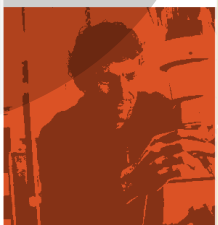
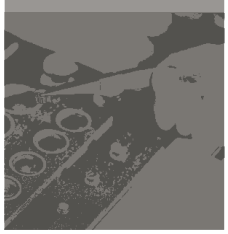
Measurement Standards Laboratory
of New Zealand

STRATEGIC PLAN
2017 – 2022

MEASURING UP





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DIRECTOR'S FOREWORD

The Government recently reviewed the Measurement Standards Laboratory (MSL) and the role of physical metrology services in New Zealand. The review confirmed that metrology services are essential to innovation and growth and are critical if New Zealand wants to be a technology-driven economy.

A long-term investment strategy has been developed to support the maintenance and development of MSL's capabilities now and for the future so that New Zealand industry can continue to benefit from a robust standards and conformance system.

This Five Year Strategic Plan explains MSL's role in the New Zealand economy and how we intend to achieve our vision for a high-quality measurement system that meets the needs of government, industry, trading partners, and the New Zealand public.

Dr Fleur Francois
Director,
Measurement Standards Laboratory

MSL STRATEGIC PLAN 2017 – 2022

Our mission

To accelerate New Zealand's economic growth and enhance well-being through access to world-class measurement standards and advice.

Our vision

New Zealand's measurement infrastructure is nationally and internationally relevant, recognised, and respected.

MSL ensures measurement, testing, and analysis meet the needs of government, industry, trading partners, and the New Zealand public.

New Zealand's measurement system is founded on science-led systems and standards.

Strategic context

The Measurement Standards Laboratory of New Zealand (MSL) is New Zealand's national metrology institute (NMI), ensuring New Zealand's units of measurement are consistent with the International System of Units, the SI. MSL is part of Callaghan Innovation, whose mission is to grow New Zealand's economy by helping business succeed through technology.

A national metrology (measurement) system is an integral part of the infrastructure required for a well-functioning economy, similar to having legal and currency systems. Accurate, traceable, and reliable measurements allow markets and economies to transact in confidence. Measurements are necessary to support government regulations for health, safety, and the environment, and underpin practically all industrial processes and many innovations.

WHY NEW ZEALAND NEEDS A NATIONAL METROLOGY INSTITUTE

MSL ensures New Zealand has ready access to accurate and reliable measurements traceable to recognised international standards, which is essential for ongoing international trade and to serve as a technical basis for solving major scientific, social, and economic challenges (see Figure 1).

For example, MSL provides measurement training, calibration, proficiency tests, and oversight in the development of codes of practice for the electricity industry's high-quality power measurements. This supports the efficient delivery of New Zealand's over $10 billion per year electricity industry.

Measurement underpins scientific and technological innovation, enhances competitiveness in business, and strengthens regulation of health, safety, and the environment.

For example, MSL provides services to the NZ Police, which ensures confidence in the accuracy of their measurements. Similarly, MSL supports the calibration of over 1,500 weighbridges used to enforce the maximum weight of trucks on roads, and the calibration of equipment used to enforce size limits in commercial fishing.

Consumers can also be confident about the millions of items sold by weight daily in supermarkets through the measurement traceability provided by MSL.

