



ISO/TC STRATEGIC BUSINESS PLAN TEMPLATE – INSTRUCTIONS

Important information

Every newly established technical committee (TC) is required to prepare a strategic business plan (SBP) within 18 months of its provisional establishment, in parallel with its standards development work. The SBP of a TC covers the activities of any subcommittees under the TC. For existing TCs, it is proposed that in the development of the SBP, the TC should identify the range of stakeholders that should be engaged based on the subject area being standardized. Each active TC is required to prepare, maintain and regularly review its own SBP. The SBP of a new TC must be formally agreed upon by the TC and then reviewed and approved by the Technical Management Board (TMB).

See [Annex SC.3 of the Consolidated ISO Supplement](#) for details on the procedures to be followed for the development, approval and review of SBPs.

NOTE: The SBP contains information on the scope, title, structure and work programme of the TC. Such information must *already have been approved/ratified* by the TC and/or the Technical Management Board before being included in the SBP, e.g. if a SC is added to the Committee structure, the creation of the SC should have already been ratified by the TMB before being included in the SBP. See the [ISO/IEC Directives Part 1](#), 1.5.10 (title and scope); 1.6.1 (subcommittees); 2.1.5.6 (work programme).

Main objective of the SBP

The main objective of the SBP is to provide a concise and up-to-date overview of the committee's work in a user-friendly format for interested stakeholders. The types of stakeholders to be addressed in the SBP include:

- The management layer of organizations and companies making a contribution to standardization;
- Standards developers and standards developing organizations;
- Regulators;
- Users of standards;
- The interested public.

The SBP should provide an analysis of important business, technological, environmental and social trends in the field addressed by the work of the ISO/TC. It should also explain the linkages between these trends and the priority areas in the standards development work of the committee.

Drafting instructions

Information must be entered into this SBP template as indicated (in the header/footer and in fields marked 'click here to enter text') for the **Executive summary** and **sections 2 to 6**. See the relevant drafting instructions in each section for guidance on the content.

Please consider including **graphical elements** to represent market structures, information on trade or the structure of the committee, where relevant.

Hyperlinks

In some cases, information – for example regarding the work programme, project target dates, the list of published standards, the committee structure etc. – can be included dynamically via hyperlinks from the SBP template to committee-specific information available from ISO's main website, ISO Online. Where this is required, the need to add hyperlinks will be clearly indicated with **red, underlined text**. In addition to the required hyperlinks given in this template, TCs may include hyperlinks pointing to other relevant sections on ISO Online, or to their own databases with more detailed project information.

*Once you have completed the draft SBP, please **delete all grey-shaded boxes** with 'Drafting instructions' throughout the document.*

STRATEGIC BUSINESS PLAN – ISO/TC 333

Executive summary

Main field

ISO/TC 333 develops standardization in the field of lithium concentrates as final products and lithium compounds/materials (including oxides, salts, metals, master alloys, etc.). The work program includes terminology, technical conditions of delivery to overcome transport difficulties, unified testing and analysis methods to improve the general transparency in trades of lithium products, but lithium batteries as end products are excluded.

The standardization mentioned above can be mainly focused on the field of lithium concentrates, lithium compounds/materials (i.e., oxides, salts, metals, master alloys, etc.), including terminology, characterization and methods of sampling, testing and analysis.

Benefits expected from standards

The global end-use markets for lithium in 2021 were: battery, 74%; ceramics and glass, 14%; lubricating greases, 3%; continuous casting mold flux powders, 2%; polymer production, 2%; air treatment, 1%; and other uses, 4%. Batteries account for the most of lithium consumption (as shown in Figure 1, estimated by the U.S. Geological Survey), and it has increased significantly in recent years because rechargeable lithium batteries are used extensively in the growing market for portable electronic devices, electric vehicles (EV), electric tools, and grid storage applications. Lithium consumption is expected to increase sharply as the development and sale of electric vehicles is being fostered strongly by many countries. The development of standards in ISO/TC 333 is to facilitate the international exchange of goods and services, and to develop cooperation in the spheres of intellectual, scientific, technological and economic activities between stakeholders which include miners, refiners, manufacturers, consumers, traders, recyclers, testing organizations and governments.

