ISO FORM 1
ISO TS/P 311

PROPOSAL FOR A NEW FIELD OF TECHNICAL ACTIVITY

PROPOSER:

Standardization Administration of China (SAC)

DATE OF CIRCULATION:

2023-05-24

CLOSING DATE FOR VOTING:

2023-08-16

A proposal for a new field of technical activity shall be submitted to the Office of the CEO, which will process the proposal in accordance with ISO/IEC Directives, Part 1, Clause 1.5.

Furthermore, a proposal will be considered as complete if every information field is complete and follows the guidelines for proposing and justifying a new field of activity given in the ISO/IEC Directives, Part 1, Annex C.

TITLE
(Please see the ISO/IEC Directives, Part 1, Annex C, Clause C.4.2)

Mechanical Energy Storage Technology

SCOPE
(Please see the ISO/IEC Directives, Part 1, Annex C, Clause C.4.3)

Standardization in the field of mechanical energy storage (MES) technology including terminology, components, functions, design, safety, testing, construction, and maintenance of mechanical energy storage devices. It focuses on the mechanical and physical aspects of mechanical energy storage technology and equipment.

Excluded:

- **air compressors, air compression systems, and compressed air handling technologies covered by ISO/TC 118**
- **apparatus and measurement of vacuum equipment covered by ISO/TC 112**
- **flywheel module design and testing on aircraft covered by ISO/TC 20**
- **elements of spherical plain bearings covered by ISO/TC 4**
- **pump equipment covered by ISO/TC 115**
- **pumped storage covered by IEC/TC 4**

PURPOSE AND JUSTIFICATION (Please use the field immediately below or attach an annex.)
(Please see the ISO/IEC Directives, Part 1, Annex C, Clause C.4.13)

As an alternative to electrochemical storage, mechanical energy storage is an important energy storage solution with unique advantages and development prospects, which can help transform into a green and low-carbon energy structure and shift towards a net-zero future. At present, more and more new mechanical energy storage technologies and application scenarios have emerged, such as

gravitational energy storage based on structure height difference, mountain drop or underground shaft, flywheel energy storage applied to UPS or wind farm peak shaving, and compressed air energy storage which uses abandoned mines or caves to seal the air under high pressure. These mechanical energy storage technologies are generally environmentally friendly, safe and reliable, flexible in construction, have no limit on the number of charges and discharges, and have excellent development potential. However, the worldwide development of this technology is slower than expected due to the lack of policy support and international standards.

There are many standards for mechanical energy storage to be prepared, such as:

- **a) the standardization of new gravity energy storage, including classification, site selection and planning, exceptional structural performance on the operation of MES.**
- **b) the standardization of flywheel energy storage, including mechanical hazard protection, mechanical vibration, operating environment, flywheel material, performance requirements and evaluation.**
- **c) the standardization of compressed air energy storage, including site planning when using abandoned mines or caves, design of complex and efficient systems, technical requirements of turbo-expander, acceptance and maintenance.**
- **d) general characteristics to compare solutions and their overall performance, technical requirements of the intelligent control system, energy storage conversion efficiency performance test, and economic evaluation.**

The choice of standards directly affects technical processes, costs, benefits, and project lead time. Standardizing MES technology can remove trade barriers, improve international market access, support public procurement, and increase operational efficiency. Applying MES standards can also raise awareness of environmental protection as MES have less impact on the environment and are safer in operation. Globally recognized standards should be established to match mechanical energy storage technology development and applications supporting the ISO standardization foresight framework.

There is yet to be a specific Technical Committee in ISO or IEC to prepare relevant standards for MES itself, especially in mechanical and physical aspects, such as the standards for the equipment and technology of gravity energy storage shown in Fig. 1. For instance, ISO/TC 118 focuses on general standards for industrial compressed air applications, such as compressed air equipment and energy conversion devices, without special consideration for compressed air energy storage. IEC/TC 120 focuses on system aspects of EES Systems rather than energy storage devices ("Energy storage itself is not in the scope of the work." is also addressed in the scope of IEC/TC120, please see http://www.iec.ch/dyn/www/f?p=103:7:::::FSP_ORG_ID:9463).

