows in other parts of the supply chain should be included where they represent significant impact and will be used as a modifier on the material flows. By addressing both flows and impacts, UL 3600 seeks to address the progress toward sustainability in a more holistic way.

MEASURING OVERALL CIRCULARITY

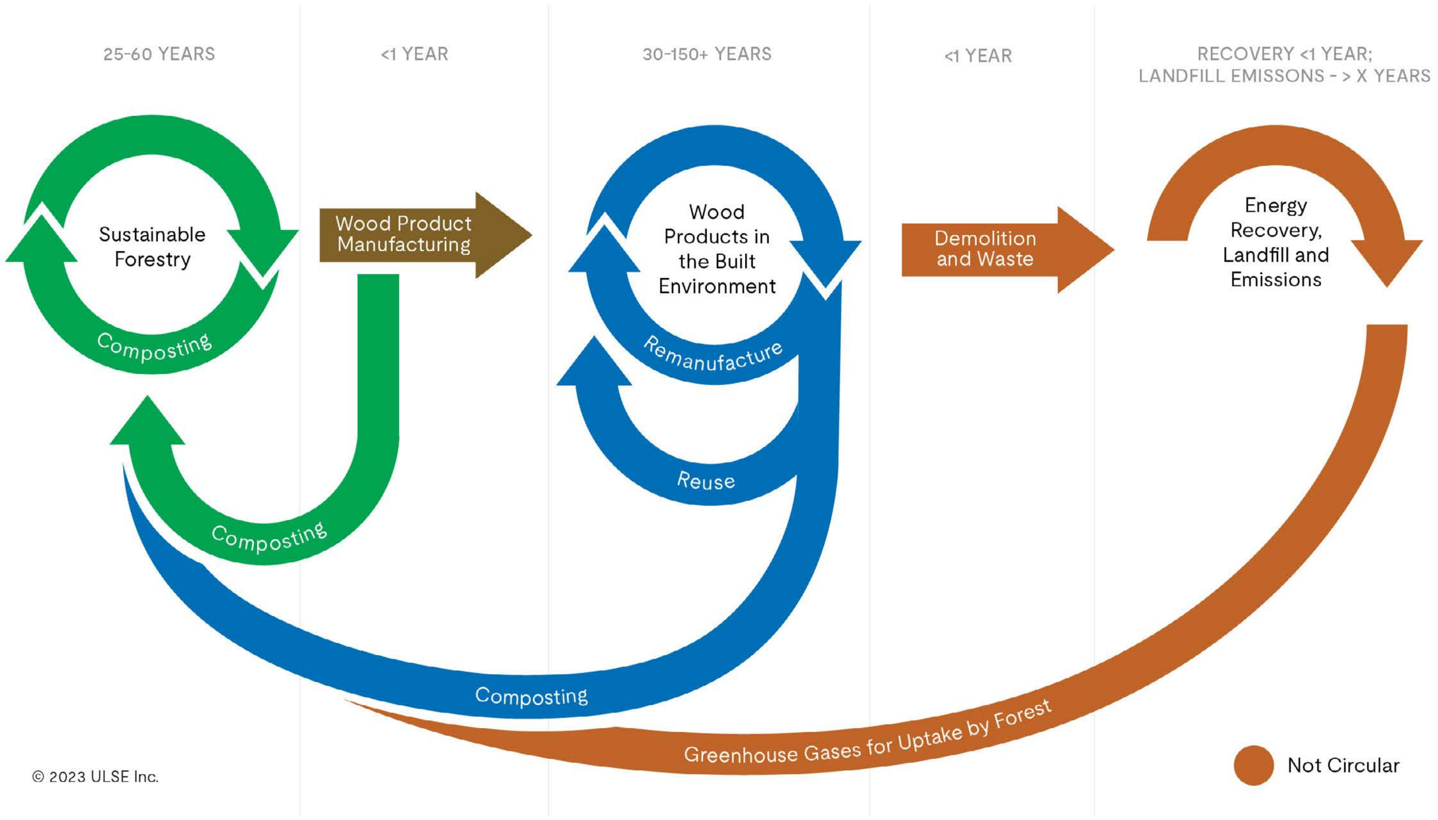
The overall circularity is determined by measuring upstream and downstream material flows, or inflows and outflows. Materials are grouped into product flows and site flows when determining inflows and outflows. Figure 1 below represents the flow of materials through a site and/or product and includes materials

