

## Training Course on Electricity Meters

February 28 to March 3, 2006  
Ho Chi Minh City, Vietnam



Cambodia

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ANGKOR WAT, CAMBODIA

## Electricity Meters

- Department of Metrology (DOM) and Industrial Laboratory Center of Cambodia (ILCC) regulate the Electricity Meters in Cambodia on the Primary Secondary and Working Standards.
- The legal units of measurement on Electricity in Cambodia is kWh, the tariff was approved by Ministry of Industry Mine and Energy (MIME) and Electricity Authority of Cambodia (EAC), but Electricite du Cambodge (EDC) is responsible for selling the Electricity.

## Electricity Meters

- Now, MIME has not passed the metrology law on electricity meters yet.
- Unfortunately, DOM and ILCC have no equipment to test the Electricity Meters, but EDC has their own equipment to verify the meters.
- EAC has solved the complaints by conducting the verification of electricity meters, but EAC cannot calibrate them.
- In reality, DOM and ILCC are responsible to verify and calibrate the Electricity Meters.

## Electricity Meters

- EDC is a private electrical company but administrated by MIME.
- EAC is an Authority to sold the disputes between the consumers and EDC.
- DOM and ILCC are the departments to control all the metrology in Cambodia including Electricity Meters.

## Industrial laboratory Center of Cambodia

ILCC has two main Laboratories as below:

- **Food Microbiology and Chemical Lab**

1. Microbiological
2. Water Chemical
3. Food Chemical
4. Non Food Chemical

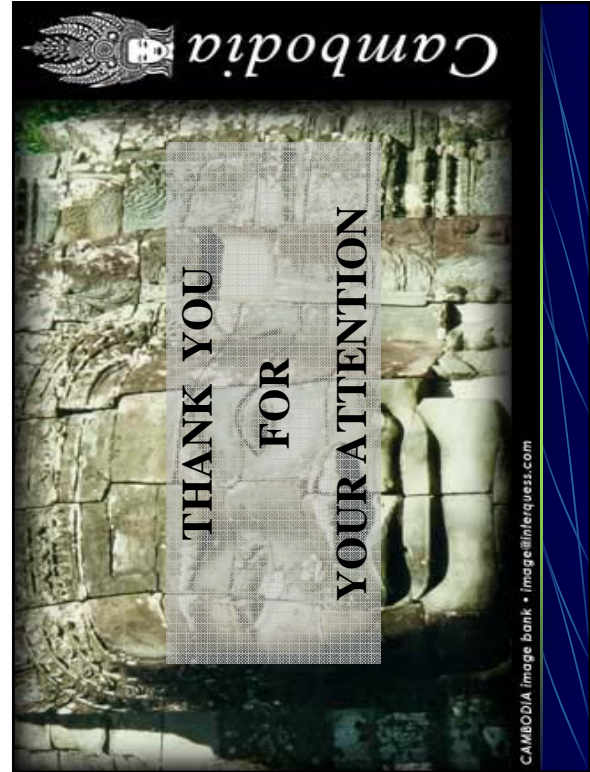
- **Scientific and Industrial Metrology Lab.**

1. Mass and Volume
2. Scale Temperature
3. Electrical and Pressure

## Department of Metrology

DOM is responsible for legal Metrology and divides into 4 offices as below:


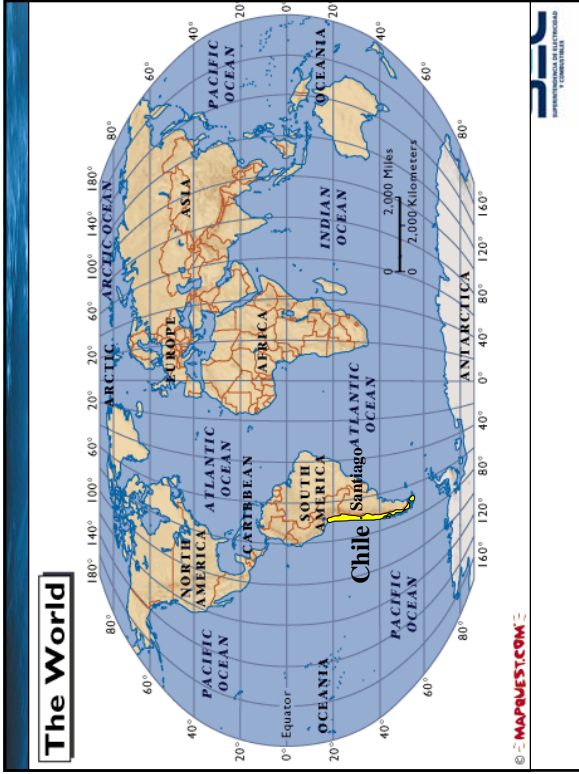
- Administration and Legislation
- Control- Verification
- Technological Development of Metrology
- Provincial Management Metrology.



# Electricity Meters – Chile

**Cristián Espinosa**  
 Chief of Electricity Area  
 Superintendency of Electricity and Fuels (SEC)

APEC/APLMF Seminars and Training Courses in Legal Metrology (CTI-10/2005T)  
 Training Course on Electricity Meters  
 February 28 - March 3, 2006

## Chilean Energy Regulatory bodies

**CNE**


(National Commission of Energy)

Regulatory body

**SEC**

(Superintendency of Electricity and Fuels)

Supervision or Controller body



## Regulations on Meters

- Before installing, the meters have to be verified, calibrated, sealed and certified by a body authorized to do so by SEC (Certification Body).
- In service meters have to be controlled by Verification Bodies (authorized by SEC).
- The distribution companies have the responsibility of doing maintenance to the meters.
- SEC determines the reverification and maintenance intervals, based on technical characteristics of the equipment.
- The distributions companies can charge the maintenance cost, only after the service has been done.



## Some Facts

- There are about 5.000.000 electricity customers and meters in Chile.
- The distribution companies own about half of these meters, and rent them to the customers (the tariff includes maintenance).
- The customers that own the meters have to pay the "maintenance" (reverification).
- Both prices are set by a tariff fixing process, lead by CNE.
- The Verification Bodies are independent companies owned by the distribution companies (subsidiaries).



## Maintenance Tariff

- Maintenance and rent tariffs are very similar in present value, but the rent is a per month tariff.
- The maintenance tariff was calculated with a reverification interval for customer owned meters of 4 years.
- The tariff decree indicates that the interval will be 4 years until SEC determines a different interval.
- SEC determined 10 years. The Government National Controller dictated that SEC cannot do this until a new tariff process is held. SEC appealed.
- Very unpopular service
  - Cost: US\$ 20 to US\$ 35, depending on the tariff area.
  - Reclamations from customers and authorities



## Measurement complaint/dispute resolution process

- If a customer asks for a reverification, the distribution company has to do so by an authorized Verification Body.
- If the meter is OK, the reverification is paid by the customer, otherwise paid by the company.




## Electricity Meters – Chile

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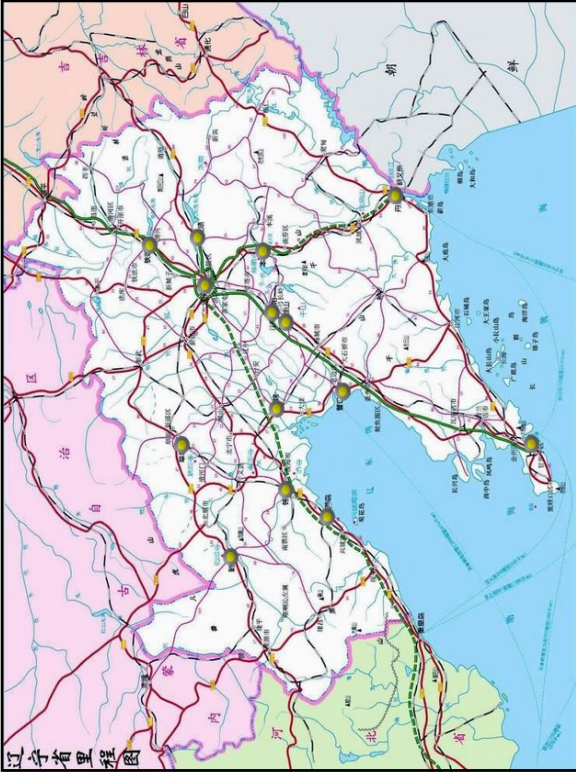