As the global lithium industry has developed rapidly, the volume of international trade is increasing, and more market participants could be expected to contribute to the growing demand for and supply of lithium. For this reason, if properly considered and based on market and technological fundamentals, international standards can help play a role in the lithium production, testing, labeling, packaging, transport, transactions and use. All stakeholders can propose projects which they believe will bring value and every stakeholder can be involved in the project expressing their voices from a national point of view.

The benefits expected from standards could be clarified in the following respects:

Firstly, standards can help connect lithium suppliers with global downstream end-users accurately and efficiently through the establishment of terminology standards.

Then, by establishing a series of testing and analysis methods standards, these can facilitate and maintain rapid decision-making and generate economic effectiveness.

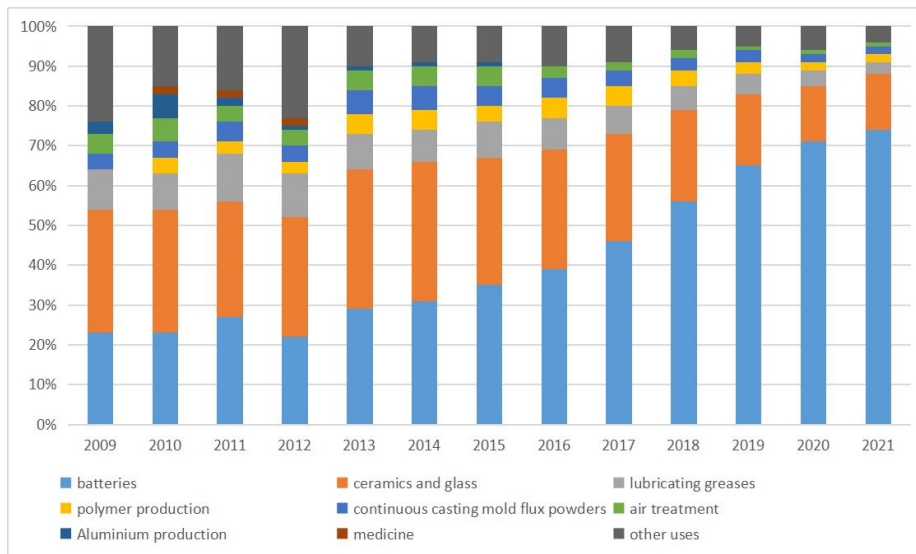


Figure 1 Global end-use markets for lithium

Main objectives and priorities

The terminology standard is the basic standard, and it is the foundation of the whole standards system so it will be appropriate to start the TC 333 standards development with terminology . The testing and analysis method standards could provide a harmonized process for objectively and consistently evaluating the quality and the characteristics of a lithium material or a product with repeatable, verifiable results that can be relied upon by all market participants, this standard should not impede technical advancement. Other standards for methods of materials sampling, labeling, and packaging and transport may also prove useful.

1 Introduction

1.1 ISO technical committees and business planning

The extension of formal business planning to ISO Technical Committees (ISO/TCs) is an important measure which forms part of a major review of business. The aim is to align the ISO work programme with expressed business environment needs and trends and to allow ISO/TCs to prioritize among different projects, to identify the benefits expected from the availability of International Standards, and to ensure adequate resources for projects throughout their development.

1.2 International standardization and the role of ISO

The foremost aim of international standardization is to facilitate the exchange of goods and services through the elimination of technical barriers to trade.

Three bodies are responsible for the planning, development and adoption of International Standards: ISO (International Organization for Standardization) is responsible for all sectors excluding Electrotechnical, which is the responsibility of IEC (International Electrotechnical Committee), and most of the Telecommunications Technologies, which are largely the responsibility of ITU (International Telecommunication Union).

ISO is a legal association, the members of which are the National Standards Bodies (NSBs) of some 164 countries (organizations representing social and economic interests at the international level), supported by a Central Secretariat based in Geneva, Switzerland.

The principal deliverable of ISO is the International Standard.

An International Standard embodies the essential principles of global openness and transparency, consensus and technical coherence. These are safeguarded through its development in an ISO Technical Committee (ISO/TC), representative of all interested parties, supported by a public comment phase (the ISO Technical Enquiry). ISO and its Technical Committees are also able to offer the ISO Technical Specification (ISO/TS), the ISO Public Available Specification (ISO/PAS) and the ISO Technical Report (ISO/TR) as solutions to market needs. These ISO products represent lower levels of consensus and have therefore not the same status as an International Standard.