Figure 1: Material Inflows and Outflows for a Product and for a Site



that become products, along with the ancillary materials that are used at the site but are not shipped with the product. The material categories defined on the inflow side of the diagram can either be single materials or those contained in a component, product, or subassembly from an earlier stage in the material flow. Biogenic inflows include new and recycled biobased materials, and biogenic outflows include biochemical sources, composted materials, anaerobic digestion, biofuels, and recycled biobased content—all of which contribute to the regeneration of natural systems. Technical material inflows and outflows are those that are recycled, reused, refurbished, or circulated in a closed loop, along with byproducts, with the objective of keeping these materials in use rather than discarding. Non-circular linear materials are composed of parts or components that do not meet any of the circular categories, and are disposed at landfills, incinerated, or used for thermal processing with energy recovery after use. Through the evaluation criteria and reporting methods listed above, UL 3600 can help to quantify the circular economy efforts of companies as they aim to eliminate waste, reuse and/or repurpose materials, and regenerate natural resources through their processes. As sustainability awareness continues to gain momentum and drive consumer behaviors, UL 3600 can serve as a valuable tool for companies looking to promote the sustainability and safety of their circular economy initiatives (without greenwashing), and it can also help them improve their performance, increase transparency, and differentiate themselves in a competitive marketplace.

Figure 2: Biobased and Technical Material Flows Within the Wood Carbon Life Cycle



NOTE: Circular materials are subdivided into biogenic (green) and technical materials (blue); non-circular flows are orange; transition between biogenic and technical flow is shown in brown.

HOW YOU CAN GET INVOLVED

UL Standards & Engagement is dedicated to promoting global safety through the development of consensus standards that guide the performance and sustainability of new and evolving technologies and services. Our standards development process is open and transparent. Anyone can participate by submitting a proposal, or by applying for membership on one of our Technical Committees (TCs). The consensus-based process relies on the input of diverse, knowledgeable experts who ensure standards are comprehensive, sustainable, and focused on driving safety in line with the UL mission statement of working for a safer world.

If you would like to share your expertise and help to develop standards in your industry, learn more about voting and nonvoting roles in our standards development process and how you can get involved at ULSE.org/get-involved. If you have questions about standards development or our work, contact us at ULSE.org/contact. To access UL and ULC Standards documents, or to sign up for alerts, visit ShopULStandards.com. At ShopULStandards.com, UL standards and other documents can be purchased or viewed for free using our Digital View feature (with site registration).

JUST PUBLISHED

Check out the latest and greatest recently published standards by the IEC. A complete list of recently published documents can be found **here**. Here's just one (of many!) we think you'll find interesting:

IEC 63333:2023 PRV PRE-RELEASE VERSION: GENERAL METHOD FOR ASSESSING THE PROPORTION OF REUSED COMPONENTS IN PRODUCTS

IEC 63333:2023 deals with the assessment of the proportion of reused components in products on a horizontal level, which can be applied at any point in the life of the product. This document applies to electrical and electronic products. It can also be applied to other product types.

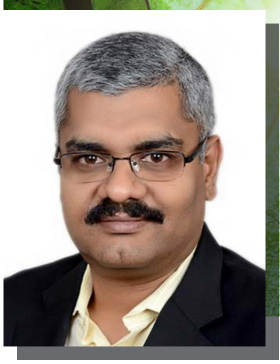
Intended to be used in the assessment of the proportion of reused components in products, this document can also be used by technical committees when developing assessment methods dedicated to their product or product-group publications.

Aspects like performance, validation, verification, and suitability of reused components are not in the scope of this document. It is the responsibility of the user of this document to address these aspects.

This document has the status of a horizontal publication in accordance with IEC Guide 108. Developed by IEC TC 111.

SMART BUILDING SYSTEMS RATING: A MECHANISM TO PULL THE FUTURE FORWARD

Sudhi Ranjan Sinha, Vice President, Ecosystems and Service Development – UL Solutions, Member of USNC TAG to IEC SyC Smart Cities



Commercial buildings have been considered “smart” for several decades, with digital technologies satisfying building operation specifications since the 1990s. Throughout this period, “smart” has been relative to what technology solutions were available, affordable, and acceptable to the buildings’ markets. Original Equipment Manufacturers (OEMs), who develop these smart systems, have tried to set the pace of new technology adoption for the industry—to bring new capabilities to their customers, differentiate their products and systems, and create a competitive advantage. But that pace, no matter the decade, was always met with the market realities of winning on bid day with new product offerings and working through the local end-to-end contracting thickets at the building project level. These market realities continue to be compounded with:

- A highly fragmented and localized market that sets building operational best practices through an interpretative and design-to-installed solution process
- Confidence gaps in the contracting process that feeds aversion to new solutions
- Lack of whole building operational standards that would provide an acceptable baseline

Just because something was labeled as smart, advanced, or intelligent, doesn’t mean it has earned the trust to be included in a building construction or retrofit project, especially if no independent 3rd party agency has validated such claims and the associated value.