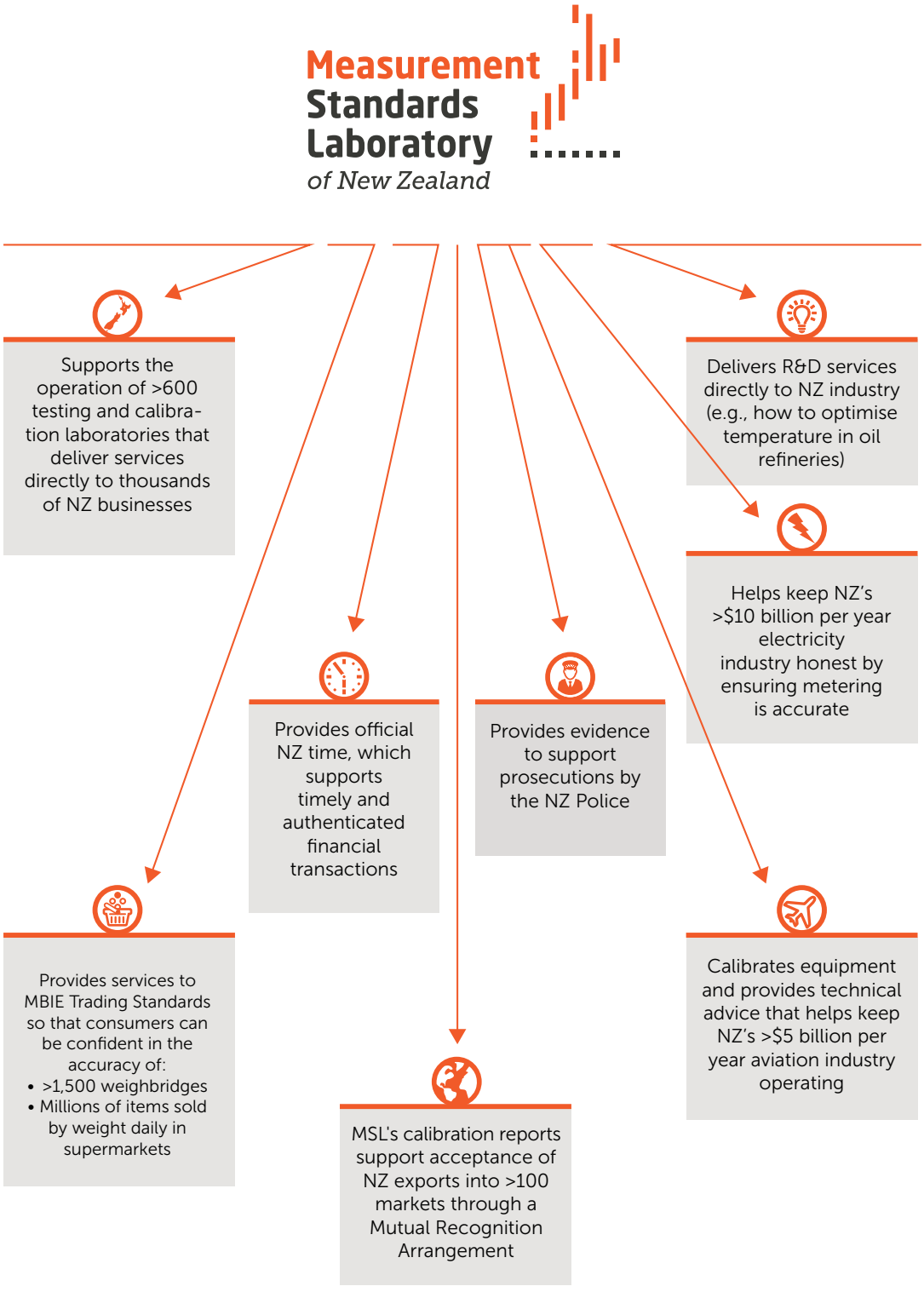


Figure 1: How MSL supports New Zealand's economy – Part 1

MSL has primary responsibility for the provision of physical measurement standards under the following legislative frameworks:

- Measurement Standards Act 1992;
- National Standards Regulations 1976;
- Weights and Measures Act 1987;
- Standards and Accreditation Act 2015;
- Fair Trading Act 1986;
- Land Transport Act 1998;
- Health and Safety at Work Act 2015.

If we didn't have a National Measurement System, there would be:

- significant barriers to trade domestically and internationally;
- loss of trust in institutions, more uncertainty, and problems enforcing the law;
- increased health and safety and environmental risks;
- lower-quality goods and services on the market;
- lost economic opportunities for New Zealand through local industries being unable to develop or adopt new technologies reliant on measurement.

New Zealand's National Quality Infrastructure

New Zealand's National Quality Infrastructure (NQI) is an institutional framework that facilitates international trade, sustains industrial production, protects consumers and the environment, and supports the growth of innovation. MSL is a pivotal part of the NQI, which also includes MBIE Trading Standards, International Accreditation New Zealand (IANZ), and Standards New Zealand (see Figure 2).

The NQI offers authoritative, independent services to encourage and facilitate the best use of measurement and quality management practice in New Zealand.

MSL is an important player in the NQI as it provides the key mechanism for disseminating quality measurements to other players in the NQI system. MSL supports the operation of over 600 testing and calibration labs, which service thousands of industry customers (see Figure 3).

MSL connects businesses to accredited labs and helps businesses access expertise to assist them in verifying the performance and quality of their products.

For example, there are 15 calibration labs accredited for thermometry in New Zealand, who gain traceability of their temperature measurements directly from MSL. These laboratories, in turn, calibrate tens of thousands of thermometers used in businesses throughout New Zealand for the manufacture of products and the control of processes in industries such as dairy and food, health, power generation, and aircraft maintenance.

MSL's calibration services are accredited to ISO/IEC 17025 by International Accreditation New Zealand (IANZ).