ISO offers also the International Workshop Agreement (IWA) as a deliverable which aims to bridge the gap between the activities of consortia and the formal process of standardization represented by ISO and its national members. An important distinction is that the IWA is developed by ISO workshops and fora, comprising only participants with direct interest, and so it is not accorded the status of an International Standard.

2 Business Environment of the ISO/TC

2.1 Description of the Business Environment

The following political, economic, technical, regulatory, legal and social dynamics describe the business environment of the industry sector, products, materials, disciplines or practices related to the scope of this ISO/TC, and they may significantly influence how the relevant standards development processes are conducted and the content of the resulting standards:

2.1.1 State of the art of the domain

ISO/TC 333 mainly focuses on standardization in the field of lithium concentrates as final products, lithium compounds/materials (i.e., oxides, salts, metals, master alloys, etc.) including terminology, characterization¹ and methods of sampling, testing and analysis, but lithium batteries as end products are excluded. Recycling of lithium is an essential part, from a product life-cycle point of view, of the lithium value chain, however as the technologies for this are only emerging, recycling is not included as a separate working group, but may be considered as part of sustainability or other NWIPs, and therefore is not excluded from the scope of TC333.

2.1.2 Recent or expected changes and major innovations

2.1.2.1 Extraction, purification, and concentration approached for intermediate lithium products

The electrolysis is a process which is used to produce the lithium products, and electro dialysis is a process that causes the physical separation of species under an electric field via a membrane. The conversion facility would recover and purify the lithium bearing solutions through the application of a 'novel' (for lithium) and proprietary flowsheet based on electro dialysis and electrolysis, after the removal of the major impurities by conventional methods. The above two processes are applied for any aqueous solutions that bearing lithium ions, and no matter the origin of thereof. Therefore these processes may be applied for extracting lithium from hard rock or brine or used lithium batteries, etc.

Direct lithium extraction(DLE) has been developed for the extraction of lithium from fluids including salar brines, and geothermal waters using solvent extraction, selective membranes, ion adsorption or ion exchange..

2.1.2.2 Lithium in granite ores.

Large deposits of lithium contained in micaceous granite have been identified in recent years in the United Kingdom, Czech Republic, and Germany. Lithium has not previously been extracted commercially from such deposits and so development of new technology has been required. Patented technology has been developed for extraction of lithium from micaceous granite. A pilot plant is under construction in the UK, and several developments have been proposed in Europe to produce lithium on a commercial scale.

2.1.2.3 The development of cathode materials

Another focus on lithium research is the development of cathode materials that facilitate to increase the energy density or improve the safety of the battery. For example, the solid-state lithium battery which may use lithium strip as anode materials. Other high energy density lithium-ion battery cathode materials, such as lithium nickel cobalt aluminium oxide (NCA) and high nickel lithium nickel manganese cobalt oxide (NMC) chemistries, have drawn extensive attention.

2.1.2.4 Lithium recycling

¹ Characterization describes the results of the testing methods, while specification means a clear definition of limits to differentiate between quality grades.

Lithium recycling is an emerging industry, and it is also an essential link in the product life cycle. In particular, the recycling of lithium-ion batteries is an important means to protect the environment as well as save lithium resources. There will be a large amount of end of life (EOL) lithium batteries as the demand and production of lithium batteries are increasing sharply year by year. It is predicted that the disposal output of the global EOL lithium batteries would be more than 11 million tonnes by 2030 (according to World Economic Forum). The lithium scrap of the EOL lithium batteries could be recycled through complex processes, and then synthesized into other lithium compounds, such as lithium carbonate. But the standardization of lithium recycling process does not include collecting the batteries, dismantling packs, modules, and cells, or anything about the lithium batteries. More details should be discussed further by experts from the related stakeholders if any P members are about to propose the lithium recycling standards.

2.1.2.5 Lithium sustainability

Lithium sustainability is also an ever-growing issue for the industry, with concerns arising from lithium raw and refined materials production for the EV industry. As consumer demand and institutional environmental, social and governance(ESG) standards are asking for “green” batteries, transparency/traceability over the associated value chains is becoming a must for lithium suppliers, battery manufacturers and end-users (ex. Global Battery Alliance’s Battery Passport, and the recently updated European Regulation on Batteries and Waste Battery: https://ec.europa.eu/commission/presscorner/detail/en/ip_20_2312).