It took at least 10 years from the mid-1980s through the mid-1990s for newly developed digital technologies, which were smart at the time, to be fully trusted inside a commercial building. The OEMs worked hard (and continue to do so today) to advance their market position, keep up with digital technologies, fix product problems, and create new uses, all while operating in a steep learning curve of advancing technologies and market acceptance. Not until the industry found common ground in the applicable use of reliable technologies did the buildings’ market adopt standards and specifications that were predominately digital solutions. But this common ground happened largely through contracting trades as they set best practices locally, fundamentally setting the early smart building standards for the industry. Standards organizations needed to catch up to the wave of installations while continuing to research and advance building operating standards that could best be satisfied with digital technologies. Consultants and specifying engineers paid close attention to these paradigm shifts, and into the early 2000s created a solid foundation for the beginning of the “smart” building evolution.

The digital revolution was met with further market challenges in the mid-1990s through the early 2000s. The advancement of communicating digital technologies from the OEMs was predominately siloed and proprietary, making it costly and risky to advance the intelligence of the building through integrated systems. Systems relied on siloed working solutions, patched together with OEM gateways via installing contractors, without a whole building operational system in mind. Throughout that period, the strength of the demand in the market drove OEMs into technical consolidation, and standards organizations into developing new industry standards that allowed the interoperability of digital systems to emerge. There was again a market forcing factor that the OEMs, standards organizations, and integrating contractors had to navigate to advance the applicability of their technology offerings.

A similar but emerging story can be told about the 2010s through today. OEMs are setting an accelerated pace of innovation that owners, general contractors, consultants, integrating contractors, and building operators are trying to keep up with (and trust) within their operation. But again, the lens they look through to get the intended operational outcome of the building is not consistent throughout the contracting process. Expectations and capability gaps exist between the major stakeholders.

- Owners want investment value and assurances
- Consultants want innovation with predictability
- General Contractors (GCs) want working solutions and outcome control
- Installing contractors want lower risk and control of project cost overruns

To help bridge these gaps, OEMs need to further understand that they have a significant role to play in the unification of smart building stakeholders through their offerings. The market needs the assurance that technologies will not only work as intended, but are purposely built with an operational mindset for the whole building.

A big difference emerging today, though, is that smart building technology value expectations are growing. Commercial buildings are continually being operated more as an asset than as an expense, and the building needs to serve the operation of the business versus just housing the operation. The need for the building to serve the “mission of the business” is creating higher operational expectation pressure from owners and operators, which is beginning to drive different behaviors in the market. The pressure is coming in the form of owners and GCs asking the chains of influence throughout the engineering, technology selection, and project delivery processes to get their act together. This means, in one sense, finding standard solutions that meet the promises set by smart building specifications and financial operating cost projections. The OEMs must continue to play a critical role in this journey.

THE OEM OPPORTUNITY

Over the years, it has been, and still is, tedious and slow to push the contracting industry into the Smart Building business through building project specifications. Contractors (installers, integrators, service providers) will perform to the interpretation of a specification, but not necessarily embrace the work to a point that drives their innovation. The industry is extremely local and fragmented, and collating industry best practices is very difficult without a holistic mechanism that bridges the fragmentation of the industry. A seamless link between the design intent of the specification process to the product properly operating in a building is a key success factor and critical to establishing the dominance of an OEM's technology offering. OEMs are an important part of a complex owner-to-contractor equation. Their technologies are the foundation of a successful smart building, but also the foundation of the expected seamless link between design intent and actual performance.

Planning and designing to provide this link can be a new and differentiating way to drive preference for a technology and/or a system of technologies. Providing predictability to the operation and "mission of the building" performance will drive new levels of acceptance and credibility and help bridge the industry's fragmentation gaps. Contractors and distributors who can leverage technologies that are designed to encompass and function in a whole building approach will gain preference because they support the value expectations set by the owner and the specification developer.

The industry uses standards today to direct and recommend how technical components need to be interoperable, but not necessarily how they need to perform in the context of a whole building ecosystem. The interoperability between technologies has been mostly solved, but the standards around the holistic operation of a smart building are still evolving. A smart building technology rating system that takes a comprehensive approach to guide and project new foundations of design criteria will provide a trusted path to bridging the gaps in a fragmented owner-to-contractor, contracting process.