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 Legal Metrology (CTI-10/2005T)  
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 Asia-Pacific  
 Legal Metrology Forum

## Overview of the Electricity Meters in China

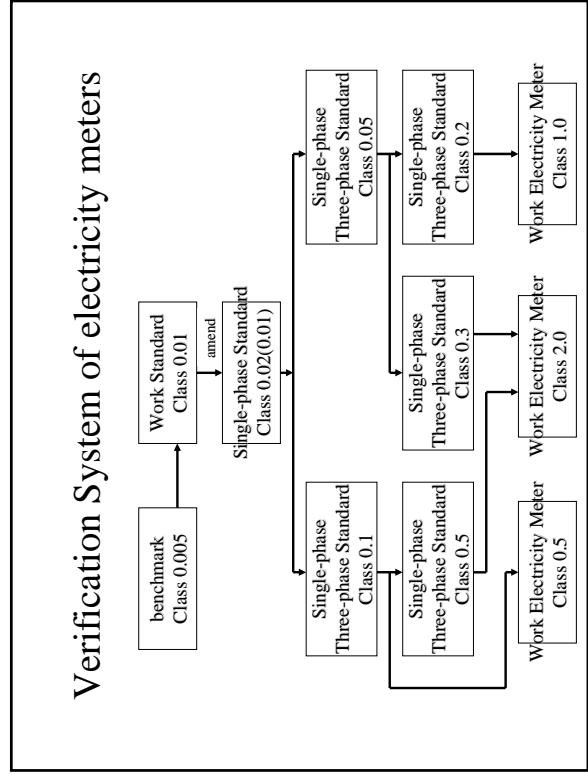
Yang Ming  
 Qin Tong  
 Liaoning Provincial Institute of Measurement (LIM)



## Liaoning Provincial Institute of Measurement (LIM)

- LIM is subordinate to Liaoning Provincial Bureau of Quality and Technical Supervision, it is a authoritative legal metrological verification institution, and it is also the locus of Northeast National Center of Metrology and Measurement.



## Organization(s) which regulate the measurement of electricity in our economy

- In our economy, the measurement of electricity is regulated by General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China. (AQSIQ)

## The legal units of measure for the sale of electricity

- kWh
- kVARh
- kVAh

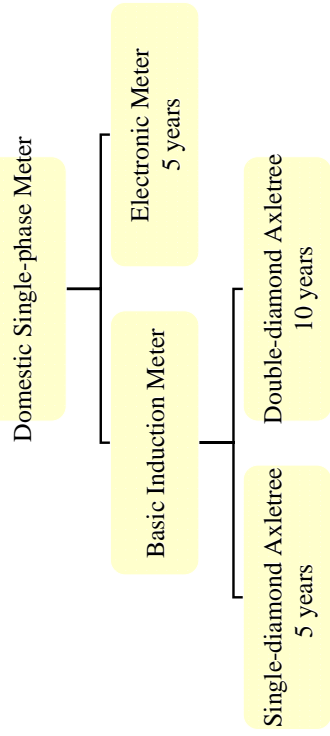
## Type Approval

- All kinds of electricity meters require approval of type test.
- The approval of type test includes insulation performance test, accuracy demand test, electric demand test, EMC test, climatic influence test, mechanism demand test.
- Only the organization of metrology and measurement which be authorized by AQSIQ can do the approval of type test.
- Electricity meters can be produced after they passed approval of type test.

## Meter Verification Testing

- Meter verification testing is required.
- The verification centre of electricity meters which be authorized by AQSIQ can do the meter verification testing.
- Tests are performed on meters in service.

## Re-verification Intervals



Thank you for your Attention



## Electricity Meter Measurement System in Indonesia

M HENDRO PURNOMO

### OVERVIEW

- Number of electricity meter installed is more than 38 million
- All of electricity meter are belonging to PLN (National Electricity Company)

### OVERVIEW

- Directorate of Metrology (DoM) is institution under Ministry of Trade has responsible to carry out legal metrology in Indonesia
- Ministry of Trade regulate the measurement of electricity in Indonesia (MET-4005/3548/VIII/1991)

### OVERVIEW

- Electricity meter is a legal metrology measuring instrument which must pass in verification and re-verification
- Directorate of Metrology (DoM) performs approval of type, verification, re-verification test



## OVERVIEW

- Meters are given a re-verification every 10 years
- The legal units of measure for the sale of electricity are :
  - kWh (residence)
  - kvarh (factory)

## CURRENT SITUATION

- 14 millions meters must be re-verify and finished in 2007
- Dom and RVO could not handle
- Third party needed

## Introduction of Electricity Meter

Japan Electric Meter Inspection Corporation  
Verification Management Group  
Isamu Namiki

## Introduction of Electricity Meter on Legal Metrology

- ✓ National regulatory organization : METI  
METI : Ministry of Economy, Trade and Industry
- ✓ Legal Unit : W , Wh , Varh , V , A
- ✓ Type Approval Body : JEMIC
- ✓ Verification Body : JEMIC, Designated Manufacturer
- ✓ Verification Periods : 7years or 10years

## Example of Type test (1)

(Extra Magnetic field Test)



- ✓ Helmholtz Coil
- ✓ Field Strength  
100 [A/m]
- ✓ Direction
  - Front Side to Back Side
  - Upper side to Bottom side
  - Left side to Right side



## Example of Type Test (2) (Electromagnetic Compatibility)



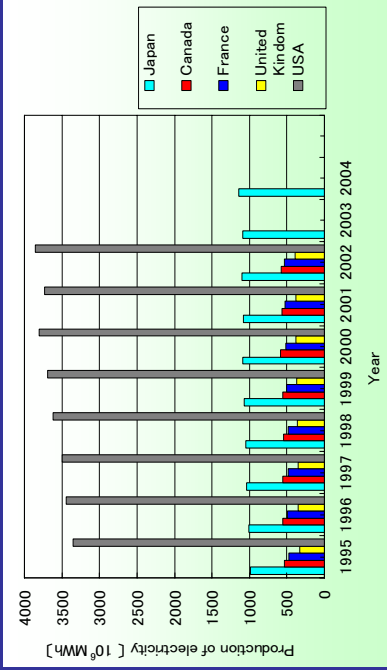
- ✓ Distance  
3[m]
- ✓ Frequency  
Range  
26-1000 [MHz]
- ✓ Field strength  
10[V/m]

### Example of Type Test (3) (Electrostatic Discharge Test)

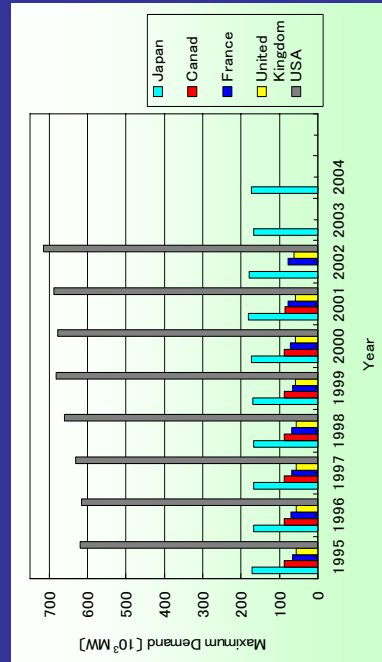


- ✓ Electrostatic Voltage  
8[KV]
- ✓ Test Condition  
Contact discharge  
10 Times

