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Establishing Digital Infrastructure and Industrial Digitalization in Papua New Guinea

The Metrology Division of the National Institute of Standards and Industrial Technology (NISIT) of Papua New Guinea has partnered with Telikom PNG to collaboratively develop and deploy a Digital Calibration Certificate (DCC) system and secure digital infrastructure

*National Institute of Standards and Industrial Technology (NISIT)
Papua New Guinea (PG)*



The Challenge

Papua New Guinea (PNG) is undergoing increasing industrial and digital transformation across key economic sectors, including mining, petroleum, telecommunications, aviation, utilities, healthcare, manufacturing, and infrastructure development. These sectors rely heavily on accurate and metrologically traceable measurements for safety, compliance, operational efficiency, and international trade.

The Metrology Division of the National Institute of Standards and Industrial Technology (NISIT) — PNG's national metrology institute — has historically operated a paper-based calibration certification system. The manual, paper-based processes have created ongoing operational inefficiencies, including delays in issuing calibration certificates, affecting the timely compliance of industrial clients. Other limitations included difficulty verifying certificate authenticity, the risk of fraudulent, expired, or invalid certificates being accepted within regulated environments, and delays in servicing geographically dispersed clients across PNG's provinces, where postal and physical collection are the only available options. Furthermore, the paper-based system lacked integration between calibration records and digital industrial management or compliance systems, resulting in inconsistent retrieval of historical calibration records and complicating audit, compliance, and quality management processes.

These limitations have had significant consequences, undermining confidence in the authenticity of certificates and measurement traceability that underpins regulated industries, reducing industrial productivity, and affecting the effectiveness of quality assurance systems. It has also reduced regulatory compliance and audit readiness across government and industry while limiting interoperability with international digital quality infrastructure systems. All these concerns negatively impact PNG's broader national digital transformation agenda.

The primary measurement challenge is the limited efficiency, traceability, and accessibility of the calibration certification systems that support PNG's industrial and regulatory sectors. The affected measurement quantities span the full range of parameters that require periodic calibration across PNG's industrial and regulatory sectors, including mass, temperature, pressure, dimensional, electrical, and volumetric measurements, as well as general industrial instrumentation parameters.

Inadequate or delayed measurement verification may also result in non-compliance risks within ISO quality management systems adopted by mining, petroleum, and aviation

operators, as well as operational inefficiencies in regulated industries that rely on timely recalibration and certification. There may also be reduced confidence in measurement data used for trade, safety, and regulatory decisions, as well as increased administrative costs and time burdens for both NISIT and its industrial clients. Ultimately, without action, barriers will exist to the adoption of smart industry practices and digital compliance verification.

The convergence of these challenges, alongside the growing international movement towards Digital Calibration Certificates and Digital SI infrastructure, created a clear strategic opportunity for PNG to modernize its national metrology services through a structured, ICT-supported digitalization program.

The Solution

In 2025, NISIT entered into a Memorandum of Understanding (MoU) with Telikom PNG — PNG's national telecommunications and ICT provider — to collaboratively develop and deploy a Digital Calibration Certificate (DCC) system and associated secure digital infrastructure. Implementation activities commenced in 2026. The initiative represents a strategic, cross-institutional effort to modernize PNG's national quality infrastructure in alignment with global digital metrology trends and sustainable development goals for industry.

Under the new MoU, the Metrology Division has initiated the development of a DCC system. Implementation activities commenced in 2026, and the project is currently in the system development and implementation phase. Full deployment and operationalization are expected by the end of 2026 or early 2027. Institutions involved in the initiative include the National Institute of Standards and Industrial Technology (NISIT) — National Metrology Institute of Papua New Guinea, responsible for calibration services, metrology standards, and technical oversight of the DCC framework, and Telikom PNG — National telecommunications and ICT provider, responsible for digital platform development, ICT infrastructure, and cybersecurity support. Engagement with industrial and regulatory stakeholders across the mining, petroleum, aviation, utilities, and healthcare sectors is also maintained, as these are the intended beneficiaries of the system.

The intervention underway currently encompasses the following activities:

- Development and pilot testing of QR-code-enabled, **digitally verifiable calibration certificates** to replace paper documents (see **Figure 1**);
- Design and development of a **secure digital platform for calibration requests and record management**, incorporating centralized database architecture (see **Figure 2**);
- Development of **automated calibration workflows** to reduce manual processing time and improve service responsiveness;
- Strengthening of **cybersecurity protocols and data integrity controls** to ensure the reliability and authenticity of digital calibration records;

NISIT AI-Powered
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National Metrology Institute of PNG

CRF-2026-145
NISIT PNG — CALIBRATION CERTIFICATE

DCC-2026-0299
Certificate Number

Date of Issue: 2026-06-23
Valid Until: 2027-06-23

Instrument under Test

I Description:	I Make / Model:
Pressure Calibrator	AB104-S/FACT
I Serial No.	I Client:
PC-2023-007	Lae Industrial Services

Calibration Results

Measurement Uncertainty Statement: The expanded measurement uncertainty is $U = \pm 0.01046 \text{ bar}$ ($k=2$, 95% confidence), calculated in accordance with the GUM.

I QR Code & Verification :



Scan to verify certificate authenticity at nisit.gov.pg/verify
SHA-256:a3f8...7b2c

Calibrated by
Peter Namaliu, Pressure Lab

Authorised Signatory
[Pending — Dr. David Temu]

[Cancel](#) [Download](#)

Figure 1. A prototype of a Digital Calibration Certificate (DCC), with an incorporated QR Code and verification step.