Measurement Standards Laboratory of New Zealand

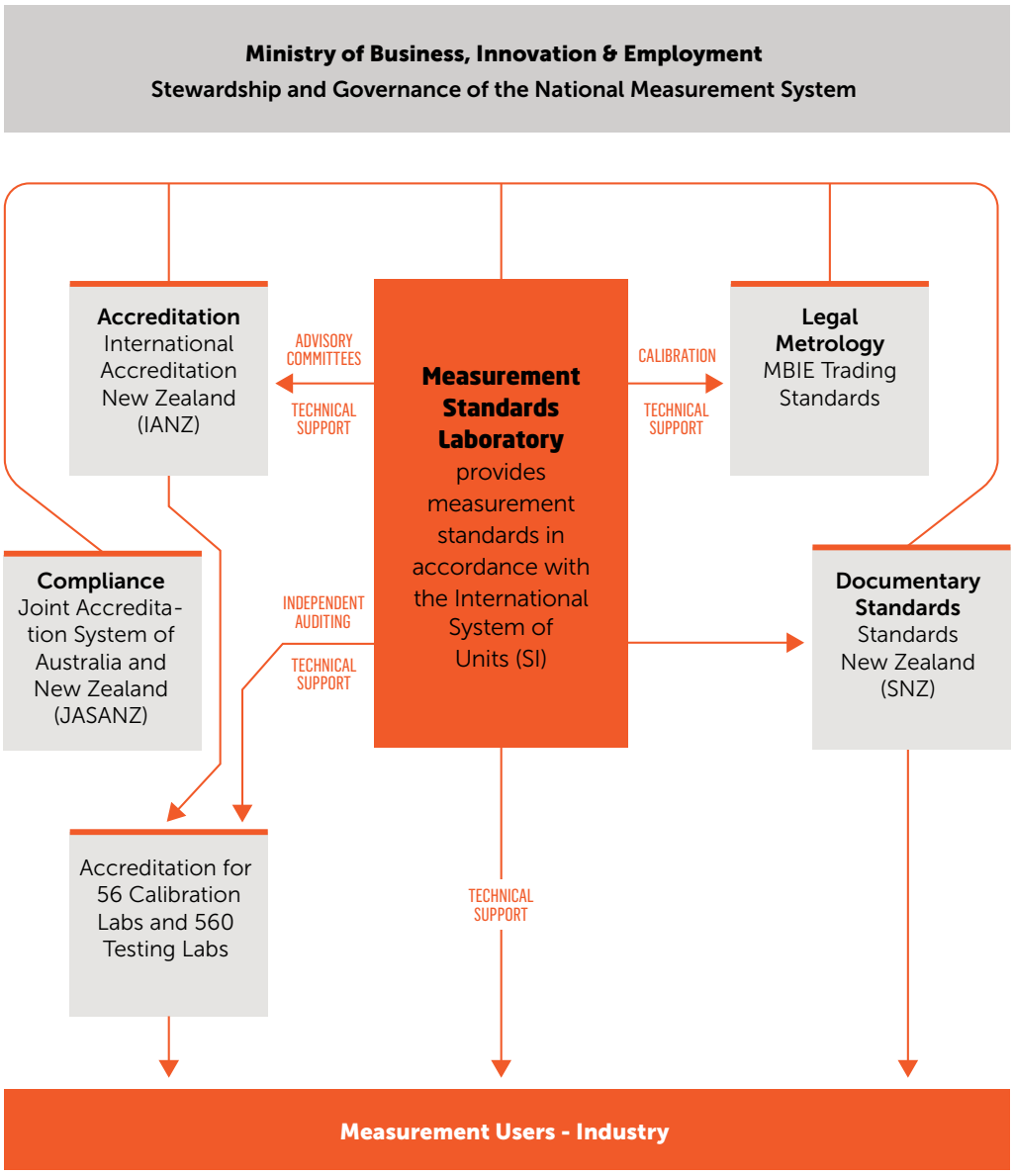


Figure 2: New Zealand's National Quality Infrastructure

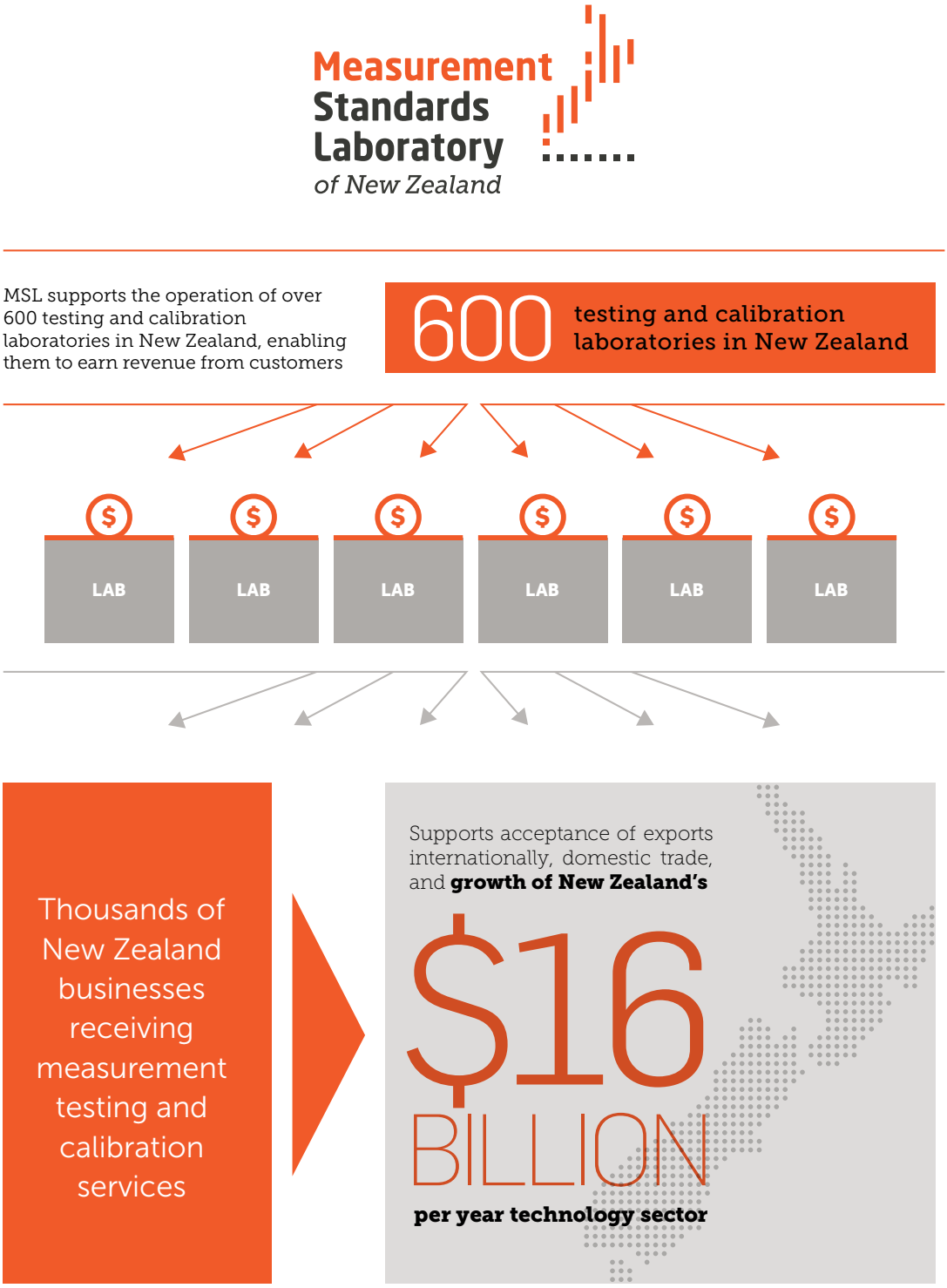


Figure 3: How MSL supports New Zealand's economy – Part 2

MSL's role in the innovation system

MSL is part of Callaghan Innovation, whose mission is to grow New Zealand's economy by helping businesses succeed through technology. Callaghan Innovation provides a single front door to the innovation system for businesses at all stages of their innovation journey – from start-ups to the most experienced R&D performers. Callaghan Innovation delivers the following innovation services to businesses:

Technology and product development: Helping businesses take an idea from concept to commercial reality.