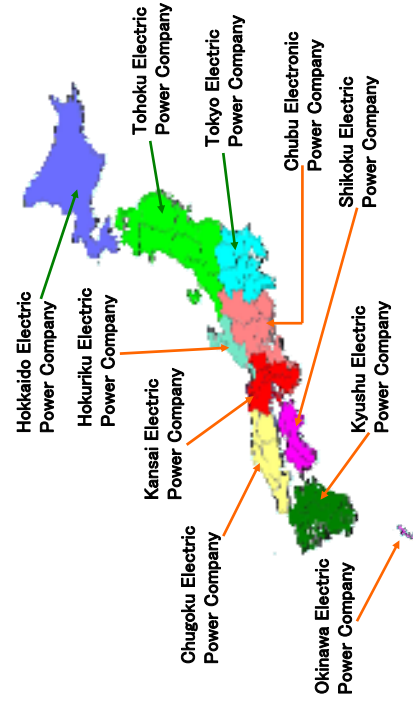
### Production of Electric Power 1995 - 2004



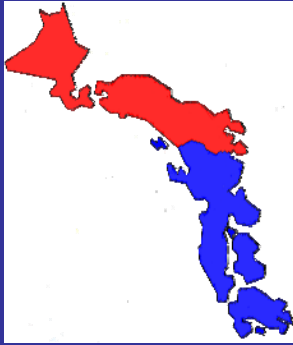
### Maximum Demand 1995 - 2004



### Electric Power Companies in Japan



## Power Supply Frequency in Japan



### 50Hz

Hokkaido Electric Power Company  
Tohoku Electric Power Company  
Tokyo Electric Power Company

### 60Hz

Chubu Electric Power Company  
Kansai Electric Power Company  
Hokuriku Electric Power Company  
Chugoku Electric Power Company  
Shikoku Electric Power Company  
Kyushu Electric Power Company  
Okinawa Electric Power Company

Thank you for your attention

Training Courses  
on

# Electricity Meters

Country report of Metrology in Lao PDR

February 28 - March 3, 2006 in Ho Chi Minh City, Vietnam

## Background

Lao people's Democratic Republic (Lao PDR) established Department of Intellectual Property Standardization and Metrology (DISM) in 1993. The Metrology Division (MD) that carries out industrial and legal Metrology activities is one of the four Divisions that function within the purview of the Department of Intellectual Property, Standardization and Metrology (DISM) established under the Science, Technology and Environment Agency (STEA).

MD is governed by the Decree on Metrology management of Lao PDR issued in 1993 as well as a regulation on Measuring instruments issued in 1995. Another regulation that has been issued has been with respect to the registration of fuel dispenser pumps in 2001. Regulations are being prepared presently for pre-packaged foods and road tankers.

This agency, which is a Government body, is the focal point responsible for advising the Government on issues of Standards, Metrology, Testing and Quality (SMTQ).

The Metrology Division is presently Vietnam is providing assistance to construct and equip a National Metrology Center. The reviewing a draft Metrology law, and new building that will house laboratory and administrative area is presently under construction.

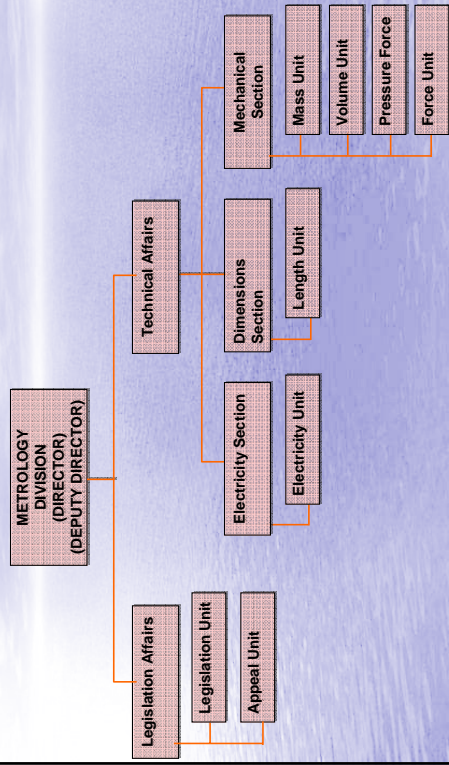
STEA has used this laboratory as the third party for control of metering electric energy in the whole country. Through the calibration of watt-meter is being conducted, it is not actively conducted by the national administrative body and entrusted to the company itself to calibrate due to the lack of reference instrument.

## **FUNCTIONS & DUTIES OF METROLOGY DIVISION (MD)**

- Being a custodian of national measurement standards;
- Establishment and maintenance of international traceability of national measurement standards;
- Verification of measuring equipment used in trade and commerce;
- Supervision, inspection and registration of measuring instruments;
- Provision of calibration and traceability services to industrial and commercial establishments;
- Cooperation with regional and international organisations in the field of metrology;

- Provision of training and improvement of the technical level of its employees;
- Drafting of legal instruments in the field of metrology,  
e.g.) Metrology law, Decree and Regulations.

## CHART OF METROLOGY DIVISION



## VERIFICATION AND REVERIFICATION

Currently in Lao PDR, there are some laboratories related to metrology activities. Lao Electric company's Laboratory is the lab cooperated with STEA that tests and calibrates the electric meter. This laboratory under Ministry of Industries and Handicraft was established to test and calibrate particularly for metering electric energy.

STEA has used this laboratory as the third party to control metering electric energy in the whole country. Although the calibration of watt-meter is being conducted, it is not actively conducted by the national administrative body and is entrusted to the company to calibrate due to the lack of reference instrument.

The legal metrology on measuring instruments by the inspector of metrology is to see if it is appropriate enough on the Technical certainty, and legalized by sealing it with validity mark and or attaching the examination result.

Verification and reverification testing for the electric meter are organized in MD.

Reverification interval for electricity meter is 10 years.

## Metrological Services

Metrology Division under the Science Technology and Environment Agency is to manage and regulate standard measurement on the measure of electricity for legal metrology measuring instrument.

The legal units of measure of the electricity meters is KILOWATT-HOUR or WATT HOUR.

Thank you very much



# Overview of Measurement System & Current Situation of Electricity Meters in Malaysia

Norhisam Ismail  
National Metrology Laboratory  
SIRIM Berhad, MALAYSIA  
Tuesday, February 28 2006

## Overview of Energy Industry in Malaysia

### Energy Commission

- Established under Energy Commission Act 2001 on 1<sup>st</sup> May 2001
- Responsible to regulate the energy supply activities in Malaysia
- To enforce energy supply laws
- Promote further development of the energy

3 main utilities

### Tenaga Nasional Berhad (TNB)

- Main power utility in Peninsular Malaysia
- Established in September 1990 through corporatization and privatization by government
- Formerly known as National Electricity Board (NEB) in 1965
- Core activities are in the generation, transmission and distribution of electric energy
- Under the distribution, electricity meters is one of the main activity

### Sabah Electricity Sdn. Bhd. (SESB)

### Sarawak Electricity Supply Corp.(SESCO)

- Independent Power Provider (IPP)
- supply to main utilities about 40% in 2002
- 19 IPPs

## Measurement Law in Malaysia

### Weights and Measure Act 1972

- Prescribes S.I units as the only legal units to be used throughout Malaysia
- Provides for the establishment of national measurement standards of physical quantities based on the S.I units

Enforcement

### Ministry of Domestic Trade and Consumer Affair - Enforcement Division

- It is gazette as Inspector of Weights and Measures

### 4 amendments: 1981, 1985, 1990 & 1992

#### Amendment in 1985

- Electricity meters, taxi meters, water meter and billing systems in telecommunication industry are exempted from verification and inspection by Inspector of Weights and Measures

- These instruments are instead to be verified and tested by the respective designated authorities

- In the case of electricity meters, verification and inspection are conducted by Tenaga Nasional Berhad (TNB)

## Measurement System in Malaysia

### NML-SIRIM Berhad

- Responsible of establishment and maintenance of national primary standards of measurement

### -All measurement used in trade transactions and other fields of legal metrology are traceable to NML

- Electrical – smoke meters, radar gun, lux meter, stop watches and also pattern approval of parking meter
- Mechanical – weight, balance, rulers
- Flow-volume, capacity, prover tank
- Chemistry-breath analyzer

### Accredited Laboratory

- About 4 accredited laboratories in electric meters including TNB through its subsidiary, TNB Metering Sdn. Bhd.