2.1.3 Other relevant international, regional or national standards or voluntary initiatives

IEC TS 62607-4 series which focus on cathode nanomaterials are listed below as references:

- IEC TS 62607-4-1:2015 Nanomanufacturing - Key control characteristics - Part 4-1: Cathode nanomaterials for nano-enabled electrical energy storage - Electrochemical characterisation, 2-electrode cell method
- IEC TS 62607-4-2:2016 Nanomanufacturing - Key control characteristics - Part 4-2: Nano-enabled electrical energy storage - Physical characterization of cathode nanomaterials, density measurement
- IEC TS 62607-4-3:2015 Nanomanufacturing - Key control characteristics - Part 4-3: Nano-enabled electrical energy storage - Contact and coating resistivity measurements for nanomaterials
- IEC TS 62607-4-4:2016 Nanomanufacturing - Key control characteristics - Part 4-4: Nano-enabled electrical energy storage - Thermal characterization of nanomaterials, nail penetration method
- IEC TS 62607-4-5:2017 Nanomanufacturing - Key control characteristics - Part 4-5: Cathode nanomaterials for nano-enabled electrical energy storage - Electrochemical characterization, 3-electrode cell method
- IEC TS 62607-4-6:2018 Nanomanufacturing - Key control characteristics - Part 4-6: Nano-enabled electrical energy storage devices - Determination of carbon content for nano electrode materials, infrared absorption method
- IEC TS 62607-4-7 Nanomanufacturing – Key control characteristics – Part 4-7: Nano-enabled electrical energy storage – Determination of magnetic impurities in anode nanomaterials, ICP-OES method
- IEC TS 62607-4-8:2020 Nanomanufacturing - Key control characteristics - Part 4-8: Nano-enabled electrical energy storage - Determination of water content in electrode nanomaterials, Karl Fischer method

The standards listed below are the most relevant to the working scope of ISO/TC333 through a detailed analysis from the information of American Society of Testing Materials’(ASTM) database.

—ASTM D3561-16 Standard Test Method for Lithium, Potassium, and Sodium Ions in Brackish Water, Seawater Brines by Atomic Absorption Spectrophotometry

— ASTM E2941-14 Standard Practices for Extraction of Elements from Ores and Related Metallurgical Materials by Acid Digestion

Parts of national standards of Chile are listed here as references:

— NCh3349:2020 Brines - Determination of alkali metals by flame atomic absorption spectrometry

— NCh3358:2020 Brines - Boron determination by potentiometric acid-base titration

Parts of national standards of China are listed here as references:

— GB/T 4369 Lithium

— GB/T 20930 Lithium strip

— GB/T 20252 Lithium cobalt oxide

— GB/T 8766 Lithium hydroxide monohydrate

— GB/T 11064 Methods for chemical analysis of lithium carbonate, lithium hydroxide monohydrate and lithium chloride (16 parts)

2.1.4 Categories of relevant stakeholders

The stakeholders engaged in this area include mining companies as far as concentrates are concerned, processors, manufacturers, recycling firms, trading organizations, material handling and transportation companies, lithium regulatory institutions or related government ministries or institutions.

2.2 Quantitative Indicators of the Business Environment

The following list of quantitative indicators describes the business environment in order to provide adequate information to support actions of the ISO/TC 333:

2.2.1 Resource and reserves

Lithium resource² mainly exists in the form of brine and mineral. The lithium resource has increased substantially worldwide owing to continuing exploration over these years. Brine-based lithium sources are in various stages of development in Argentina, Bolivia, Chile, China, and United States; mineral-based lithium sources (including Spodumene, Zinnwaldite, Lepidolite, Mica, Petalite etc.) are in various stages of development in Australia, Austria, Brazil, Canada, China, Congo, Czechia, Finland, Germany, Mali, Namibia, Portugal, Serbia, Spain, United Kingdom and Zimbabwe; and lithium-clay sources are in various stages of development in Mexico and United States; also the geothermal lithium resource which is mainly located in France, Germany, Iceland, United Kingdom and Czechia accounts for a certain amount of lithium Resource.

2.2.2 Worldwide production and consumption³

Lithium has become a very important element, since, in recent years, its application in batteries is growing rapidly, which is well-known as the "21st century energy metal".