Access to experts: Opening doors for New Zealand businesses seeking innovation advice skills, support, and technical expertise.

Innovation skills: Helping businesses build in-house innovation skills and capability.

Business collaborations: Leading collaborative innovation projects and technology missions for businesses.

R&D grants: Adding scale to businesses' R&D investment for greater impact.

MSL contributes to delivering Callaghan Innovation's technology and product development, access to experts, and innovation skills services.

MSL plays an enabling function in the innovation system. This is done through providing measurement-related services that enable the development of technology in a more accurate way, resulting in R&D being cheaper, faster, easier, and more efficient.

A NZ manufacturer has developed a composite product to replace steel reinforcing bar in concrete in humid environments. MSL provided preliminary measurements of the thermal expansion coefficient of their product to enable export of the innovative product. MSL is currently working to develop an internationally recognised measurement service in this area to meet NZ industry's needs.

MSL helps New Zealand industries adopt technology advances from overseas while also being able to help develop the technology in New Zealand. Through the services it offers, MSL is able to make innovation internationally meaningful and accepted.

MSL functions

MSL provides customers with the most accurate calibration services in the country for a wide range of instruments and artefacts. However, it carries out many other functions, ensuring smooth functioning of New Zealand's National Measurement System.

It carries out research to improve the SI and to solve measurement problems in industry and government, and provides advice and training to ensure that measurement equipment can be used effectively by customers. MSL also plays a key role in ensuring international recognition of New Zealand's National Measurement System, which is essential for New Zealand's ongoing international trade.

MSL's key functions are:

Standards Maintenance: new and improved methods for disseminating the SI definitions.

Measurement Services: calibrations, testing, field measurements.

Industrial Research: solving industrial measurement problems.

Education and Training: developing metrology skills and capability among testing and calibration labs and industry.

International Representation: promoting NZ's interests.

Fundamental Metrology: new or improved SI definitions, measurement theory.

MSL provides New Zealand with uniform units of measurement and maintains standards of measurement of physical quantities in the following areas:

Electricity;

Temperature and Humidity;

Time and Frequency;

Length;

Mass and Pressure;

Photometry and Radiometry.

MSL connects New Zealand to the international measurement community

New Zealand is a signatory to, and member state of, the Metre Convention – the intergovernmental treaty that is the basis of the international agreement on units of measurement. MSL is a member of four of the ten scientific Consultative Committees that advise on the development of the SI. MSL is a signatory to an arrangement for the international mutual recognition of calibration certificates issued by NMIs, known as the CIPM MRA (Comité international des poids et mesures Mutual Recognition Arrangement).

MSL is a founding member of the Asia-Pacific Metrology Programme that brings together all the national metrology institutes in the region. MSL participates in international comparisons of standards to confirm our capabilities and ensure our services remain world-class.

MSL is a member of NCSL International. NCSL International promotes cooperative efforts for solving the common problems faced by measurement laboratories. It has over 1500 member organisations from academic, scientific, industrial, commercial, and government facilities around the world.

MSL represents New Zealand's national committee on the International Commission on Illumination (CIE), a worldwide cooperation for the exchange of information on all matters relating to the science and art of light and lighting, colour and vision, and image technology.

These partnerships allow New Zealand to trade internationally and grow our economy.

STRATEGIC AGENDA FOR 2017 – 2022

MSL's mission is to accelerate New Zealand's economic growth and enhance well-being through access to world-class measurement standards and advice.

MSL's strategic priorities for the next five years are:

Greater engagement and connectedness – lead and coordinate engagement with business and government stakeholders on the benefits of good measurements to enhance productivity and foster innovation.

Building New Zealand's skills and capability – assist industry and others to translate measurement skills and best practice into applications.

Customer focused / market approach – deliver measurement services that enhance the productivity and growth of New Zealand industries.

Providing technological thought leadership – provide advice on international trends in measurement and standards, and the science and technology required to underpin them, to allow New Zealand industry to adopt them.

To achieve this strategic agenda MSL will need to prioritise effort, review activities, and realign priorities in response to available resourcing and other challenges.

Greater engagement and connectedness

Lead and coordinate engagement with business, and government stakeholders, on the benefits of good measurements to enhance productivity and foster innovation.

Goals during 2017 – 2022

Lead a measurement system that adapts to the needs of New Zealand businesses and government (including local) stakeholders.

Build constructive and enduring relationships with government to be a valued partner on New Zealand measurement issues.

ACTIONS

Leverage Callaghan Innovation's Sector Impact Model to:

Identify industry and government measurement needs to inform the future services MSL provides.

Develop and implement a marketing and promotions plan.

Develop and implement a stakeholder engagement plan.

Improve engagement with regulators and regulatory decision-makers.

Desired outcomes

People know about what we do and how MSL can help. MSL is the first place that people think about when there is a complex measurement problem.

Our stakeholders know about and care about good measurement. Stakeholders know the importance of measurement and value measurement expertise.