### -Reference standards used for verification and testing of electricity meters are traceable to NML

- Measurement instruments used in law enforcement are traceable to NML

### Industry

- None trade measurement used for manufacturing, industrial and scientific purposes are traceable to NML directly or to accredited laboratory

### Government Enforcement Agencies

- Such as MDTC, police, Road and Transport Department, Environmental Department

- Measurement instruments used in law enforcement are traceable to NML

### Legal unit

-The legal unit used in sale of electricity is kilowatt hour (kWh)

### Pattern Approval

- Pattern approval of electricity meters is compulsory and performed by TNB.
- Adopting IEC standard which is depending on class of the meter.
- The electricity meter's manufacturers are required to attach the results from certified independent laboratory.

### Electricity Meters Verification

- Electricity meters verification is performed by TNB.
- For medium and high voltage consumer which electricity meters used of transformer, the verification interval is once a year.
- For low voltage consumer, in single phase or three phase electricity meters, there is no specific verification interval. The verifications test is done where there is some differences in bill statistic or complain by the consumers.

Thank You



Mongolian Agency for  
Standardization and Metrology

# COUNTRY PRESENTATION

# MONGOLIA

T. Savd-Erdene  
Verification officer



## Quick facts about Mongolia

- Population: 2,4 mil. (with low density of 1,5 persons per sq.km)
- More than 10 ethnic groups, (75%- Khalkha, 7% -Kazakhs and others)
- Language: Mongolian
- Religion: More than 90% -Tibetan Buddhist Lamaism, 6% -Muslim
- Climate: Extreme continental, 4 distinct seasons (-25C in January, +25C in July)



## History of Mongolia

- Mongolia was inhabited 500,000 years ago.
- First state was established by Huns tribes in 209 B.C.
- Great Mongol Empire under Chinggis Khan was established in 1206.
- Conquest by Manchu Empire during XVIII-XIX centuries
- Restoration of Mongolian sovereignty in 1911.
- Creation of People's Republic of Mongolia in 1924 (under communism)
- Establishment of democracy in 1990



# Mongolian Agency for Standardization and Metrology - MASM

Government regulatory agency which is responsible for coordination and management of the metrology including measurement of electricity meters, standardization, testing and quality throughout the country.

# MASM

- The main functions are:
  - Standardization
  - Certification
  - Establishment of national measurement standards
  - Legal metrology
  - Accreditation
  - State supervision of standardization, quality and metrology
  - Training and consulting
  - International cooperation

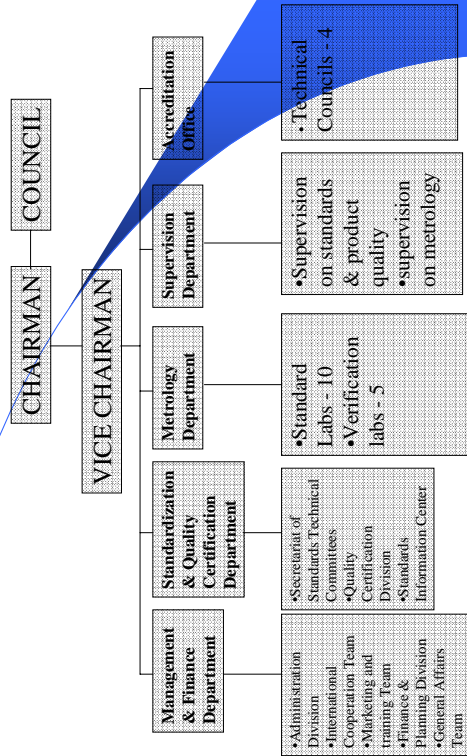
# Legal Metrology

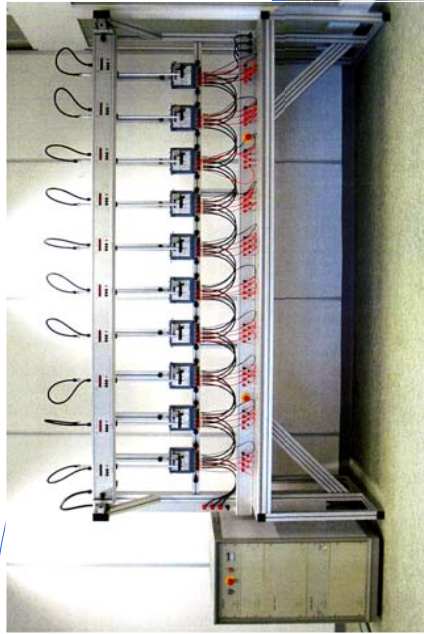
In the frame of legal metrology the MASM carrying out following activities :

A pattern approval for electricity meters according to MNS/IEC 61036 and it does by the electrical standard laboratory of the MASM



# ORGANIZATION CHART





• Verification of mandatory electricity meters by the Verification laboratory of the MASM and its branches. The re-verification intervals for mechanical meters are 3 years and for electronic meters- 8 years.



There are granted the licenses for manufacture, repair, service and sale of electricity meters to 20 more companies and organizations.

**THANK YOU**

## APEC / APLMF (CTI 10/2005T)

Training Course on Electricity Meters  
Feb 28 – March 3, 2006

### Introduction

- Name: Mr. Victor Gabi
- Position: Senior Metrologist (OIC Metrology Dept)
- Organization: National Institute of Standards and Industrial Technology
- Department: Metrology
- Responsibility: National Body in charge of Physical and Legal Metrology in the Country.

What Organization (s) regulate the measurement of electricity in your economy?

- PNG POWER LTD (service delivery and Regulator Functions) verification/testing/inspection
- ICCC (Consumer Protection/consumer right)
- NII SIT (called upon for Standards and Conformance)

What are the Legal Units of Measurement for the sale of electricity?

- KiloWatt-hour

Do electricity Meters require approval of type?

Yes they do require type testing -

- AS Wiring Rules & Associated STDS
- PNGPOWER Trade Circular

What organization performs approval of types testing?

PNG Power Ltd

Is meter verification testing required?

■ Yes

What organization performs the meter verification test?

**PNG Power Ltd**

Are test performed on meter in service?

**PNG Power Ltd**

Are meters given a verification interval?

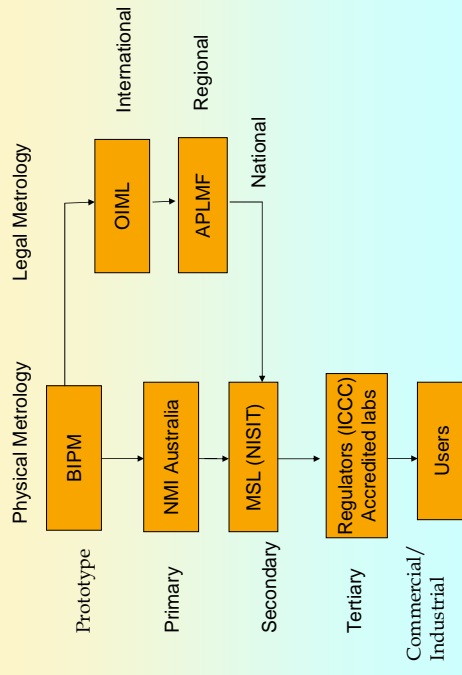
**Yes. 5 years interval**

Is there a measurement complaint/dispute resolution process?

**Yes.**

**Tripartite : PNGPOWER, ICCC, NISIT**

### Traceability of Measurement



**END**



Department of Science and Technology  
**Industrial Technology Development Institute**  
 National Metrology Laboratory  
 Bicutan, Taguig, Metro Manila, Philippines

## Overview of (Electricity) Measurement Systems in the Philippines

Manuel M. Ruiz  
 Electrical, Time and Frequency Standards Section

REPUBLIC OF THE PHILIPPINES  
 BATASANG PAMBANSA  
*First Regular Session* } C.B. No. 11

### BATAS PAMBANSA BLG. 8

AN ACT DEFINING THE METRIC SYSTEM AND ITS UNITS, PROVIDING FOR ITS IMPLEMENTATION AND FOR OTHER PURPOSES

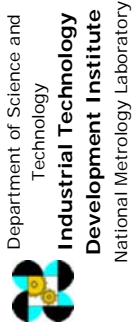
Be it enacted by the Batasang Pambansa in session assembled:

#### SECTION 1. Adoption of the metric system -

Effective January one nineteen hundred and eighty-three, the metric system (SI) as defined herein, shall be the sole measurement system to be used in the Philippines. ...