² A 'Mineral Resource' is a concentration or occurrence of solid material of economic interest in or on the Earth's crust in such form, grade (or quality), and quantity that there are reasonable prospects for eventual economic extraction. The location, quantity, grade (or quality), continuity and other geological characteristics of a Mineral Resource are known, estimated or interpreted from specific geological evidence and knowledge, including sampling. Mineral Resources are sub-divided, in order of increasing geological confidence, into Inferred, Indicated and Measured categories.

All reports of Mineral Resources must satisfy the requirement that there are reasonable prospects for eventual economic extraction (i.e. more likely than not), regardless of the classification of the Resource. JORC 2012 para 20

³ The data in this section are quoted from the companies' website, and ISO/TC 333 does not take the responsibility to verify the accuracy.

SQM is one of the world's largest producers of lithium carbonate and lithium hydroxide, and their sales of lithium products in 2021 surpassed 101,000 tonnes lithium carbonate equivalent (LCE). The annual production capacity of lithium carbonate plant at the Salar del Carmen is planned to reach 180,000 tonnes in 2022, A portion of this quantity will be used to produce lithium hydroxide.

(According to the company's annual report 2021 <https://www.sqm.com//news/2022/SQM-Reports-Earnings-for-the-Fourth-Quarter-of-2021>)

Albemarle Corporation ("Albemarle") is another leading global lithium chemicals producer, which produces lithium carbonate and lithium chloride in Chile and United States, along with lithium derivatives in United States, Germany, Taiwan and China. Albemarle also owns 49% of Talison Lithium Pty Ltd. (" Talison ") Greenbushes spodumene mine and 50% of Mineral Resources Wodgina spodumene mine. Albemarle operates lithium hydroxide conversion plants in Australia, China, and the US.

(According to the company's annual 2022 report URL https://www.albemarle.com/skins/base/flipbooks/sustainability-report-2021/2021SustainabilityReport_2022-06-02_19-43-55.pdf)

Livent has one of the broadest product portfolios in the industry, powering demand for green energy, modern mobility, the mobile economy, and specialized innovations, including light alloys and lubricants. Livent operates manufacturing sites in United States, United Kingdom, India, China and Argentina. Livent is planning to reach Lithium Carbonate production capacity in Argentina of 100,000 tonnes by the end of 2030 and at least doubling the production capacity of Lithium Hydroxide to 55,000 tonnes.

(According to the company's annual report https://livent.com/wp-content/uploads/2022/07/Livent_2021SustainabilityReport-English.pdf)

Sichuan Tianqi Lithium Industries ("Tianqi"), a Chinese company producing basic lithium chemicals in China from concentrated lithium minerals, owns 25% of Talison in Western Australia. The production capacity of basic lithium chemicals is 44,000 tonnes LCE. The sales volumes were 44,000 tonnes LCE in 2021.

Jiangxi Ganfeng Lithium, another Chinese company involved in the whole industry including resource mining, refining and processing, battery manufacturing and recycling, and the products are widely used in electric vehicles, energy storage, consuming electronic products, chemicals and pharmaceuticals, etc.

2.2.3 Sector trend

Global lithium total supply is expected to increase from 370 thousand tonnes LCE in 2019 to a million tonnes LCE in 2025. In the aspect of lithium demand, it is predicted that the annual sales volume of electric vehicles will exceed 16 million in 2025 and 35 million in 2030 . Suppose 40 kilograms lithium carbonate are needed per EV, the demand of lithium for EV consumption will reach 640 thousand tonnes LCE, plus all other aspects of lithium demand, such as other mobility, consumer electronics, grid storage, global Lithium demand is on track to reach nearly 1 million tonnes LCE by 2025, compound average growth rate driven principally by EV penetration of new car sales. Also, the lithium recycled from the used lithium batteries will account for a certain portion of lithium sources to produce lithium products.

3 Benefits expected from the work of the ISO/TC

ISO/TC 333 Lithium is a technical committee focusing on developing standards which conform to industry needs and covering market-facing components of lithium chemical, sales and use including sampling, test methods, labelling, packaging and transport and characterization standards to lithium concentrates, lithium basic chemicals, other lithium compounds, etc.

The development of ISO standards will remove technical barriers if the focus in drafting is entirely based on technical and economic fundamentals, which can economically optimize commerce between market participants from different nations (e.g., harmonization), and it will eliminate some unnecessary disputes or misunderstandings caused for those market participants who mutually agree to transact according to affixed standards.

