

NMISA International Metrology Day

From Compliance to Cost Control: Traceable Energy Measurement in Modern Power Systems

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Slide 2 — Why Metering Matters

Electricity Metering Impacts:

- Revenue recovery
- Customer billing
- Energy management
- Municipal sustainability
- Industrial efficiency
- Utility planning
- National energy accountability

Key Statement:

“Every kilowatt-hour sold is a legal and financial transaction.”

Slide 3 — The Evolution of Metering

The Metering Journey

Ferraris Era

- Electromechanical meters
- Spinning aluminium disk
- Remarkably stable technology

Electronic Era

- Digital sampling
- DSP-based measurements
- Improved functionality

Smart Meter Era

- Communications
- Remote reading
- Load profiling
- Data analytics
- Smart grids

Slide 4 — Modern Energy Measurement

Today's Meter Measures Far More Than kWh

Modern systems measure:

- Active energy (kWh)
- Reactive energy (kvarh)
- Apparent energy (kVAh)
- Demand
- Voltage quality
- Harmonics
- Load profiles
- Power factor
- Event logs
- Tampering

Slide 5 — From Compliance to Cost Control

The Paradigm Shift

Traditional View

“Metering exists because regulations require it.”

Modern View

“Metering exists because organisations cannot effectively manage energy costs without trustworthy measurement.”

Slide 6 — The Importance of Traceability

Measurement Traceability

Customer Meter



Reference Standard



Calibration Laboratory



National Standard



SI Units

Key Principle

“Traceability creates confidence in measurement results.”

Slide 7 — Calibration and Uncertainty

Calibration Is More Than A Certificate

Calibration supports:

- confidence
- comparability
- repeatability
- accountability
- uncertainty evaluation

Important Reality

“A highly accurate meter installed incorrectly can still produce very inaccurate billing.”

Slide 8 — Real-World Metering Challenges

Practical Sources of Error

- CT saturation
- Phase angle errors
- Burden effects
- Harmonics
- Temperature effects
- Incorrect installation
- Tampering
- Neutral disturbances
- Communication failures

Slide 9 — Smart Metering and Modern Systems

Smart Metering Introduces New Dimensions

Opportunities

- Remote reading
- Load management
- Energy analytics
- Faster fault detection
- Demand management

Challenges

- Cybersecurity
- Data integrity
- Communication reliability
- Firmware management
- System interoperability

Slide 10 — South African Context

South Africa's Metering Environment

South Africa has developed strong expertise in:

- prepaid metering
- STS systems
- revenue protection
- utility metering
- industrial metrology
- smart metering implementation

Key Challenge

Balancing:

- technical accuracy,
- affordability,
- infrastructure constraints,
- and operational sustainability.

Slide 11 — Why Metrology Matters

Metrology Creates Trust

Metrology supports:

- fair billing
- customer confidence
- energy accountability
- legal defensibility
- financial sustainability
- technical optimisation

Key Statement

“You cannot effectively control what you cannot trustfully measure.”

Slide 12 — Closing

Final Thoughts

From compliance to cost control, traceable energy measurement has become essential for:

- utilities
- municipalities
- industry
- commerce
- and society as a whole.

Final Message

“Metrology is not merely about numbers — it is about trust, accountability, and informed decision-making.”

Thank You

Questions & Discussion