#### SECTION 6. National Standards for metric units -4.

For the purpose of deriving the value of the base units, the **National Institute of Science and Technology shall establish and maintain national standards of these units** with the concurrence of the Board for certification by the International Bureau of Weights and Measures when necessary. ...



... is mandated by law to establish and maintain physical standards for basic units of measurement – electricity included.

Also, pursuant to Republic Act No. 9236 "An Act Establishing a National Measurement Infrastructure System for Standards and Measurements, and for Other Purposes" otherwise known as The National Metrology Act of 2003:

There shall be established a National Measurement Infrastructure System providing measurement standards that are internationally traceable and consistent with the Metre Convention.

Republic of the Philippines  
 Congress of the Philippines  
 Metro Manila

Twelfth Congress  
 Third Regular Session

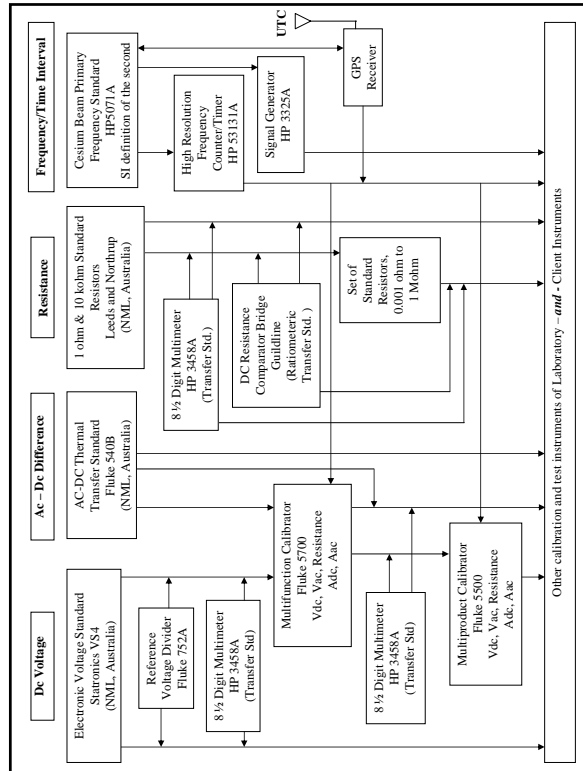
Began and held in Metro Manila, on Monday, the twenty-eight day of July, two thousand and three.

[Republic Act No. 9236]

**AN ACT ESTABLISHING A NATIONAL MEASUREMENT INFRASTRUCTURE SYSTEM (NIMS) FOR STANDARDS AND MEASUREMENTS, AND FOR OTHER PURPOSES**  
 Be it enacted by the Senate and House of Representatives of the Philippines in Congress assembled:

SECTION 1. Title. – This Act shall be known as "The National Metrology Act of 2003."

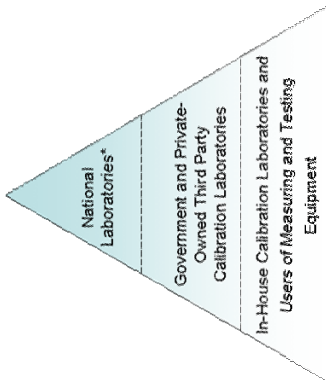
SECTION 2. Declaration of Policy. – It is hereby declared the policy of the State to facilitate the development of scientific and technical knowledge and progress in the national economy by encouraging the standardization and modernization of units and standards of measurements to adapt to the needs of the times, thereby complying with international standards and protecting the health, interest and safety of every consumer and his environment from the harmful effects of inaccurate or false measurements.





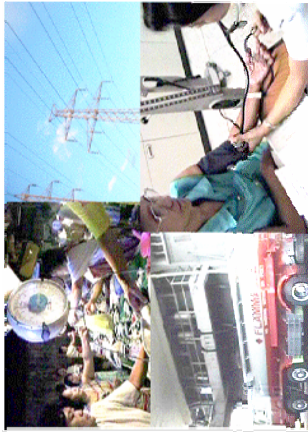
Measurement laboratories in the National Measurement Infrastructure System shall be, with respect to accuracy level, hierarchical in nature, forming a metrology pyramid:

- national laboratories of highest accuracy level at the apex
- government and private-owned third party calibration laboratories in the middle
- in-house calibration laboratories and users of measuring and testing equipment at the base



\* PNRI – DOST and BHDT – DOH: ionizing radiation  
 PAGASA – DOST: time of the day  
 ITDI – DOST: all other national standards of units of measurement (e.g., mass, length, electricity, frequency, temperature, force, pressure).

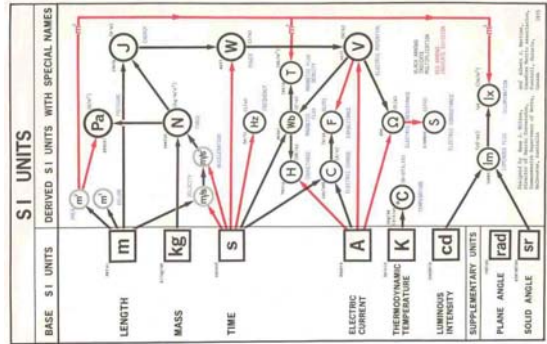
The National Metrology Act of 2003 prescribes the metrological controls on measuring instruments and standards required to ensure reliable measurements in the Regulated Areas of Application.



"... the field of endeavors or areas which are critical to citizens as they affect health, safety, welfare, physical conditions, trade and commerce, legal transactions, environment and other areas as may be determined by the National Metrology Board."

The National Metrology Board is the body responsible for implementing the provisions of the Act

In the regulated areas of application, the system of units based on the International System of Units prescribed by the CGPM is **mandatory** throughout the country.



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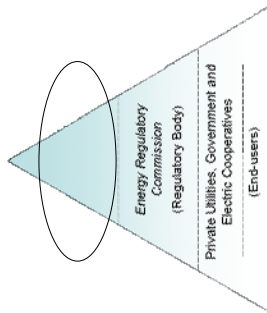
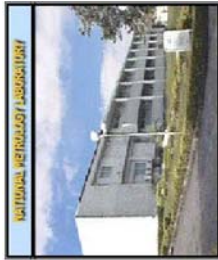


The National Metrology Laboratory (NML/Phil) presently existing as the laboratory arm of the ITDI on metrology shall lead public and private laboratories in carrying out:

- Calibration
- Verification
- Type Approval
- Testing, and
- Other Metrological Controls

of measuring instruments to effectively implement the provisions of the Act.

For the purpose of enforcing its mandate, the National Metrology Board may delegate specific authority and functions to other departments and agencies of the government and private institutions as deputized entities to assist in the implementation of the Act.



ITDI shall form "Technical Working Groups" drawing members from the departments and agencies of the government and private institutions, to draft technical and other guidelines needed to carry out the provisions of the Act. Among others, these shall include:

- Verification Procedures
- Type Approval Procedures
- Verification Intervals
- Tolerances for Measuring Equipment

International Standards shall be used as reference for developing guidelines for the above procedures.

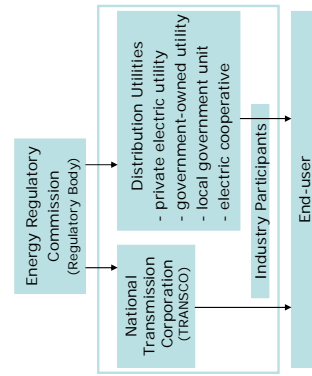
Verification intervals for measuring equipment that are of widespread use for sale of goods directly to consumers

Equipment	Type	Use	Interval
Weighing Scale	Spring	Dry and Wet Market	12 months
Weighing Scale	Top loading, electronic	Dry and Wet Market	12 months
Weighing Scale	Hanging scale, pendulum	Dry and Wet Market	12 months
Water Flow Meter	Mechanical	Residential	8 years
Electric Energy Meter	Electro-mechanical	Residential	10 years
Electric Energy Meter	Electronic	Residential	7 years
Master Petroleum Product		Gasoline Stations	Daily checks by station
Calibrating Buckets		Verification of dispenser at gasoline stations	12 months
Measuring Sticks		Sale of textiles, wires, etc.	5 years
Steel Tape Measure		Sale of wires, metal rods, etc.	6 years

Distribution of electric power to all end-users is undertaken by private distribution utilities, cooperatives, local government units and other duly authorized entities.