For the specific benefits expected from the work of the ISO/TC are as follows:

First, as described above, the global lithium industry has developed rapidly, lithium supply pattern is being diversified globally, however, many terms often used in international trade are not clearly defined yet, such as residual alkali content, they all need to be defined in international standards. This could help connect lithium suppliers with global end-users accurately and efficiently through the establishment of terminology standards.

Second, as various testing methods have been developed, testing conditions and methods must be specified in sufficient detail such that results are credible, repeatable and can be relied upon by all market participants, for example, the chemical analysis of lithium-containing products.

Moreover, with the continuous development of the lithium industry, various lithium products have emerged. Standards will play an important role in the elimination of disputes between the consumers and suppliers.

At the beginning of this new committee, work will be focused on terms and testing methods standards, which may also be the basis for the development of other types of standards. However, any P-member may advance a proposal (NWIP) for any category or for a category not yet defined.

All the standards developed by ISO/TC 333 should obey one principle, that is it must allow for technological development, and needs to be future proof so that it does not exclude or hamper tech innovations.

4 Representation and participation in the ISO/TC

4.1 Membership

<https://www.iso.org/committee/8031128.html?view=participation>

4.2 Analysis of the participation

As of August 2022, there are 20 P members and 12 O members in ISO/TC 333.

From the perspective of lithium Resources, the brine-based lithium Resources are mainly concentrated in the “lithium triangle” of South America (Chile, Argentina, Bolivia), and USA and China, the spodumene mineral-based lithium Resources are mainly concentrated in Australia, Canada and Congo (Kinshasa), the mica granite hosted lithium in the United Kingdom, Czechia and Germany, and the clay-based lithium Resources are mainly concentrated in United States and Mexico. Among these countries, United States, Argentina, Chile, Bolivia, Australia, Canada, the United Kingdom, The Democratic Republic of Congo and Zimbabwe are P members. In other words, the countries with the most abundant lithium resource are willing to participate actively in the work of ISO/TC333. Other countries, such as Finland, France, Portugal, Germany host relatively lower identified lithium resource, are also our P-members. Austria, Czech Republic, Spain, Poland, etc., are O-members.

From the perspective of lithium production and consumption, on a global basis, China is the largest consumer of lithium, Europe is the second largest, followed by Japan and South Korea. It is estimated that the sales volumes of lithium battery cathode materials are about 400 thousand tonnes in 2019 in China (according to statistics of China Nonferrous Metals Industry Association Lithium Branch), which accounted for above 50% of the global lithium battery cathode material sales volumes. Take lithium nickel cobalt manganese oxides as an example, the net import volumes from Japan and Korea are about 22 thousand tonnes. Umicore, the biggest manufacturer of battery intermediates located in Belgium, is an innovative leader in cathode materials manufacture, and has extensive experience in lithium cobalt oxide and lithium nickel cobalt manganese oxide. Korea, Belgium and Japan are also our P members.

5 Objectives of the ISO/TC and strategies for their achievement

5.1 Defined objectives of the ISO/TC

The objective of ISO/TC 333 is to develop the following categories of standards:

(1) Basic standards for terms and definitions, packaging, labelling, transport, and storage.

(2) Sampling, test and analysis standards, including:

- Sampling methods for lithium concentrates, lithium basic chemicals, other lithium compound and so on;
- Chemical and physical analysis for lithium concentrates, lithium basic chemicals, other lithium compound, lithium cathode materials and so on;

The first and the second categories (especially the methods capable of achieving accurate detection and having enough practical experience) are on the top list to be developed, but these are not limiting factors and any P-member may submit an NWIP for any category or for a standard outside the listed categories. The committee is engaged in developing standards which can draw the attention of most relevant stakeholders and meet their needs.

Regard to the recycling, it is insufficiently developed for standardization purposes. Lithium recycling is an emerging industry, an essential link in the lithium product life cycle. There will be a large amount of end of life(EOL) lithium batteries as the demand and production of lithium batteries are increasing sharply year by year. The lithium scrap of the end of life(EOL) lithium batteries could be recycled through complex processes, and then synthesized into other lithium compounds, such as lithium carbonate, or directly into the cathode materials, such as lithium ferrous phosphate. Thus the projects about the recycling may be established in the future, and the technical committee may consider setting it as preliminary work item if any country concerns.