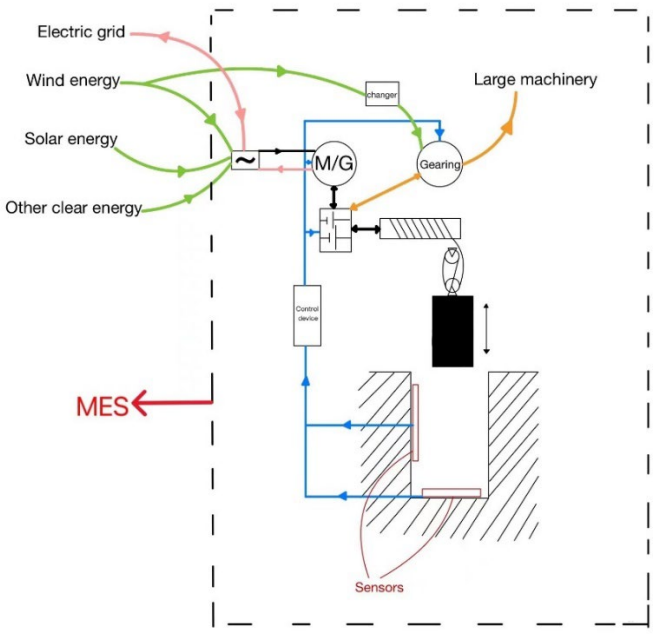

Fig. 1 MES standardization scope illustrated by an example of gravity energy storage.

Mechanical energy storage is valuable to all countries, and sharing experiences and best practices is welcomed. Countries involved can improve their institutional and technical capabilities and enhance project management, which helps attract more investment, and thus government can introduce more favourable policies to boost economic development. These goals align with UN SDG 7 and are closely related to SDGs 8, 9, 11, and 17.

The lack of an organization for standards management in this field could increase the gaps among manufacturers in product function, performance, and compatibility. Moreover, inadequate safety, reliability and efficiency standards undermine technological improvement and market growth in mechanical energy storage. Establishing the proposed TC facilitates the development of international standards in the planning, design, construction, and management of mechanical energy storages and promotes connections with related TCs to ensure technical feasibility and standards implementation. All of this help boost the scaled application of this technology worldwide, thus stimulating the healthy and rapid development of the mechanical energy storage market.

The proposal aims to promote the sustainable development of mechanical energy storage technologies worldwide through standardization.

PROPOSED INITIAL PROGRAMME OF WORK (Please use the field immediately below or attach an annex)
Please see the ISO/IEC Directives, Part 1, Annex C.4.4 and C-4.5)

For each item, the initial work programme shall define the deliverable type and target dates. The initial work programme shall also assign priorities to the different items.

After the proposal is approved, the proposed TC prioritizes the following items:

1. Vocabulary (IS, 3 years)
2. Guidelines for MES project planning (IS, 3 years)
3. Feasibility, process, and technical requirements of MES technology (IS, 3 years)
4. Technical and functional requirements for the leading equipment of MES (IS/TR/TS/PAS, 1-5 years)
5. Test methods and performance evaluation of MES technology (IS, 3 years)
6. Risk Management - Safety Specification - Identification and Methodologies for MES technology and equipment (IS, 3 years)
7. Guidelines for the operation and maintenance of the MES project (IS, 3 years)
8. Examples of good practices for MES technology. (TR, 1 year)

Step 1: Carry out detailed experiments and measurements for existing MES technology and equipment, especially in flywheels, compressed air, and gravity energy storage, to recognize the critical function and get data on related indicators.
Step 2: Develop standard SBP, which provides a reference for technology selection, effective prediction, and evaluation and promotes further development of MES technology.
Step 3: Develop ISO documents. Serial guides for Mechanical Energy Storage technology, e.g., terms and definitions, and planning scheme, are scheduled for publication two years after the establishment of the new TC.

These projects will be completed within five years of establishing the proposed TC.

RELATION OF THE PROPOSAL TO EXISTING INERNATIONAL STANDARDS AND ON-GOING STANDARDIZATION WORK

☒ The proposer has checked whether the proposed scope of the new committee overlaps with the scope of any existing ISO or IEC committee or JTC1 sub-committee

☐ If an overlap or the potential for overlap is identified, the affected committee has been informed and an agreement has been reached between proposer and committee on
i. modification/restriction of the scope of the proposal to avoid overlapping,

ii. potential modification/restriction of the scope of the existing committee to avoid overlapping.

☐ If agreement with the existing committee has not been reached, please explain why the proposal should be approved.

Click or tap here to enter text.

☐ Have proposals on this subject been submitted into an existing committee and rejected? If so, what were the reasons for rejection?

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LISTING OF RELEVANT DOCUMENTS (SUCH AS STANDARDS AND REGULATIONS) AT INTERNATIONAL, REGIONAL AND NATIONAL LEVEL
(Please see the ISO/IEC Directives, Part 1, Annex C, Clause C.4.6)

There is no ISO technical committee dedicated to MES technology. Although ISO and IEC have published some standards in the field of energy storage, most of them belong to the area of electrochemical energy storage or focus on grid integration of the energy storage systems rather than energy storage technology. Relevant standards are listed as follows:

- **ISO 6469-1: 2019 Electrically propelled road vehicles-safety specifications-Part 1: Rechargeable energy storage system (RESS)**
- **ISO 11011: 2013 Compressed air-energy efficiency-assessment**
- **ISO 16111: 2018 Transportable gas storage devices-Hydrogen absorbed in reversible metal hydride.**
- **IEEE P2030.2-Guide for the Interoperability of Energy Storage Systems Integrated with the Electric Power Infrastructure**
- **IEEE P2030.3-Standard for Test Procedures for Electric Energy Storage Equipment and Systems for Electric Power Systems Applications**
- **ISO 21648: 2008 Space Systems-Flywheel module design and testing**
- **ISO 11011: 2013 Compressed Air-Energy Efficiency-Assessment**
- **ASME EA-4 Energy Assessment for Compressed Air Systems**
- **UL 9540, the Standard for Energy Storage Systems and Equipment**

China has developed some association standards for MES, such as:
1. T/CEC 331-2020 Flywheel energy storage system for electric energy storage
2. T/CNESA 1202-2020 General technical requirements for flywheel energy storage systems
3. T/CNESA 1201-2018 Design specification of gas-gathering pipeline for compressed air energy storage system
4. T/CNESA 1203-2021 Performance test specification for compressed air energy storage systems

LISTING OF RELEVANT COUNTRIES WHERE THE SUBJECT OF THE PROPOSAL IS IMPORTANT TO THEIR NATIONAL COMMERCIAL INTERESTS
(Please see the ISO/IEC Directives, Part 1, Annex C, Clause C.4.8)

Mechanical Energy Storage can provide clean and sustainable energy supply to build a net-zero society. The development of MES can bring substantial environmental, social, and economic benefits to all countries.

Relevant countries, such as: US, Germany, Japan, the Netherlands, Finland, UK, Denmark, China, and other countries are promoting relevant mechanical energy storage projects such as flywheel energy storage, compressed air energy storage, and gravity energy storage. This technology also has a significant demand worldwide. Therefore, it is recommended that ISO consider establishing a new TC responsible for the standardization of MES technology.

LISTING OF RELEVANT EXTERNAL INTERNATIONAL ORGANIZATIONS OR INTERNAL PARTIES (OTHER THAN ISO AND/OR IEC COMMITTEES) TO BE ENGAGED AS LIASONS IN THIS WORK
(Please see the ISO/IEC Directives, Part 1, Clause C.4.9)

ISO/TC4, ISO/TC22/SC37, ISO/TC112, ISO/TC118/SC6, and IEC/TC120.

IDENTIFICATION AND DESCRIPTION OF RELEVANT AFFECTED STAKEHOLDER CATEGORIES
(Please see ISO Connect)

	Benefits/Impacts/Examples
Industry and commerce – large industry	**Improve the efficiency, safety, and economy of conventional power generation and transmission and is essential for smooth fluctuation, peak load and frequency management, and large-scale integration of renewable energies. Among the energy storage methods, safe and reliable mechanical energy storage can be quickly built-up and are not limited to charging and discharging cycles. With the above prospects, the new TC is proposed to accelerate the application of standards in the planning, construction, operation, and maintenance of MES, promoting the development of the whole energy storage industry.**
Industry and commerce – SMEs	**By adopting the harmonized MES standards, SMEs have opportunities to demonstrate that their products meet standard requirements. Moreover, they can discuss and find solutions to common problems, increasing the safety and reliability of MES devices and systems that are traded globally.**
Government	**The new TC ensures access to global trade, impels technologies, and helps keep competitiveness. In addition, new standards will provide the technical framework, metrics, and specifications regulators can reference in legislation and give the governments technical references for public tenders. The new TC fuels competition under standard rules, which improves safety, affordability, and interoperability.**
Consumers	**The new TC will accelerate the development of standards and technological applications for MES. Therefore, consumers can get a more reliable, economical, and higher-quality power supply.**
Labour	**While the construction of MES will boost employment, applying standards will provide workers with a safer working environment.**

Academic and research bodies	**The new TC will provide a platform for academic and research institutions to communicate and cooperate on MES, bringing unique insight into the development and impact of MES standards.**
Standards application businesses	**When enterprises adopt the standards, differences, including technical ones, could be resolved, significantly reducing production, construction, and management costs.**
Non-governmental organizations	**The new TC promotes the use of renewable energies and helps intensify collaborations with other NGOs for achieving UN SDGs 7, 8, 9, 11, and 17.**
Other (please specify)	Click or tap here to enter text.

EXPRESSION OF LEADERSHIP COMMITMENT FROM THE PROPOSER
(Please see the ISO/IEC Directives, Part 1, Annex C, Clause C.4.12)

When the proposal is approved, China is willing to be Secretariat for the new TC.

☒ **The proposer confirms that this proposal has been drafted in compliance with iso/iec directives, part 1, annex c**

SIGNATURE OF THE PROPOSER

SAC

COMMENTS OF THE ISO CENTRAL OFFICE (IF ANY)

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