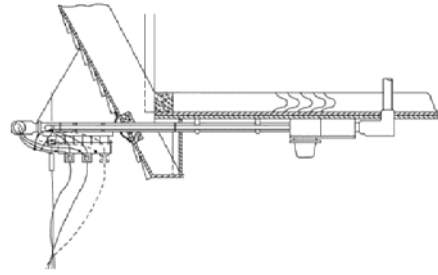
The Energy Regulatory Commission promulgates and enforces basic rules, procedures, requirements and standards that govern the operation and maintenance of electric distribution systems in the Philippines. (RA 9136 Electric Power Industry Reform Act of 2001)

This includes requirements pertaining to measurement of electrical quantities associated with the supply of electricity and procedures for providing metering data for billing and settlement. (Philippine Distribution Code)



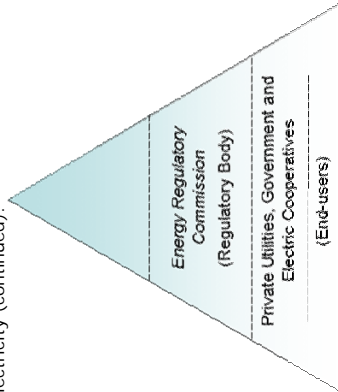
(Some important) Requirements for the supply of electricity:

- Distributor is responsible for design, installation, operation and maintenance of metering system to ensure integrity and accuracy of metering system
- Instrument transformers and their use:
  - accuracy class 0.3 or better complying with IEC or equivalent national standards
  - connected only to a revenue meter with a burden that will not affect the accuracy of measurement
  - to be tested during commissioning stage



(Some important) Requirements for the measurement and metering of electrical quantities for the supply of electricity (continued):

- meter testing and calibration:
  - shall be conducted by ERC or its authorized representative
  - performed during testing or commissioning stage
  - calibration shall be traceable to National Institute of Standards or any reputable international standard body.
  - test, calibration, maintenance and sealing records are kept by the distributor



The Consumer Affairs Service of the ERC handles consumer complaints and ensures the adequate promotion of consumer interests with respect to metering and billing disputes.

Rules and procedures governing complaints filed with the Consumer Affairs Service of the ERC have been established to provide fair and acceptable actions on complaints/grievances of consumers.

In case of measurement disputes, the National Metrology Board may assist the ERC, court or other adjudicative body by:

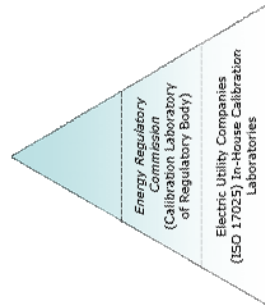
- providing technical information
- conducting tests
- rendering expert opinion

Concluding Remarks and Future Plans:

While the ERC performs calibration of electric energy meters, the NML must be able to support the traceability needs not only of the regulatory body but also of the in-house calibration laboratories of utility companies.

At present, the NML has sufficient capability in the measurement of ac voltage and current, phase angle, and time/frequency. In principle, it should be able to derive power and energy from those quantities, but the NML does not offer the measurement or calibration service.

For reasons of economics, the NML will continue to rely on the present providers of the measurement service. These existing measurement providers however are encouraged to seek accreditation (ISO 17025) for the service they perform. A formal deputizing may be required to formalize stature according the Metrology Act of 2003.



The Consumer Affairs Service of the ERC handles consumer complaints and ensures the adequate promotion of consumer interests with respect to metering and billing disputes.

Rules and procedures governing complaints filed with the Consumer Affairs Service of the ERC have been established to provide fair and acceptable actions on complaints/grievances of consumers.

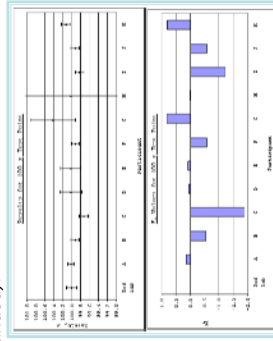
In case of measurement disputes, the National Metrology Board may assist the ERC, court or other adjudicative body by:

- providing technical information
- conducting tests
- rendering expert opinion

Concluding Remarks and Future Plans (continued):

In support of ISO 17025 accreditation requirements of calibration service providers, the NML plans to organize interlaboratory comparisons on the calibration of energy meters by:

- acting as reference laboratory, or
- purchasing a commercial Proficiency Testing, PT program from an overseas PT provider and acting program coordinator
- also suggesting to the APLMF to organize a PT program for energy meter calibration



ITDI welcomes any assistance in improving its legal metrology infrastructure, e.g. in the preparation of technical guidelines for Verification and Type Approval Procedures and in the Verification and Approval process themselves. ITDI also appreciates the efforts of APLMF in conducting these series of Seminars and Training Courses on Electricity Meters for legal metrology practitioners in the region.



**Overview of the Measurement System  
about Electricity Meters In Chinese  
Taipei**

APEC/APLMF Seminar and Training Courses in  
Legal Metrology

Tung-Tuan Wu

Taiwan Electric Research & Testing Center, TERTEC  
February 28 - March 3, 2006



**Organizations regulate the measurement  
of electricity**

- MOEA (Ministry of Economic Affairs) regulates metrological control of Measuring instruments.
- BSMI (Bureau of Standards, Metrology and Inspection) verifies measuring instruments before its sale or usage.
- BSMI inspects measuring instruments.



**The legal units of measure for the  
sale of electricity**

- Residential : KWatt-hour.
- Commercial and industrial :  
maximum demand KVA-hour.



**Requirement approval for different  
electricity meters**

- Submission of a meter and its technical information to BSMI for type approval.
- Laboratory tests ensure that electricity meter complies with regulation.

### Organization performs the meters verification test

- All new and repaired electricity meters require verification testing.
- Accredited bodies verify the meters.
- BSMI encourages private testing institutions to participate in government affairs.
- Through the contract, the BSMI accredits well-equipped, independent, and impartial testing institutions to carry out the verification.
- BSMI entrusts TERTEC for the verification of electricity meters.

### Tests perform on meters in service

- BSMI regulates which and how many meters should be tested.
- Power supply company removes meters to be tested.
- TERTEC tests electricity meters at the testing laboratory.
- Complaint dispute meters can be disassembled to be tested at the testing laboratory.

### Meters are given a validity for re-verification

- Diamond bearing watt-hour meter is valid for 7 years.
- Non-bearing (electronic) meter is valid for 8 years.
- Surge proof with transformer or with a demanding meter is valid for 8 years.
- Surge proof (magnet bearing watt-hour meter) without transformer or without demanding meter is valid for 16 years.
- Single-phase socket is valid for 20 years.

### Complaint/dispute resolution process

- Users can apply for meters identification.
- BSMI or police accompanies with users and power company staff attend the meeting for meters identification.
- TERTEC offers both power company and users the identification results.



**BSMI (Bureau of Standards, Metrology  
and Inspection)**

**<http://www.bsmi.gov.tw>**

**TERTEC (Taiwan Electric Research &  
Testing Center)**

**<http://www.tertec.org.tw>**

**Thank you for your attention!**

# Electricity

## Meters

By: Woravith Wisupakarn  
CBWM. Thailand

# Organization

In Thailand, there is no organization that is responsible for the measurement of electricity directly

# Organization

- ✧ Metropolitan Electricity Authority
- ✧ Provincial Electricity Authority



- ✧ Metropolitan Electricity Authority
- ✧ Provincial Electricity Authority

## **Verification :**

**Import :** All meters have to be verified, and standards are referred to the those of its country origin. For example, the imported meters from USA will be verified by ANSI standard.