MSL has a better understanding of how business and government value and use measurement in their activities.

Case study

MSL provided measurements to support a Commerce Commission investigation of 'Thin flexible films' supplied to the NZ building industry. These films are used in the building trade for waterproofing under concrete floors. The Commerce Commission investigated a manufacturer suspected of selling polythene that was too thin, and our measurements were used as evidence for their legal action. MSL

WE'VE GOT YOUR **MEASURE**

Lead and coordinate engagement with business, and government stakeholders, on the benefits of good measurements to enhance productivity and foster innovation.

Building New Zealand's skills and capability

Assist industry and others to translate measurement skills and best practice into applications.

Goals during 2017 – 2022

MSL is actively involved in growing the understanding and promotion of good measurement and measurement skills across:

New Zealand business.

Government sector.

Tertiary education.

ACTIONS

Improve and expand measurement training to end users and the trainers (regulators, educators), including revising training resources so they are more relevant to industry.

Engage with other technical and professional societies to grow their knowledge and skills in metrology.

Actively promote metrology in tertiary education.

Desired outcomes

MSL will improve New Zealand's measurement skills and grow the understanding of good measurement and measurement skills across industry.

Case study

Temprecord International is a NZ manufacturer of temperature and humidity data loggers. They have developed a fully automated assembly and calibration facility in their Auckland factory and now sell tens of thousands of certified loggers internationally every year. This has been made possible with MSL training on temperature and humidity measurement, assistance with the development of calibration procedures appropriate for an automatic calibration, and international acceptance of their calibrations through MSL's international recognition. MSL has also assisted Temprecord with the development of insulated boxes for shipping blood, and Temprecord has now expanded their business to provide a complete measurement and logging service for the NZ Blood Service. MSL

WE'VE GOT YOUR **MEASURE**

Assist industry and others to translate measurement skills and best practice into applications.

Customer focused / market approach

Customer focused / market approach – deliver measurement services that enhance the productivity and growth of New Zealand industries.

Goals during 2017 – 2022

MSL has greater engagement with industry sectors through Callaghan Innovation's Sector Impact Model.

MSL is effective in delivering relevant services and advice for customers.

ACTIONS

Leverage Callaghan Innovation's customer engagement model to:

Effectively meet our customers' needs.

Develop and implement a marketing and promotions plan.

Prioritise the development of measurement capabilities to support our Food and Beverage, Digital, Health, AgriTech, Transport and Logistics, and Energy and Environment sectors.

Desired outcomes

MSL provides relevant metrology services to support New Zealand's and our customers' needs.

MSL is more responsive to customers' needs, knows our customers' needs better, and understands what New Zealand businesses need.

Current and new customers value MSL's services, resulting in more customer enquiries and commercial jobs.

MSL is more integrated with Callaghan Innovation's suite of services and sector impact plans.

Case study

For many years, MSL has been studying the problems of making temperature measurements in the high-temperature furnaces used in the petrochemical industry. The main problems, caused by reflected infrared radiation, were once thought to be unsolvable. MSL developed models and measurement techniques that enable the measurements to be corrected, which were used by Methanex NZ Ltd to save about $1 million per year in their Motunui methanol plant. MSL was soon providing measurement, modelling, and training services to petrochemical plants throughout Australia and SE Asia. The technology has now been licensed to Quest, a NZ/USA company specialising in consultancy to the petrochemical industry. The techniques are slowly spreading worldwide, and Shell Global considers MSL measurement practice to be the 'gold standard'. The operational improvements to the furnaces save millions of dollars per year in wasted oil and gas, and improve the energy efficiency of the plants. Very quickly after solving the problem for the petrochemical industry, MSL realised that the same problems affect many other measurements, even at lower temperatures like in cool stores. MSL training now includes these measurements, with estimated benefits to the NZ economy of $3 million per year. MSL