UL SMART BUILDING SYSTEMS RATING PROGRAM

A smart building technology rating system can help enhance OEM's product roadmaps in several key dimensions that are recognizable and valuable to the owner (value and ROI to the business) and the contractor delivery processes (trusted and reliable working systems). The dimensions include:

- **Functional Value:** It's critical for technologies to better serve the "mission of the building." For example, features that enable the building's systems to function with advanced service capabilities, work order generation, automatic report generation, use pattern recognition, degrading performance analysis, and advanced analytics all assist the functional alignment to the goals of the building.
- **Resilience:** Buildings are always under some type of operational stress. Operational stressors can include, but are not limited to, weather, occupant use, equipment capacity/failure, and technology communication failure. Protecting the operation of the building (and its occupants) from the impact of system failures and degrading performance not only gives confidence to owners and operators but also provides an opportunity for the contracting chain to translate their experiences into the use of these technologies. For example, technologies that enable root cause determination, preemptive alerts, degrading performance warnings, system health checks, and easy automatic software upgrades help the building maintain operational consistency as well as support efficiency in servicing the building.
- **Cybersecurity:** Remote connectivity and the advancements in open digital systems interconnectivity have accelerated the threat potential for bad actors to impact the operations of the building and the business within it. Cybersecurity for building systems is especially complex because of the heterogeneity of the systems, protocols, devices, and various control capabilities. Cybersecurity capability needs to be continually advanced to be automatically initiated within building technologies so it can be normalized and standardized within contracting processes. Establishing functional standards through embedding cyber-protecting advancements directly into OEM products delivers a consistent baseline and levels of acceptable and affordable protection.
- **Digital Experience:** The useability of smart building technology is central to realizing the full capability of installed technologies. A building operator, service technician, and design/build or installing contractor

all touch the useability of the smart building technology system. Easily configured features such as custom dashboards and widgets, building maps, roles, and permission structures, as well as self-configuring data structures and expandable data storage systems, all help further establish a functional usability standard for smart buildings.

- **Controls and Automation:** The controllability of systems is central to the operational integrity and performance of interconnected systems and sub-systems within a smart building. Advanced capabilities such as self-tuning, diagnostics, and degrading performance analysis, AI, Model Predictive Control, and Digital Twin all provide capabilities that can be leveraged and designed into the system. Standardizing on a well-tested and verified approach to advanced building controllability creates predictability and trust throughout the contracting process and among critical economic stakeholders.
- **Connectivity and Interoperability:** Smart buildings are comprised of sub-systems interconnected into systems that interoperate and serve the operational needs of a building. The capability and expansion capacity within the interconnected system to reliably transport and analyze data is critical to realizing the full potential of the installed technologies. Features such as open APIs, point mapping, easy subscription software upgrades, failsafe communication redundancy, data compression, system self-testing, alarm routing, and point binding are well-established and tested technologies that, when standardized, give the industry a new connectivity baseline that can be reliably specified and installed.

Driving designs and product lines to consistently incorporate the above helps drive competency, predictability, and reliable value into the smart technology delivery process. Having technologies come ready "out of the box" and smart building rated helps both the contractor meet the intent of a specification and the owners (plus their representatives) realize the expectations of the investment. Taking as much of the guesswork and "art" out of the process and project is to everyone's benefit. Driving whole building functionality from the product side up into the contracting process lessens the natural reflex of contractors, consultants, and owners to pull back from technologies that are not very well understood and over-promised to perform.

As IT technologies and methods quickly advance throughout building network architectures, the OEMs have additional opportunities to drive whole-building functional standards and further bridge the contracting fragmentation gaps. OEM products that take advantage of modern technologies that support smart building functionality and lessen the need for installation and operational specialization gain favor with the market because they reduce ownership risk throughout the contracting process from the distributor, contractor, and owner. Like the IT industry over the past decades, a highly certified IT technician was needed to interconnect the data between servers and gateways and bind devices to each other. Today, one can add a printer to a network by just plugging it into an ethernet port. The IT industry matured and bridged fragmentation gaps with both technical and operational standards and now competes on a functional whole network basis versus the individual parts. Smartphones have quickly evolved and now set another level of ease of use and information retrieval. Most people can update their phone to the latest version while keeping their apps when upgrading—once again bridging user gaps and changing the competitive landscape to functionality.

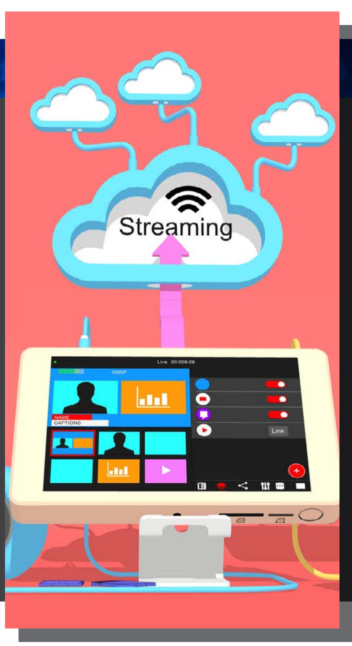
A Smart Building technology rating system has additional advantages when it is connected to a smart building assessment program like UL's SPIRE. This program not only provides a smart building capability assessment for owners and operators, but it also provides hard-to-acquire feedback on the technological conditions of buildings investing to become smart. This assessment program provides a valuable market data source for the continual development of functional standards used by OEMs in their product development.