The main purpose of more widespread uptake of electric vehicles is to reduce (green house gas)GHG emissions and noxious emissions from road transport, to promote a circular economy. Although countries have different timelines for net-zero greenhouse gas emissions, carbon neutrality is a common goal of all human beings. Thus the environmental and social impacts from lithium processing should be considered and the methods for those impacts may be standardized as needed.

5.2 Identified strategies to achieve the ISO/TC's defined objectives

5.2.1 Reference of other standards or regulations

The committee's efforts will be focus on developing standards required by the lithium industry in a timely fashion. As such and where applicable, existing national standards may be used as a basis for discussion. A proposal for a new work item should be accompanied by the documentation required by ISO Form 4.

Also, the requirements in many regulations, such as European Regulation on Batteries and Waste Battery, which is just passed at the end of 2020, could be used as a reference to fulfill the committee's objectives on sustainability.

5.2.2 Holding online meeting to facilitate the development of the standards

ISO has postponed all physical meetings to until further notice, depending on evolution of Covid-19, so the initial meeting of ISO/TC333 have to be held through zoom. Also, Online meetings are going to be considered as a long-term way forward for discussion.

5.2.3 Liaison with other committees

The committee would like to be engaged in enhancing the communications between existing P and O members. To understand the needs of users and to avoid duplication or contradiction with other works, ISO/TC 333 would need to reinforce its network, setting up liaisons with other international organizations, such as standards developers, institutional, professional, or research organizations. Until August 2022, ISO/TC333 has built liaisons from ISO/TC 82 mining, ISO/TC 298 Rare earth, IEC/TC 35 Primary cells and batteries, IEC/TC 113 Nanotechnology for electrotechnical products and systems, IEC/SC 21A Secondary cells and batteries containing alkaline or other non-acid electrolytes, European Commission(B type)

Also, the following ISO or IEC TCs has built liaisons to ISO/TC 333, they are ISO/TC 79 Light metals and their alloys, ISO/TC 82 mining, ISO/TC 188 Small craft, IEC/TC 35 Primary cells and batteries, IEC/SC 21A Secondary cells and batteries containing alkaline or other non-acid electrolytes.

6 Factors affecting completion and implementation of the ISO/TC work programme

Factors affecting completion and implementation of the ISO/TC333 work programme may include:

- A common understanding of the priorities for the standards must be realized by all members. New work items may also challenge the member bodies in providing appropriate resources.
- The discussion on a virtual meeting may have the possibility of causing insufficient communication or less efficient than face-to-face meetings.
- Validation of a test method usually needs 4 or 5 countries to cooperate, the delivery of the sample would be a potential problem during COVID-19.
- The technical committees are dependent on experts from industry for their continuing support. There appears to be ever increasing internal pressures on these experts by their own organizations. It also appears that many national standards organizations may not be reaching out to industry to ensure that the key people are aware of activity in international standardization.
- Participants who have the necessary expertise are commonly busy in their normal work, and thus the time available to work on the development of standards may be limited.
- Participants may have difficulty in sustaining the necessary technical expertise and funding.

7 Structure, current projects and publications of the ISO/TC

At the beginning of this new committee, it is important to establish several standards, as the first step, that are essential and urgent to meet the needs of production or trade of the lithium internationally. According to ISO/IEC directives, Part 1 (2.4.3), when a new project is accepted, the secretariat may propose to the technical committee or subcommittee, either at a meeting or by correspondence, to create a working group the convenor of which will normally be the project leader. So, the WGs would be established in order to facilitate the completion of the developing standards. Once all the projects are finished, the WG should be disbanded, but if P members and experts consider it is important to keep the working organization to develop similar type of standards, subcommittee is expected to be created, as the second step. The structure of ISO/TC 333 can be updated from time to time based on the needs and demands of the technical committee and standards that are being developed.