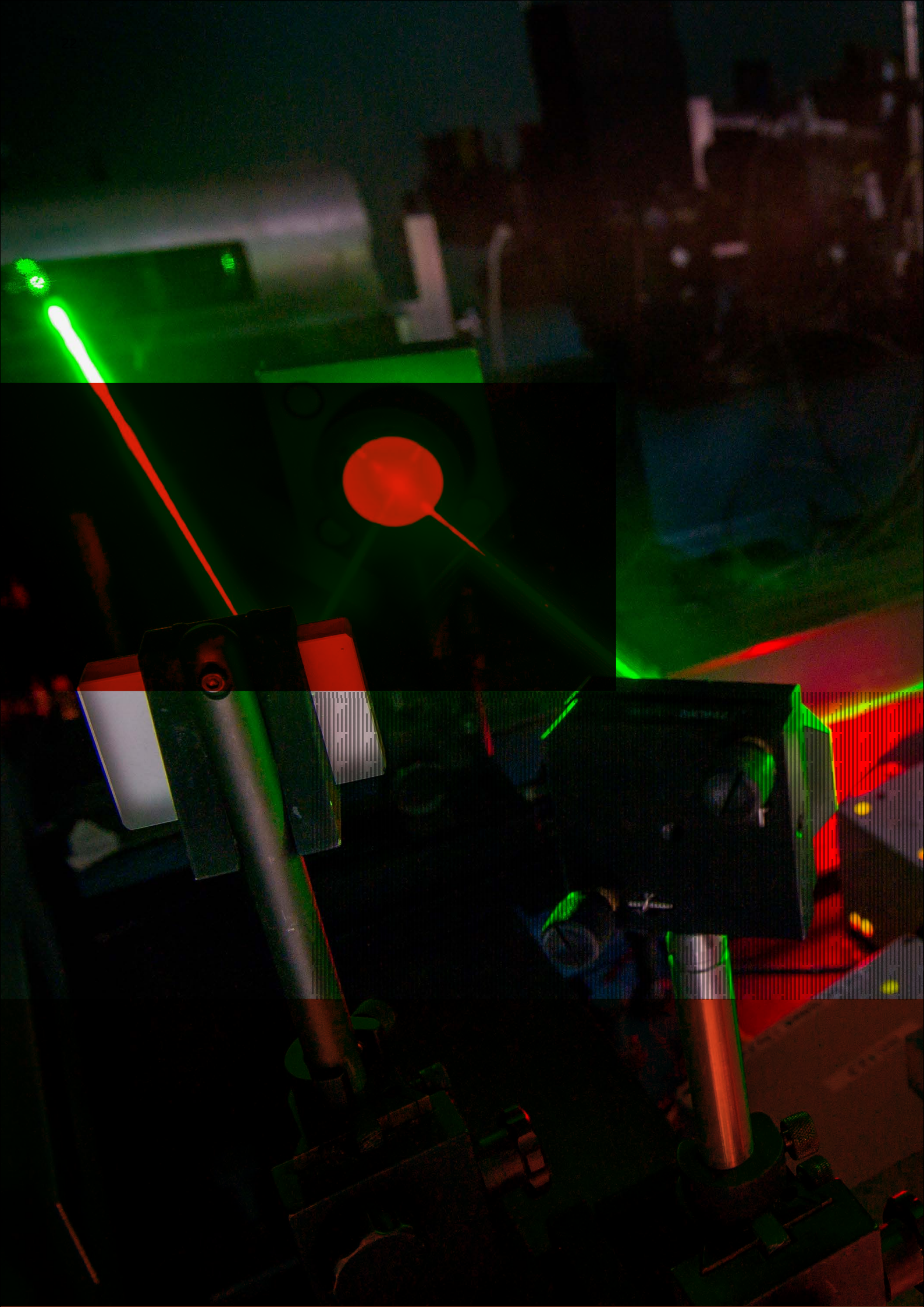
WE'VE GOT YOUR **MEASURE**

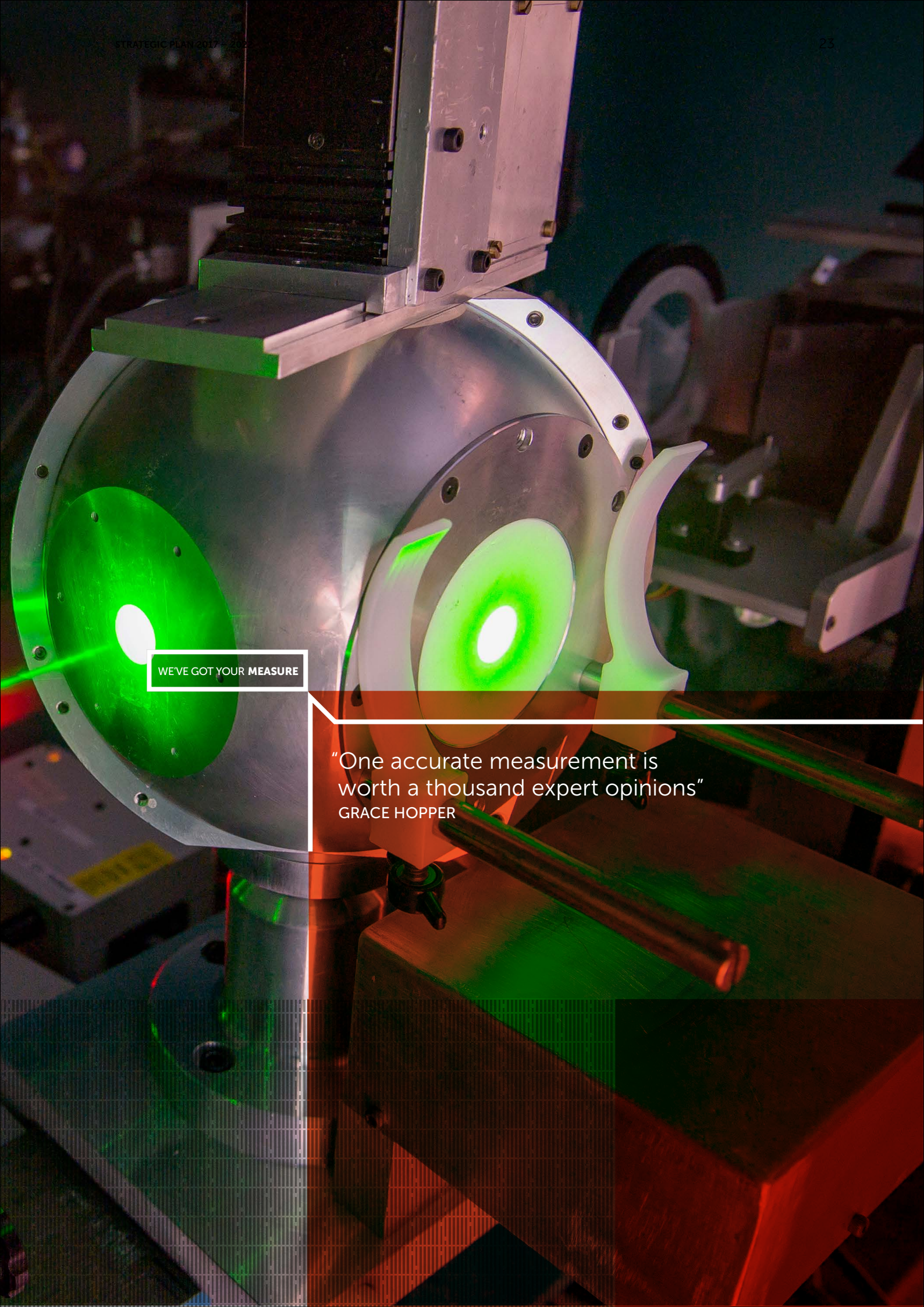
Customer focused / market approach – deliver measurement services that enhance the productivity and growth of New Zealand industries.