Operational standards that focus on the functionality of a building also provide a unifying force across the OEM product industry. Providing standards of functionality to overcome and bridge the barriers to developing and operating a smart building for the sake of the customer and the industry is positive for the maturity of the industry. Being recognized for following smart building standards helps in the identification and formation of strategic relationships within the OEM industry. It has a leveling effect across innovators with a wide range of investment risk profiles as the recognition of compliance to a functional standard gives some comfort to the risk of ongoing investment.

CONCLUSION

History has taught that the commercial building business is somewhat slow to adopt and adapt to new technologies and needs running proof before major investments in change are made. This risk aversion is primarily due to the realization that mistakes or non-performance are very expensive to the operation of the building and the contained enterprise. The industry has a high sensitivity to investing in advanced "smart" technologies without a clear path to a prescribed ROI. The fragmentation of the market and the confidence gaps in bridging technical solutions through the contracting process feeds into the aversion.

The OEM industry can help bridge and ease some of this risk aversion through the recognition and use of smart building functional standards. Owners and building operators generally trust technologies will work as an individual system but have general concerns that they will add enough value when they are part of an enterprise of technologies. Designing and developing technologies that are inclusive of functional standards involving Cybersecurity, Resiliency, Connectivity, and Interoperability can create a new level of trust in the end-to-end contracting process. Relieving any level of mistrust will not only provide differentiation for the OEM but also develops a preference for the technology across the industry. Standards are not the end-all solution to the growth and market confidence of the building technology industry, but when structured as an affirmation of what works, they can help drive the next level of competency throughout the contracting process, ultimately bridging the trust in performance gaps that exist in the smart building market today.



ANSI MEMBERSHIP WEBINARS

Membership in ANSI is the key to unlocking the benefits and opportunities that standardization can provide. Standardization and conformity assessment activities lead to lower costs by reducing redundancy, minimizing errors, and reducing time to market, resulting in enhanced profitability.

These interactive 30-minute webinars—held on the first Friday of each month and free of charge—are hosted live and provide an overview of ANSI's activities, as well as information on how to take full advantage of ANSI membership. A Q&A session encourages active dialogue between all participants.

For more details, visit our **website**!

AN ABUNDANCE OF MARINE ENERGY: SOON TO BECOME A REALITY

IEC editorial team

Award presentation to Flex Marine CEO and Technical Director David Mummery by Alistair MacKinnon, IECRE Chair – Geneva, Switzerland/Glasgow, UK, 31 May 2023

Over 70% of the earth's surface is covered by oceans, which offers one of the largest untapped sources of energy on earth. And while renewables such as offshore wind and floating solar are gradually being deployed in coastal regions of oceans, marine energy harnessed from tides, waves, river currents, and ocean thermal energy converters (OTEC) systems have had a slow start. This is now about to change.

Novel designs and concepts that underpin marine energy generation require systematic verification and a validation process to identify, quantify, analyze, and manage operational risks of deployment.

The Technology Qualification (TQ) process through the IEC technical specification (IEC TS 62600-4) provides a starting point for marine energy converters to achieve certification, which is an important step to attract finance and provide confidence that the technologies have been independently assessed in terms of safety, efficiency, and reliability.

Today, the world's first internationally recognized Feasibility Statement for a tidal energy converter was awarded to a Scottish marine energy systems manufacturer: Flex Marine Power Ltd. This was a major step in opening a pathway for the certification and the manufacture of scalable and affordable marine power-generation solutions that can be deployed in a wide range of coastal locations.

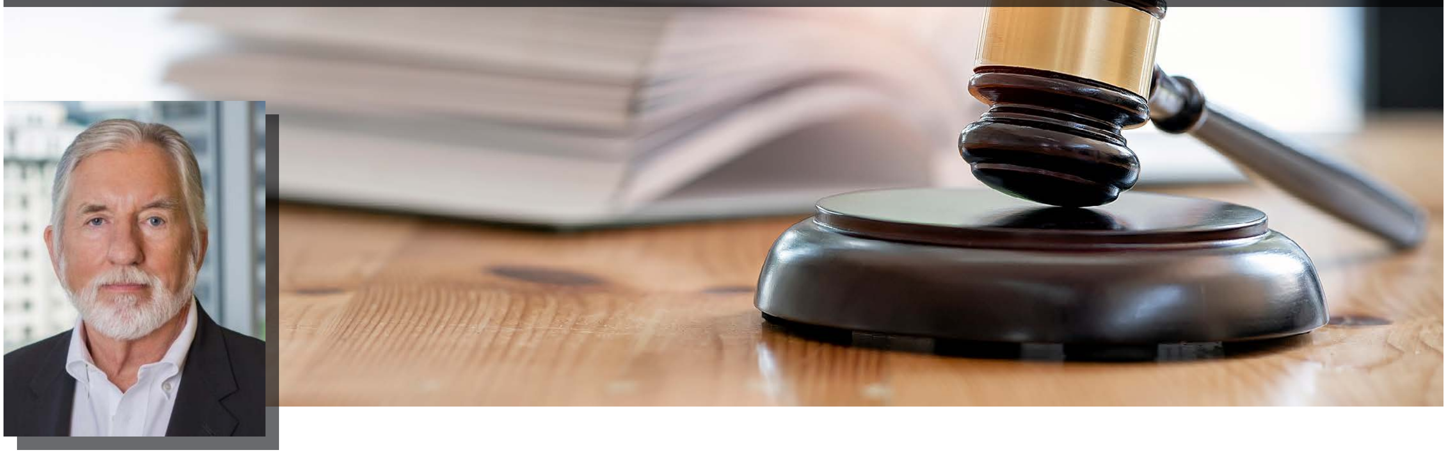
The Feasibility Statement was awarded by Lloyd's Register, which is the first and only Renewable Energy Certification Body (RECB) with a scope in Marine Energy that has been accepted by the International Electrotechnical Commission for Renewable Energy (IECRE). The IECRE is a global renewable energy conformity assessment system and a part of the IEC (International Electrotechnical Commission), which brings together 174 countries.