**Domestic :** Reference based on IEC standard and verification by random

## **In service**

❖ Each organization has to provide such data for electricity meters before setting as place, date, type, etc. After 20 years of installation, the meter will be checked and replaced by new meter. (20 years for Metropolitan Electricity Authority, and 15 years for Provincial Electricity Authority.)

## **Verification interval**

No Verification interval.

## **Unit**

Legal unit of measure is

**Kilowatt Per Hour.**



## **Type Approval**

Manufacturers have to send type test  
Include their bid. Verification is based on  
IEC521-1976.

## **Measurement complaint :**

Measurement complaint will be proceed  
as follow: the doubted meter will be  
checked at a laboratory meanwhile the  
officers replace it with a new meter at  
user' s place

## **Measurement complaint :**

Both organizations find  
measurement complaint  
approximately 0.4% a year

## **Measurement complaint :**

If the result of meter-check  
is precise, the user has to  
pay for the checking fee.

## **Measurement complaint :**

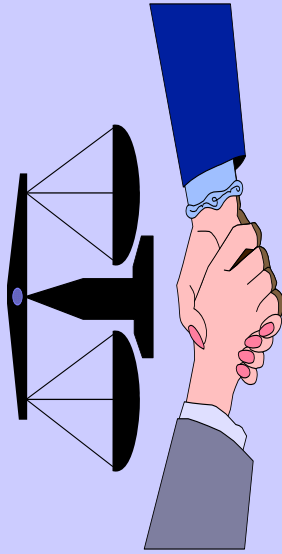
Other fees in case the meter is imprecise, officer will do the followings:

- If the meter reading is above the standard, then the organization has to pay for surplus.
- If the meter reading is below the standard, then the user have to pay for surplus.



DIRECTORATE FOR STANDARDS AND  
QUALITY (STAMEQ)  
VIETNAM METROLOGY INSTITUTE (VMI)

**YOU ARE WELCOME**



2

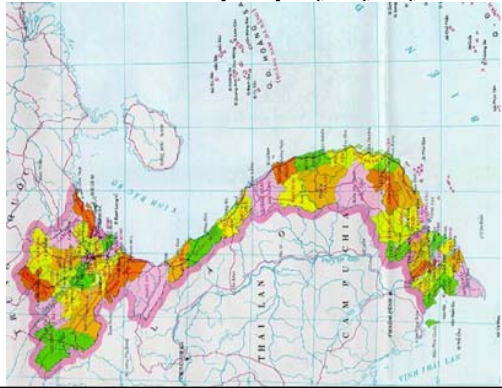


DIRECTORATE FOR STANDARDS AND  
QUALITY (STAMEQ)  
VIETNAM METROLOGY INSTITUTE

Training Courses in Legal Metrology  
Training Course on Electricity

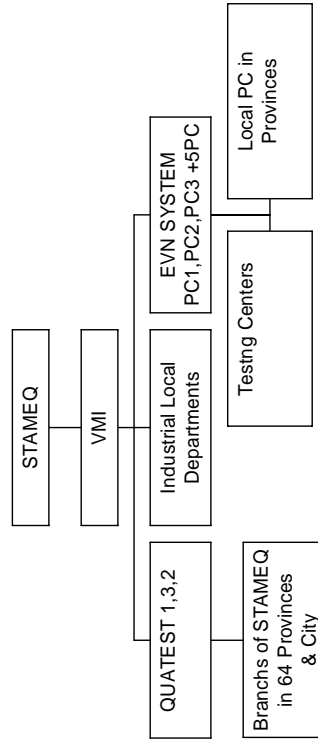
# overview of the measurement system about electricity meters in Vietnam

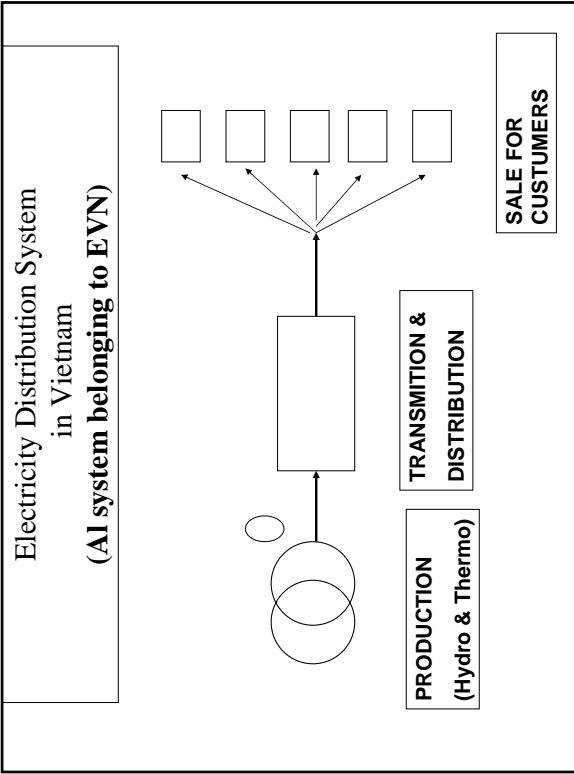
February 28 - March 3, 2006 in Ho Chi Minh City, Viet Nam



- 64 provinces & cities
- 3 regions:
  - \*North (24 provinces +2 cities)
  - \*Middle (23 provinces +1 cities)
  - \*South (12 provinces +3 cities)

## ADMINISTRATIVE METROLOGICAL SYSTEM IN VIETNAM





Statistic of Electricity Meters for The Sale of Electricity (12-2005)						
NN	organizations	Inductive 1 phase	Inductive 3 phase	Electronics	Summary	
1	EVN	11,524,956	168,342	151,686	11,844,984	
2	PC 1 (24 local PC)	1,570,882	62,680	15,867	1,649,429	
3	PC 2 (12 Local PC)	1,941,699	17,151	16,552	1,975,402	
4	PC 3 (23 Local PC)	1,914,915	31,832	12,415	959,162	
5	HANOI PC	2,571,007	14,046	9,060	1,89,113	
6	HAIPHONG PC	1,027,385	32,768	8,135	1,228,288	
7	HOCHIMINH PC	2,204,499	6,325	12,543	1,711,367	
8	DONGNAI PC	253,741	1,796	1,954	257,491	
9	NINHBINH PC	40,828	1,744	160	42,732	

**Organizations Regulate The Measurement of Electricity**

- 64 Authorized Stations  
(Branches of STAMEQ in 64 Provinces & City)
- 61 Authorized Laboratories  
(belong to PC<sub>s</sub> of the EVN System)
- 02 Authorized Laboratories  
(belong to local Industrial Departments)

**Legal Unit of Measure  
For The Sale of Electricity**

- kWh (Kilowatt-Hour)
  - kVArh ( KiloVar-Hour)
  - kVAh (Kilova-Hour)
- In Vietnam, all the meters used for  
electricity sales by contract have to be  
verified**

## TYPE APPROVAL

2 types:

-Model Test :

- Domestically Produce  
(New design of meters)
- Imported meters

- Verification test :  
(Inspection, re-verification...)