As of August, 2022, ISO/TC 333 has built the following 7 working groups:

WG1: Lithium vocabulary

- ISO/WD 7819: Lithium-Vocabulary

WG2: Chemical analysis for lithium hydroxide

- ISO/AWI 11045-1 Methods for chemical analysis of lithium salts — Part 1: Quantitative determination of lithium hydroxide and lithium carbonate content in lithium hydroxide monohydrate — Potentiometric titration method
- ISO/AWI 16423 Lithium hydroxide monohydrate — Determination of impurities — ICP-OES method

WG 3: Chemical analysis for lithium carbonate

- ISO/WD11757 Lithium — Lithium carbonate — Determination of Al, B, Ca, Co, Cu, Fe, K, Mg, Mn, Na, Ni, Pb, S and Zn by ICP-OES
- ISO/WD 12386 Lithium carbonate — Determination of magnetic particles content
- ISO/WD 10662 Determination of main content of lithium carbonate-Potentiometric titration
- ISO/WD 12403 Lithium carbonate — determination of chloride content by potentiometry
- ISO/WD 12380 Lithium carbonate — determination of insoluble particles in acid

WG4: Analysis for hexafluorophosphate

- ISO/WD 10655 Methods for analysis of lithium hexafluorophosphate — Determination of metal ions content by Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES).

WG5: Sustainability

- ISO/AWI 9287 LITHIUM SUSTAINABILITY ACROSS THE VALUE CHAIN: CONCENTRATION, EXTRACTION, SEPARATION, CONVERSION, RECYCLING, & REUSE

WG6: Analysis for lithium cathode materials

- ISO/WD 12467-1 Chemical analysis of lithium composite oxides — Part 1: Determination of main components
- ISO/AWI 12467-2 Chemical analysis of lithium composite oxides — Part 2: Determination of trace elements
- ISO/AWI 12467-3 Chemical analysis of lithium composite oxides — Part 3: Determination of lithium carbonate and lithium hydroxide contents

WG7: Analysis for lithium chloride

- ISO/WD 16398 Lithium chloride — Determination of impurities — ICP-OES method

Proposed standards and the creation of each working group is to be completed through a Committee Internal Ballot (CIB).

Also, according to ISO/IEC Directives, the establishment of WG is depending on whether there are relevant projects approved, so that WGs wouldn't be created if there are no relevant standards to develop. The strategic business plan is a dynamic and living document.

Table1 The projects under development

No.	Reference	Title
1	ISO/WD 11757	Lithium — Lithium carbonate — Determination of Al, B, Ca, Co, Cu, Fe, K, Mg, Mn, Na, Ni, Pb, S and Zn by ICP-OES
2	ISO/AWI 16423	Lithium hydroxide monohydrate — Determination of impurities — ICP-OES method
3	ISO/WD 16398	Lithium chloride — Determination of impurities — ICP-OES method
4	ISO/WD 12386	Lithium carbonate — Determination of magnetic particles content
5	ISO/WD10662	Determination of main content of lithium carbonate- Potentiometric titration
6	ISO/WD 7819	Lithium-Vocabulary
7	ISO/WD 10655	Methods for analysis of lithium hexafluorophosphate — Determination of metal ions content by Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES).
8	ISO/WD 12403	Lithium carbonate — Determination of chloride content by potentiometry
9	ISO/WD 12380	Lithium carbonate — determination of insoluble particles in acid
10	ISO/WD 12467-1	Chemical analysis of lithium composite oxides — Part 1: Determination of main components
11	ISO/AWI 11045-1	Methods for chemical analysis of lithium salts — Part 1: Quantitative determination of lithium hydroxide and lithium carbonate content in lithium hydroxide monohydrate — Potentiometric titration method
12	ISO/AWI 9287	LITHIUM SUSTAINABILITY ACROSS THE VALUE CHAIN: CONCENTRATION, EXTRACTION, SEPARATION, CONVERSION, RECYCLING, & REUSE
13	ISO/AWI 12467-2	Chemical analysis of lithium composite oxides — Part 2: Determination of trace elements
14	ISO/AWI 12467-3	Chemical analysis of lithium composite oxides — Part 3: Determination of lithium carbonate and lithium hydroxide contents

Information on ISO online

The link below is to the TC's page on ISO's website:

<https://www.iso.org/committee/8031128.html?view=participation>

Click on the tabs and links on this page to find the following information:

- About (Secretariat, Committee Manager, Chair, Date of creation, Scope, etc.)
- Contact details
- Structure (Subcommittees and working groups)
- Liaisons
- Meetings

- Tools
- Work programme (published standards and standards under development)

Reference information

Glossary of terms and abbreviations used in ISO/TC Business Plans

General information on the principles of ISO's technical work