For questions and further information, please contact:

Gabriela Ehrlich
Tel: +41 22 919 0278
Email: geh@iec.ch

MEDICAL DEVICE MANUFACTURER PAYS $12 MILLION TO U.S. GOVERNMENT FOR FALSELY CLAIMING COMPLIANCE WITH CISPR 11 STANDARDS

Terry Mahn, USNC TAG Technical Advisor – CISPR/B



If anyone thinks that CISPR standards are not relevant when it comes to U.S. product marketing, they should think again. On December 20, 2022, the Department of Justice (DOJ) announced a $12 million monetary settlement with Advanced Bionics, a manufacturer of FDA-approved cochlear implants, for falsely claiming that one of its products complied with CISPR 11 standards. Interestingly, CISPR 11 compliance is not a legal pre-requisite for FDA approval or for U.S. marketing of medical devices generally, including cochlear implants. So how does DOJ justify a monetary penalty for a failure to comply with a voluntary CISPR standard?

First, a little background. To access the U.S. healthcare market, an electronic medical device manufacturer must demonstrate compliance with a number of technical standards including, among others, the electromagnetic compatibility (EMC) limits set forth in the FCC's Part 15 and Part 18 rules. To access most foreign healthcare markets, manufacturers must demonstrate EMC compliance with CISPR 11 limits that are similar, but not identical to, FCC rules. Typically then, for purposes of worldwide marketing, healthcare manufacturers will "kill two birds with one stone" by testing for both FCC and CISPR compliance and including both sets of test reports in their product marketing applications.

In the U.S., medical devices are approved (or cleared) for marketing based on the truth and accuracy of information submitted to FDA. Similarly, the reimbursement for medical devices under federal healthcare programs (e.g. Medicare, Medicaid, Veteran's Health, etc.), depends on the same truth and accuracy of this information. Thus, if any technical data in an FDA application is determined to be false, a claim for reimbursement would also be false and, if made knowingly, would violate the U.S. False Claims Act (FCA), set forth in 31 U.S.C. §3729. And FCA violations for medical products can be quite expensive.

Under U.S. law, a "false claimant" is anyone who seeks or obtains a reimbursement from a federal healthcare agency for a medical device approved by FDA based on false test data. The monetary penalty for an FCA violation includes both civil penalties and triple damages for financial injuries (i.e. payments for unlawful devices) sustained by the federal government. Importantly, the FCA allows a private party—known as *qui tam* *realtor*—to bring a civil action on behalf of the federal government and share in up to 25% of any damages awarded. More importantly, the *qui tam* plaintiff gets to share in any damage award even if DOJ takes over prosecution of the case, as it is required to do in various circumstances. Thus, by design, the FCA incentivizes whistleblowers to file *qui tam* suits against drug and medical device manufacturers whose products were approved based on false data, or were marketed for unapproved uses.

In the cochlear implant case, Advance Bionics submitted a pre-market application to FDA showing both FCC and CISPR 11 compliance. Although CISPR 11 compliance is not required for U.S. marketing, positive test results were used to support a finding of safety and efficacy required for FDA approval. According to the FCA complaint, Advance Bionics' test engineers knowingly rigged a "worst case" EMC test procedure to falsely demonstrate CISPR 11 compliance. FCC compliance was not at issue in the case and there was no evidence of any implant causing actual or threatened RF interference. Nonetheless, DOJ concluded that the knowing submission of false CISPR 11 test data to support an FDA determination of "safety and efficacy" for the implant was sufficient evidence to sustain an FCA action for triple damages. Hence, the $12 million settlement award that was presumably shared with the whistleblower, in this case a disgruntled test engineer.