Examples of how MSL can support industry sectors:

Sector	Scope	Examples of how MSL can help
AGRITECH	Companies who design, develop, and manufacture technology and systems for improving yield, efficiency and profitability in agriculture, horticulture, forestry, and aquaculture.	Temperature and humidity measurement Pressure measurement Dimensional accuracy of agricultural machinery and equipment
TRANSPORT & LOGISTICS	Companies who design, develop, and manufacture vehicles, infrastructure, and the operational systems used in the movement of people, animals, and goods. Logistics focuses on the technologies/ systems created to allow for information flow, planning, monitoring, and analysing of transports solutions.	Calibration of aircraft maintenance equipment Accuracy of aircraft instruments Electrical measurement Calibration of weighbridges, industry advice on standards, tolerances, and construction
ENERGY & ENVIRONMENT	Energy: Companies who develop high-value products and services relevant to the production, supply, management, and conversion of energy. Environment: Companies who develop high-value products and services that reduce negative environmental impacts.	Temperature and pressure measurement Thermocouple use Electrical measurement and metering Light source efficiency

Sector	Scope	Examples of how MSL can help
 FOOD & BEVERAGE	Companies across the whole value chain from farm to fork (post-harvest), with particular focus on the technologies and companies that enable added-value offerings.	Temperature and humidity measurement for food safety and to avoid waste Mass and pressure measurement Volume measurement Safety of food sorting machines
 DIGITAL	Companies primarily engaged in the field of IT, such as writing, modifying, testing, or supporting software to meet the needs of a particular consumer, or planning and designing computer systems that integrate hardware, software, and communication technologies.	Radio frequency measurement Electrical measurement Time authentication for cyber security Time and frequency measurement
 HEALTH	Health companies who design, develop, and manufacture medical devices, biomedical solutions, human therapeutics, and IT products/solutions for human health in the categories of: (a) assist/ rehabilitate, diagnose, monitor, treat, prevent, or cure disease or medical conditions; (b) E-health, e.g. patient records and mobile applications; (c) self-monitoring healthcare devices.	Laser power in diagnostics and therapy Safety and efficacy of UV radiation Humidity levels in respiratory therapy Accuracy of thermometers Dimensional accuracy of artificial implants





WE'VE GOT YOUR **MEASURE**

"One accurate measurement is worth a thousand expert opinions"
GRACE HOPPER

Providing technological thought leadership

Provide advice on international trends in measurement and standards, and the science and technology required to underpin them, to allow New Zealand industry to adopt them.

Goals during 2017 – 2022

MSL expands international networks and effectively represents New Zealand's measurement interests internationally.

MSL is able to respond to changing technologies and international trends.

ACTIONS

Attend and contribute to key technical meetings – nationally and internationally.

Contribute to international research through development of MSL's Watt (Kibble) Balance and new capabilities for measuring the performance of thermocouples.

Participate in key international measurement comparisons.

Desired outcomes

Measurements in New Zealand are internationally accepted and recognised as being consistent with world best practice.

New Zealand benefits from being well-informed about international developments in measurement, particularly where they impact on trade.