- Establishment of **long-term digital archival systems** for calibration records, supporting audit and compliance requirements;
- **Capacity building within the Metrology Division** to operate, maintain, and further develop the digital metrology infrastructure;
- Institutional collaboration and **knowledge transfer between NISIT and Telikom PNG** throughout the development and implementation phases.

Metrological traceability to SI units is maintained throughout the transition, with calibration procedures and records remaining linked to established international metrology practices. The DCC framework is being developed in alignment with global Digital SI initiatives and international digital quality infrastructure standards, as promoted by APMP and BIPM programs,¹ which positions PNG for future interoperability with APMP and BIPM digital metrology programs.

¹ BIPM. Digital Transformation: Joint Statement of Intent on the digital transformation in the international scientific and quality infrastructure. <https://www.bipm.org/en/liaison/digital-transformation>

NISIT AI-Powered Digitalization Platform National Metrology Institute of PNG James Raka

Front Desk Dashboard < Calibration Request Form (CRF)

Contact Information

I Company Name: PNG Power Ltd I Contact Person: James Raka
 I Telephone: +675 xxx xxx I Email Address: r.temu@pngpower.com.pg
 I Designation / Position: e.g. Instrument Engineer I Postal Address: PO Box 1492, Boroko NCD, Port Moresby PNG

Instrument Details

#	Instrument / Artefact	Equipment Make	Equipment Model	Serial Number
1	Digital Pressure Ga	Druck	AB104-S/FACT	0-600 ba

Measurement Parameter: input Measurement Range Required: e.g. 0-100 ba, 0-100°C

Attachments

Supporting Documents

Drop files here or click to upload
 Previous certificate - Equipment photo - Technical manual - Instrument list (Excel)

Attached Purchase Order

Drop files here or click to upload
 Previous certificate - Equipment photo - Technical manual - Instrument list (Excel)

Save Draft Submit

NISIT AI-Powered Digitalization Platform National Metrology Institute of PNG James Raka

Front Desk Dashboard < Calibration Request Form (CRF)

CRF Details

I CRF Number: CRF-2026-145 I Submission Date: 06/03/2026
 I Company Name: PNG Power Ltd I Contact Person: James Raka
 I Telephone: +675 xxx xxx I Email Address: r.temu@pngpower.com.pg
 I Calibration Type: Offsite (In-Lab) I Preferred Service Date: 07/06/2026

Intake Confirmation & Feasibility Routing

I Intake Assessment Remarks: input

Reject Confirm

Instrument Items

Job No: MSL-CAL-2026-089-1 Mass Comparator Standard 50kg Under Feasibility Review

I Equipment Make: Druck I Equipment Model: AB104-S/FACT

Figure 2. Screenshots of the Online Client Calibration Request Form.

Baseline data for the initiative includes calibration laboratory records documenting measurement parameters, instrumentation types, and traceability chains under the existing paper-based system, and certificate issuance records capturing historical processing and turnaround times as the baseline against which digital system performance will be measured. Further, the workflow audit data identifying process bottlenecks and administrative inefficiencies in the current manual system, and the client service records capturing demand patterns and accessibility challenges, particularly from provincial and remote stakeholders, will be included.

During the deployment, several progress indicators will be tracked to assess the impact of the metrological intervention. This includes certificate processing and issuance times (compared to baseline), calibration record retrieval efficiency, and digital certificate verification success

rates. An estimate of client satisfaction and accessibility metrics will be assessed, together with uptake from provincial stakeholders. Further, any reduction in administrative costs associated with paper-based certificate management will be noted.

Data quality will be assured through controlled laboratory procedures, SI-linked traceability documentation, calibration quality management systems aligned with international standards, and verification controls embedded within the digital certificate platform.

A Quantifiable Impact

As the NISIT Digital Calibration Certificate initiative is currently in the implementation and development phase, full outcomes of the metrological intervention are anticipated by the end of 2026 or early 2027. These projections are grounded in the identified baseline deficiencies and informed by comparable digital metrology modernization programs in the Asia-Pacific region. Upon operationalization, the DCC system is expected to establish a foundational digital quality infrastructure that will enable the delivery of online calibration services accessible to all stakeholders nationwide.

The NISIT Digital Calibration Certificate initiative demonstrates how strategic investment in national metrology infrastructure can directly support digital transformation, institutional strengthening, and sustainable industrial development in a developing Pacific Island economy. The initiative also aligns with and supports PNG's national digital transformation agenda by establishing foundational digital quality infrastructure within a key government technical agency. It supports regulatory modernization objectives by enabling digital compliance verification for industries operating under national and international quality management frameworks.

Furthermore, the cross-sector MoU between NISIT and Telikom PNG serves as a practical model for developing digital quality infrastructure in resource-constrained environments but also supporting national ICT development priorities. The PNG model is also replicable for other small and developing economies in the Pacific and Asia-Pacific regions seeking to modernize national quality infrastructure with constrained resources. A further benefit is a nationwide boost to industrial innovation and competitiveness, achieved by reducing administrative barriers to calibration services and improving measurement reliability for export-oriented industries.

This case highlights how sustained, strategically planned investment in metrology modernization — particularly through cross-sector institutional collaboration — can strengthen governance systems, improve industrial efficiency, and build the trusted digital infrastructure necessary for equitable and sustainable economic development, in direct alignment with the UN Sustainable Development Goals.

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