It is significant to note that the FCA test for "knowingly" does not require the person submitting the false reimbursement claim to have actual knowledge that the claim is false. A person can be liable for acting in reckless disregard or deliberate ignorance of the truth or falsity of such information. This broad sweep of the statute, coupled with its unique *qui tam* incentives, renders the FCA an effective tool for ferreting out "false claimants" for medical reimbursements even when such falsity involves submissions, such as CISPR 11, that are not technically required for U.S. marketing.

Let this case be a warning to electronic medical device manufacturers seeking access to U.S. markets. If you claim CISPR 11 compliance to a federal authority, you had better be correct.

DECISION DEPOT

This column provides easy access to recent decisions that have been made regarding IEC and USNC policies and procedures that directly affect our members. Click the link below to access the recent decisions.

See the Decision List below for decisions made at the following meetings: IEC Board meeting held on 2023-02-22/23; SMB meeting 176 held on 2023-02-14; and CAB meeting 53 held on 2023-06-12/13.

IEC BOARD: IB/191/DL

SMB: SMB/7840/DL

CAB: CAB/2365/DL

CALL FOR STANDARDS ACTION AND PARTICIPATION

USNC VIRTUAL TECHNICAL ADVISORY GROUPS (VTAGS)—IEC BUSINESS ADVISORY COMMITTEE (BAC), DIVERSITY ADVISORY COMMITTEE (DAC) AND GOVERNANCE REVIEW AND AUDIT COMMITTEE (GRAC)—PARTICIPANTS NEEDED

The convenors for the USNC VTAGs to IEC BAC, DAC, and GRAC would like to grow their membership. Individuals interested in serving as the USNC VTAGs on the IEC BAC, DAC, or GRAC are invited to contact Mackenzie Connors at maconnors@ansi.org as soon as possible.

BAC SCOPE

The IEC Board delegates to the Business Advisory Committee (BAC) the coordination of financial planning and outlook, and commercial policies and activities, as well as organizational (information technology) infrastructure in support of the IEC Board.

The BAC comprises 4 members of the IEC Board, 15 members from National Committees and the Officers (without vote).

DAC SCOPE

The Diversity Advisory Committee (DAC) has the task to propose guidance, as requested, to the IEC Board for its selection process of members of the other bodies reporting to the IEC Board. Guidelines may include appropriate skills and competencies matrices, best practices for diversity performance indicators, and recommended monitoring measures, as needed at any level of the Commission.

Such guidelines and provisions of recommendations shall also be available to National Committees for consideration in their nominations, including for membership on the IEC Board.

Any guidelines developed by the DAC shall be submitted for approval by the IEC Board.

The DAC is composed of one Chair, three members from Group A Members, and three members from non-Group A Members.

GRAC SCOPE

The Governance Review and Audit Committee (GRAC) is an advisory group that assists in providing independent oversight of governance of the Commission, ensuring the financial security and compliance of the Commission, and reducing potential risk in current (financial) operations. The GRAC makes recommendations to the IEC Board.

The GRAC is composed of one Chair, three members from Group A Members and three members from non-Group A Members.

USNC PARTICIPANTS AND USNC TAG ADMINISTRATOR NEEDED

IEC approved one (1) new Committee: IEC Project Committee (PC) 130, *Cold storage equipment for medical use*.

Individuals who are interested in becoming a USNC Technical Advisory Group (TAG) participant or the USNC TAG Administrator for the USNC TAG to PC 130, *Cold storage equipment for medical use*, are invited to contact Mackenzie Connors at maconnors@ansi.org as soon as possible.

PC 130 SCOPE

Standardization in the fields of cold storage equipment for storing reagents, medicines, vaccines, biological specimens, etc., in medical practice and medical research.

The work of PC 130 will include terminology, classification, reliability, performance requirements, testing methods, in-service maintenance and monitoring, inspection, and energy efficiency. Safety aspects are expected to be addressed as joint efforts between PC 130, TC 66, and other related Committees.

IEC STANDARDIZATION EVALUATION GROUP (SEG) 15: METAVERSE—US PARTICIPANTS NEEDED

SMB set up SEG 15, *Metaverse,* to explore the needs for standardization and opportunities in the area of Metaverse and related technologies. As this SEG is an open group, each National Committee is able to submit an unlimited number of experts to participate. Individuals interested in serving as a U.S. participant on SEG 15 are invited to register directly on the IEC site.

SEG 15 SCOPE

SMB set up SEG 15, *Metaverse*, to explore the needs for standardization and opportunities in the area of Metaverse and related technologies. The tasks of the SEG include the following:

» Develop a common understanding and definition of Metaverse.

