



UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

Bureau
International des
Poids et
Mesures



Metrological Traceability for Strengthening National Industrial Innovation and Export Potential for Belarus

BelGIM is strengthening industrial innovation and export competitiveness by expanding national measurement standards and traceability in high-temperature and radiation metrology for strategic sectors, including energy, healthcare, manufacturing, and petrochemicals

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The Challenge

In the Republic of Belarus, ensuring the competitiveness of high-tech products in international markets is a key national priority. Aleksandr Lukashenko, President of the Republic of Belarus, has set the task of strengthening the integration of industry with science, including metrology, and developing the production of computing, electronic, and optical equipment. Belarus's national industries require a robust metrological infrastructure to meet international quality standards and regulatory requirements. This is vital to a range of industry sectors, such as mechanical engineering, pharmaceuticals, construction, food industry, and healthcare, specifically radiation medicine.

As an illustrative example, in the energy and ecology sectors, the operation of the Belarusian Nuclear Power Plant (BelNPP) demands high-precision measurements in the field of ionizing radiation and radiation control to ensure the safe operation of BelNPP in the field of nuclear energy use and radiation protection of nuclear power plant personnel and the population of the country as a whole. Until just recently, the Republic of Belarus did not have a standard for the units of neutron flux density, absorbed dose rate and equivalent dose rate of neutron radiation.

Furthermore, the lack of recognized measurement capabilities in the Republic of Belarus can act as a technical barrier to trade, hindering the export of industrial goods. In the energy, petrochemical, food and radio-electronic industries, users of precision measuring instruments require an extension of the temperature measurement to 1084.62°C (freezing point of copper) to implement import substitution programs for metrological evaluation within the Republic of Belarus under sanctions conditions. As a critical example for Belarus, many measuring instruments with a temperature measurement range exceeding the measurement capabilities of the National standard of the unit of temperature - kelvin, which ranges from -38.8344 °C (triple point of mercury) to 961.78 °C (freezing point of silver). The entry of such measuring instruments into the State Register of Measuring Instruments and Reference Materials of the Republic of Belarus is carried out in accordance with PMG 06-2019 "Procedure for the recognition of test results and type approval, initial verification, metrological certification of measuring instruments". As a consequence, the full scope of metrological evaluation work for users of precision measuring instruments with an upper measurement range limit of 1084.62 °C cannot be performed.

The Solution

Belarusian State Institute of Metrology (BelGIM), as the NMI for Belarus, has developed and maintained national measurement standards and provided calibration services traceable to the SI. To address the issue of the temperature measurement range limit, modernization of the National standard of the unit of temperature - kelvin is planned to expand the temperature reproduction range up to 1084.62 °C, as well as to include new devices for maintaining, reproducing, and controlling temperature. This will enable the performance of metrological evaluation work in the high-temperature range for precision measuring instruments operated in the Republic of Belarus, as well as for foreign customers. It will also support scientific research in the field of temperature measurement and facilitate participation in international comparisons.

The modernization will be carried out within the framework of one of the priority areas of scientific and technical activity in the Republic of Belarus for 2026–2030, approved by Decree of the President of the Republic of Belarus No. 135 of 1 April 2025 to include innovative technologies in industries, such as technologies and equipment (machinery) in metallurgy, mechanical engineering, machine tool and instrument manufacturing, technologies for extraction and processing (refining, enrichment) of minerals.

BelGIM recently created national standards of units of neutron flux density, absorbed dose rate and equivalent dose rate of neutron radiation. A modernization of the national standard of units of air kerma and air kerma rate was also achieved. These metrological advances have now made it possible to carry out metrological evaluation of instruments operated at the Belarusian Nuclear Power Plant (BelNPP), equipment manufactured by Belarusian producers (Atomtekhn, Radmetron), and equipment received from foreign countries.

BelGIM also maintains an active participation in international comparisons within the CIPM MRA framework, and the publication in the BIPM KCDB database of an increasing number of internationally peer-reviewed calibration and measurement capabilities covering many areas of metrology. Reflecting the growing importance of international recognition and the increased engagement of BelGIM, Belarus became a full Member State of the BIPM in 2020, having previously been an Associate state since 2003. By establishing a reliable metrological traceability chain, BelGIM ensures that measurements performed by Belarusian manufacturers are internationally recognized through the mutual recognition of calibration certificates.

A Quantifiable Impact

The implementation of these metrological solutions has reduced technical barriers to trade for Belarusian industrial exporters by increasing the international acceptance of measurement results and by enabling enterprises to save on costs by eliminating the need for repeated testing and calibration abroad. It has also enhanced innovation in the manufacturing sector

by providing access to high-accuracy measurement infrastructure, ensuring compliance with stringent global quality standards.

Currently, the Republic of Belarus has 70 national measurement standards that fully meet the country's industrial needs. In 2025, the subprogram "Measurement Standards of Belarus" for 2021-2025 was completed, further advancing Belarus's metrology capability. As a result, 7 national standards were created, and 7 national measurement standards were upgraded.

The impact of BelGIM measurement services to support industry have been noted at the national level within Belarus. As Elena Morgunova, Chairperson of the State Committee for Standardization of the Republic of Belarus, attests:

"International recognition of national measurement standards strengthens confidence in measurement results and the quality of Belarusian products, facilitating their promotion in foreign markets and increasing the country's export potential."

As a specific example for nuclear power and radiometry, BelGIM annually verifies about 12 000 units of radiation and dosimetric monitoring instruments using these national standards. The availability of such a measurement standards base within the country eliminates the need for enterprises to export equipment outside the Republic of Belarus for metrological evaluation.

The users for precision temperature measuring instruments services have also expanded recently to include enterprises from various industrial sectors, including: OAO "NAFTAN", ZAO "BMZ", Belorusneft-Promservis State Enterprise, OAO "Mozyr NPZ", OAO "Belaruskali", OAO "GrodnoAzot", Belarusian NPP State Enterprise, OAO "INTEGRAL" – the managing company of the INTEGRAL holding, OAO "PELENG", Belneftekhim Concern, research institutes of the National Academy of Sciences of Belarus, legal entities that are part of the state metrological service, and other accredited testing laboratories.

As the NMI for Belarus, BelGIM also conducts annual scientific research in metrology in accordance with the research and development plan. In 2025, work was carried out on 182 topics, including 9 tasks under the subprogram "Measurement Standards of Belarus", 17 projects on participation in COOMET comparisons, 56 projects on research of national standards, 91 tasks on improving the regulatory framework (preparation of standards), 3 projects on the development and implementation of reference materials, and 6 exploratory topics.

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