## REGULATIONS

Vietnamese Standards

For Inductive Meter

- TCVN 6572-1999 & DLVN 07-2003
- Follow to IEC 62053-21 (IEC 521-1988)

For Electronic Meter

- TCVN 6571-1999 & DLVN 39-2004
- Follow to IEC 62053-22 (IEC 1036 , IEC 687 IEC 1268)

## Typical Electrical Meters of Used

1. Reference (Electronic)

Classification: 0,005-0,01-0,02-0,1-0,2-0,5  
Re-verification Interval: 1 year

2. Consumers (Inductive & Electronic type)

- 1 phase (2 wire)
- 3 phase (3 elements - 4wire , 2 elements - 3 wire)
- 3 phi multitariff

Classification: 0,5-1,0-2,0 (Follow to IEC)

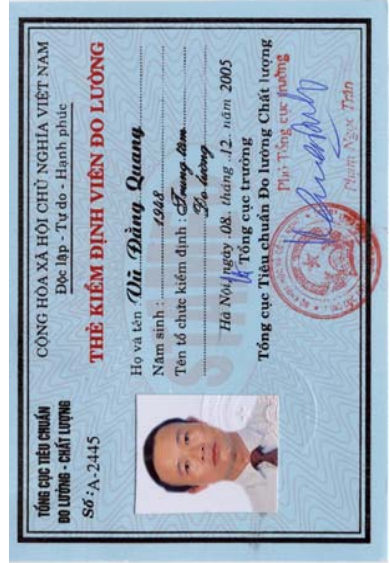
Re-verification Interval: 1 phase - 5 year      3  
phase - 2 years

**Who Has the Right to Verify and Test  
the Electricity Meter**

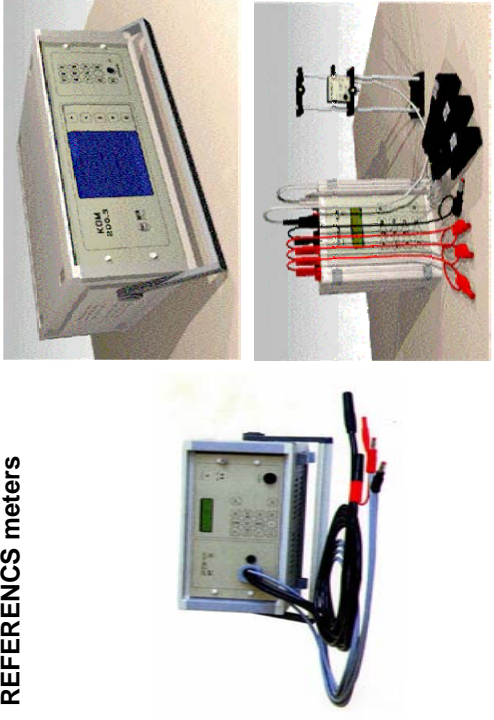
**Authorized Organization :**

- + Personal have license**
- + Technical equipments**

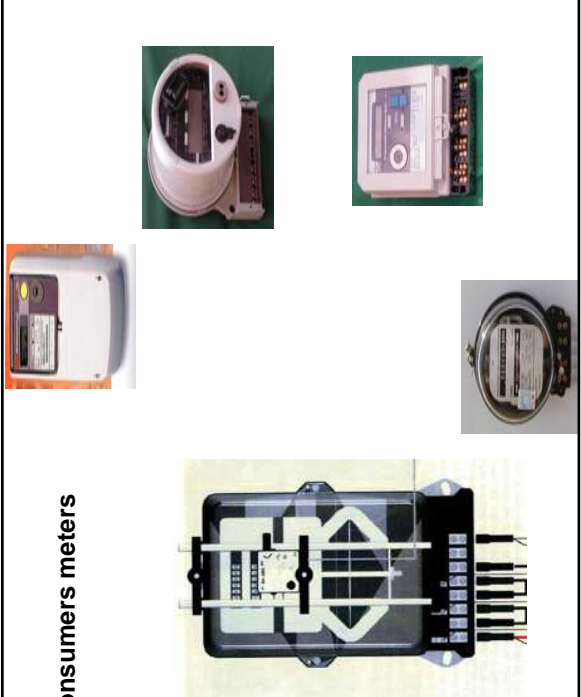
# Who Has the Right to Verify and Test the Electricity Meter



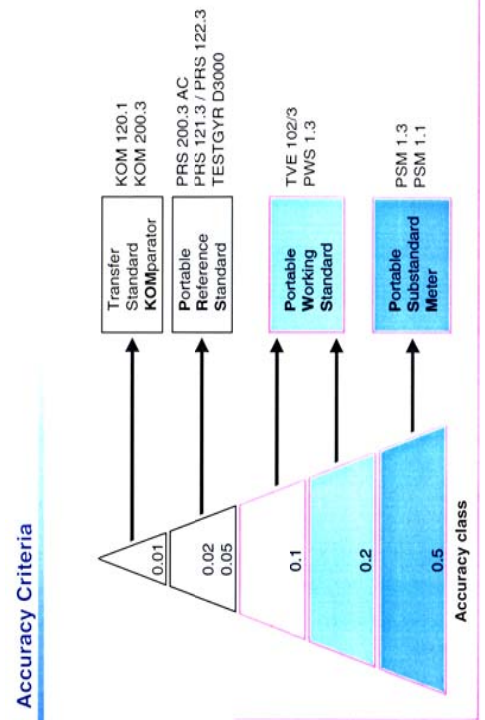
REFERENCES meters



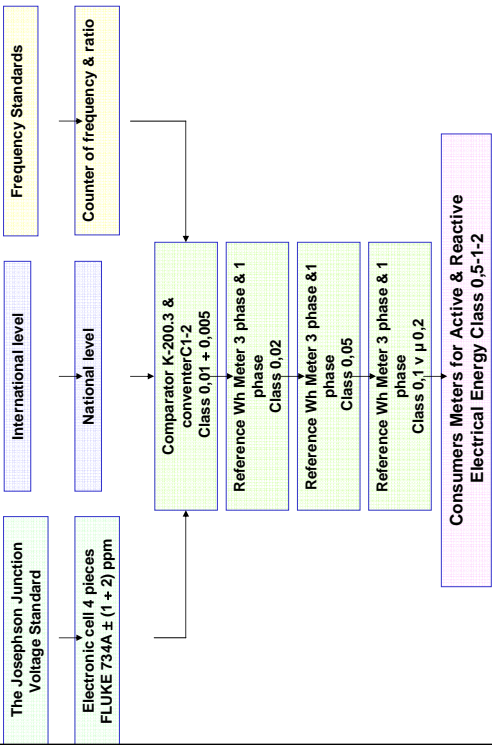
Consumers meters



Accuracy Class of Reference Meters



### Traceability of Electricity Meters



### Who Has The Right to Verify and Test the Electricity Meter

#### Authorized Organization :

#### + Technical equipments :

- MTE (Switzerland - Germany)
- China
- .....

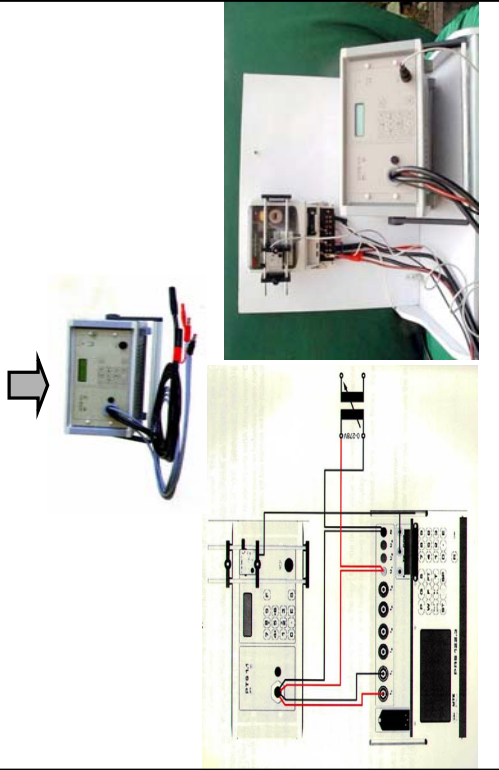
### Testing Band for Electrical Meters Made By VMI



### On-site Supply & Reference Watthourmeter



## Process of Checking



## Checking Accuracy On-site



## Checking accuracy on-site



## Complaint - Dispute Resolution Process

In Vietnam, meters used for the electricity sales by contracts to purchase electricity are the propriety of EVN. When there are complaints from customers relating to Energy account Rate, the customers have to request through the application to the local PC. The meter is reviewed by a group of 3 representatives from the organizations: Customer, Local PC and Branch of STAMEQ in local province.

If meter is faulty, its energy lost is calculated and is credited to their accounts, and the meter is replaced by local PC.

Payment for checking by Whom have done not truth

-For big customers decided by economical Law-court





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**Thank You**  
**for your attention**