Case study

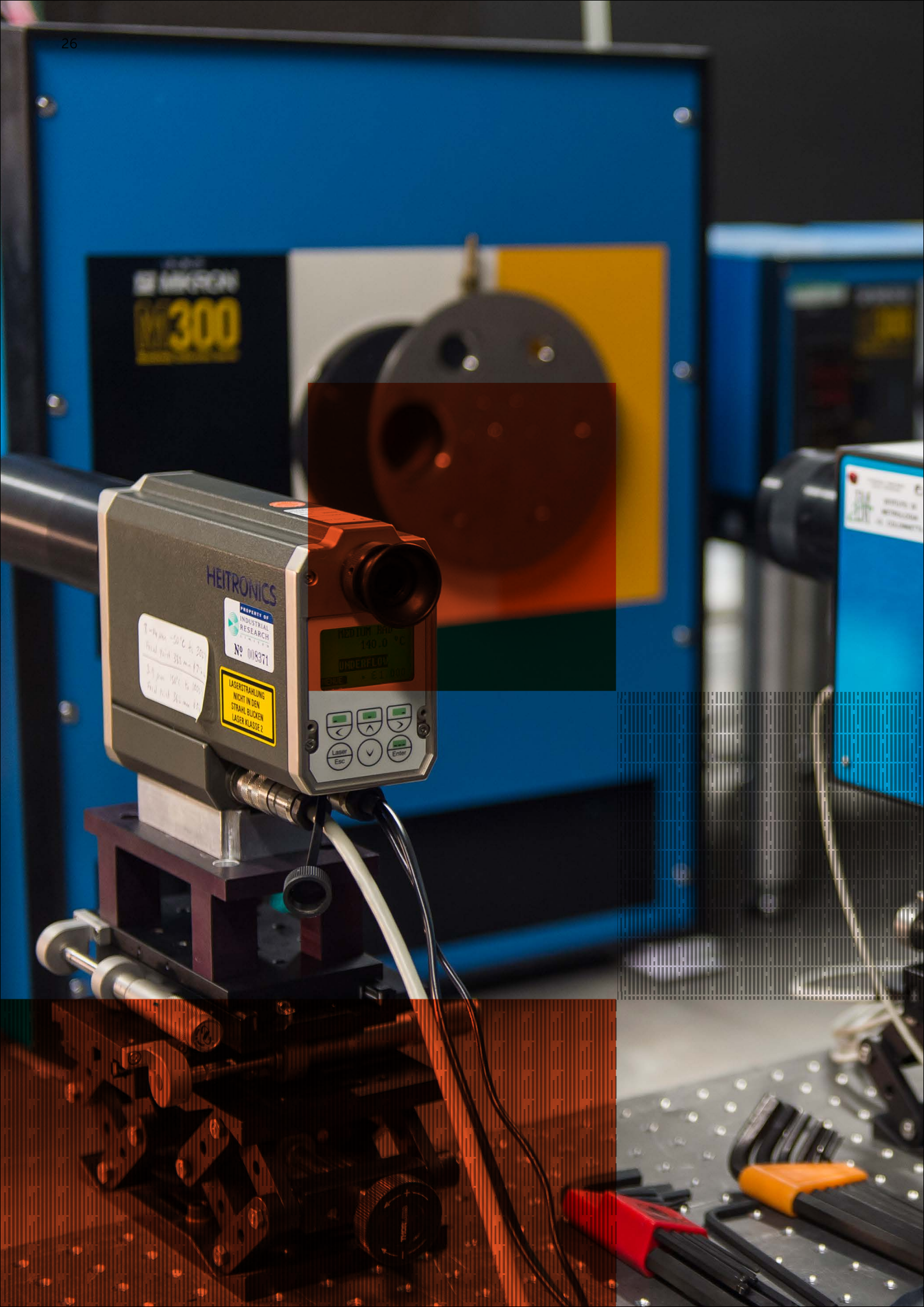
The high reliability of jet engines can only be achieved with careful balancing of the turbine assemblies. This requires very large dynamic balancing machines, which are in turn checked using large proving rotors. The FAA requires these rotors to be made to very tight dimensional tolerances. MSL helped a NZ company set up to manufacture these rotors for supply to the German manufacturer of the balancing machines. MSL provided ongoing training and then measured each individual rotor to determine compliance with the FAA specifications. The FAA accepts MSL's measurements due to MSL's participation in the international Mutual Recognition Arrangement (MRA). This arrangement provides for the international recognition of measurement made at NMIs, and requires MSL to participate in international measurement comparisons and be regularly reviewed by international colleagues. MSL's ability to provide internationally recognised measurements of the rotors allowed this NZ company to develop a new export area involving high-precision manufacturing.

KIBBLE BALANCE

The measurement world is about to change. Currently the kilogram unit is defined solely by the International Prototype Kilogram, a platinum-iridium weight held triple-locked in a vault in Paris and accessible only to a privileged few. The kilogram is the last base unit of the International System of Units to be defined by a physical object, but not for much longer.

From October 2018, the kilogram will be defined in terms of a fundamental constant of nature, known as the Planck constant, and will be accessible to all — for example via a Kibble (or watt) balance. A Kibble balance is an electromechanical instrument that measures the mass of an object in terms of precisely known standards of electric current and voltage, which together are linked to the Planck constant.

MSL is developing a Kibble balance that is radically different from, and much simpler than existing Kibble balances. Once completed, MSL's Kibble balance will allow the kilogram to be realised in New Zealand without the need to check its value regularly against a physical kilogram in Paris. MSL is one of only a handful of laboratories working on Kibble balances worldwide. This will help us measure mass more easily and cheaply. Metrology plays a central role in scientific discovery and innovation, industrial manufacturing, international trade, and protecting the global environment.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WE'VE GOT YOUR **MEASURE**

Provide advice on international trends in measurement and standards, and the science and technology required to underpin them, to allow New Zealand industry to adopt them.

HOW MSL WILL ACHIEVE THE STRATEGIC AGENDA:

MSL will prioritise effort by reviewing its activities and realign priorities in response to available resourcing and other challenges. We aim to have a balanced and broad portfolio of activities for each of our teams around research, standards development/maintenance, external training, and commercial activities.

To achieve our strategic agenda goals we need to be more outwards-focused and better connected to New Zealand industry. Callaghan Innovation's Sector Impact Model will assist us to be more informed about key industry needs so that our measurement capabilities continue to be relevant to industry.

Proposed new facilities for MSL at Callaghan Innovation's Gracefield Innovation Quarter will also enable us to have the facilities we need to grow and continue to be an effective national metrology institute for New Zealand.

Measurement Standards Laboratory of New Zealand

MSL Strategy 2017 – 2022

GROW

New Zealand's economy and enhance well-being by providing world-class measurement standards and advice

Priorities

› Greater engagement and connectedness with business and government
› Building measurement skills and capability
› Customer-focused/market approach to grow NZ industries
› Providing technological thought leadership in measurement

Services

› Primary Physical Standards
› Calibration and Testing
› Training
› Measurement Consultancy and Advice

Desired Outcomes

› The measurement system adapts to and meets the needs of NZ businesses and government
› Understanding of good measurement and measurement skills increase across industry
› MSL provides measurement services that enhance productivity and growth of NZ industries
› NZ benefits from international developments in measurement

Key Performance Indicators

› Increased demand for services (e.g. commercial revenue, training course participants)
› Increased customer satisfaction
› Increased collaborative projects with NZ industry groups or government agencies
› Productivity improvements achieved by our customers

WE'VE GOT YOUR **MEASURE**

"To measure is to know. If you can not measure it, you can not improve it".

LORD KELVIN

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of New Zealand

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