» Investigate the needs for standardization in the area of Metaverse, taking into account current research, technology and standardization activities, and trends.

» Recommend an initial roadmap for standardization activities in the area of Metaverse.

» Recommend an appropriate organization of the work in IEC (including partner organizations as needed).

» Engage at the earliest stage with TC/SC/SyCs, including JTC 1, as well as with ISO and other relevant organizations such as consortia.

» Make further recommendations to SMB as appropriate.

CALL FOR MEMBERS—USNC TAG TO IEC/TC 111

The USNC Technical Management Committee would like to grow the membership of the USNC TAG to IEC/TC 111. Individuals who are interested in joining the USNC TAG to IEC/TC 111 are invited to contact Mackenzie Connors at maconnors@ansi.org as soon as possible.

TC 111 SCOPE—ENVIRONMENTAL STANDARDIZATION FOR ELECTRICAL AND ELECTRONIC PRODUCTS AND SYSTEMS

Standardization of environmental aspects concerns:

To prepare the necessary guidelines, basic and horizontal standards, including technical reports, in the environmental area, in close cooperation with product committees of IEC, which remain autonomous in dealing with the environmental aspects relevant to their products;

- To liaise with product committees in the elaboration of environmental requirements of product standards in order to foster common technical approaches and solutions for similar problems and thus assure consistency in IEC standards;
- To liaise with ACEA and ISO/TC 207;
- To monitor closely the corresponding regional standardization activities worldwide in order to become a focal point for discussions concerning standardization;
- EMC and EMF aspects are excluded from the scope.

CALL FOR MEMBERS—USNC TAG TO IEC/TC 78

The USNC Technical Advisory Group (TAG) to IEC/TC 78 would like to grow its membership. Individuals who are interested in joining the USNC TAG to IEC/TC 78 are invited to contact Mackenzie Connors at maconnors@ansi.org as soon as possible.

TC 78 SCOPE—LIVE WORKING

To prepare International standards for tools, equipment, and devices for utilization in Live Working, including their performance requirements, care, and maintenance. Excluded: Work practices and methods for Live Working.

To prepare technical publications related to the utilization of tools, equipment, and devices on, and in the vicinity of, live parts of electrical installations and systems.

USNC MANAGEMENT MEETINGS

USNC policy groups meet at Corning, Inc. for the May 2023 Management Meetings.

USNC CELEBRATES 2022–2023 PROFESSIONAL MENTORING PROGRAM PARTICIPANTS!

As the 2022–2023 USNC professional mentoring program wraps up later this month, we'd like to take the time to say thank you to all of our mentors and protégés for investing their time with us! This 10-month commitment demands effort not only by the protégé but by our volunteer mentors as well.

Thank you to our program mentors who decide again and again to make a different in the standards and conformity assessment world. A special thanks goes out to mentors who have volunteered their time to serve in every cohort since the inception of the program back in 2021: Curtis Bender, Jonathan Colby, George Gela, and Ghery Pettit.

Thank you to our protégés, who have thoughtfully developed learning goals for themselves, and put in the time and effort into reaching them.

Please join us in celebrating our 2022–2023 cohort on the completion of their program!

MENTORS


Curtis Bender, Tennant


Jonathan Colby, Streamwise Devel-opment


George Gela, BETC


Megan Hayes, NEMA


Khaled Masri, NEMA

Not pictured: Ghery Pettit, EMC Consulting

PROTÉGÉS


Amanda Johnson, Festool, USA


Zijun Tong, NEMA


Kayla Wilson, Milwaukee Electric Tool Co.


Mike Andrews, Lasko


Steven Weber, DEHN Inc.


Ravi Vasudevan, Landsdowne Labs

For a full list of USNC professional mentoring program participants over the years, **click here**.

Interested in joining? The USNC is currently accepting **applications** for the 2023–2024 professional mentoring program. For more information, and to download the application, please visit **our website**. Questions can be directed to Megan Pahl at **mpahl@ansi.org**.

United States National Committee of the IEC

Linked in

JOIN THE USNC LINKEDIN GROUP

Would you like to stay updated with the news and events of the USNC? **Join our LinkedIn Group** to learn about and provide input on all issues electrotechnical that can affect your life, from your own home to the other side of the globe! If you have any information to share on LinkedIn, please contact Megan Pahl (**mpahl@ansi.org**).

ABOUT THIS PUBLICATION

The USNC Current newsletter is distributed to the constituency of the U.S. National Committee (USNC) of the International Electrotechnical Commission (IEC). It provides updates on technical activities and other information of interest to members of the electrotechnical community. Some articles are reprinted with permission from the IEC News log.

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HOW TO CONTRIBUTE

Contributions are gladly accepted for review and possible publication, subject to revision by the editors. Submit proposed news items to: Megan Pahl, **mpahl@ansi.org**.