

ACTIVITY REPORT FOR TRAINING COURSE ON

Verification and Pattern Approval of electricity meters and EV Supply Equipment

Dates: 18-21 January 2021

Venue: Online

Host: Zoom – supported by Malaysia

Supporting Organisations:

National Institute of Metrology, China (NIM)
Korea Testing Certification, Korea (KTC)
Zhejiang Institute of Metrology, China (ZJIM)

Trainers: Dr. Huang Hongtao, NIM, China
Mr. Ji-Hyun UM, KTC, Korea
Mr. Min-Joo Ham, KTC, Korea
Mr. Zheng Jianzhong, ZJIM, China

APLMF Rep: Mrs Marian Haire, APLMF Training Coordinator

1. Objective of the Training

The training course on Electricity Meters and EV Supply Equipment was aimed specifically at training trainers who will lead the development of knowledge and skills of verification officers within Asia Pacific region and the establishment of a uniform understanding at both the national and regional level in electricity measurement.

The training course was composed of lectures and Q&A activities. The lectures covered:

Session 1: Introduction of electrical energy measurement

- (1) Electricity distribution systems
- (2) Electrical power and energy (principle)
- (3) Traceability scheme and the chart in China
- (4) Functionality of smart meters in China

Session 2: Electricity meter verification of R46 and legal metrology system in China

- (1) Electricity meter verification of R46
- (2) Legal metrology system of electricity energy in China

Session 3: Understanding of Electricity meters & its application

- (1) Understanding of electricity meters
- (2) Technical Requirements for electricity meters

(3) Type approval of electricity meters

Session 4: Understanding of EV Supply Equipment

- (1) Understanding of EV supply equipment
- (2) Technical Requirements of EV supply equipment
- (3) Type approval of EV supply equipment

2. Target Group

The training course was designed for personnel with the responsibility to develop appropriate metrological infrastructure for testing electricity meters and EV supply equipment in their own economies. Participants are expected to train others when they return to their economy.

3. Training Course Programme – see Annexe 1.

4. Highlights/ Lessons Learned

This is the first online training course using zoom, that APLMF has presented. In addition, it is the first training course that the new APLMF Secretariat have managed, so all in all a momentous event. The training was attended by 20 participants from across the Asia - Pacific region. We held a test event on 11 January at which 14 participants introduced themselves. The new APLMF President Dr Osman Bin ZAKARIA joined us and welcomed everyone on behalf of APLMF.

On January 18 we had 19 participants present to listen to Dr. HUANG Hongtao, from NIM, China who provided a comprehensive background to the science that must be understood, in order to manage electricity meter measurements. Participants joined in by asking several questions. Unfortunately, there were some inconsistency issues with the internet working for our presenter from China. However, Dr HUANG Hongtao persisted and logged back on a few times. It was good to see that despite the issues the participants stayed online until the end.

On January 19 all participants were present and Mr. ZHENG Jianzhong, from ZJIM, China explained how electricity meters are type approved and verified in China. The Chinese government pays for all domestic meters to be type approved and they are then verified by a very sophisticated process which is all automated. The pass rate for smart meters is over 90% but less for the older type meters which are not as good quality. Smart meters have a life span of 8 years based on the statistical reports of meters used in the field. Overall there is a high level of confidence within the community regarding electricity meters used in China.

On January 20 all participants were present and Ji-Hyun UM, from KTC, explained how they carry out pattern approval and verification of electricity meters in Korea. Again participants interacted by asking questions to clarify their understanding.

On January 21 all participants were present and Mr. Min-Joo HAM, from KTC, explained how electric vehicles (EV) are managed in Korea. When the EV charging equipment

contains an electricity meter which is already type approved then fewer tests are required in order to pass. However, when there is no electricity meter present then the equipment goes through extensive testing in order to approve it for use in Korea. Korea has an issue with what to do with EV equipment which has been installed prior to their regulations being enacted.

The objectives of the course were met, and the participants reported they were happy using Zoom and that the practice session was useful. Regarding whether we should run training on consecutive days received a mixed reaction however more agreed than disagreed. The quality of the training was ranked as satisfactory to excellent and this covered materials, topics, clarity and slides. Participants said they did gain new skills but particularly appreciated gaining a global perspective on how electricity meters and electric vehicles were managed by Korea and China. Overall, the course helped to clarify OIML recommendations and how they should be interpreted. The training provided a good basis for participants to draft documents for their own economies. When asked what was most useful, participants provided a range of answers, some said, type approval and others said the interaction between OIML and IEC. To improve this training, participants wanted to access something practical. They suggested adding videos, visiting the labs of the trainers virtually.

Overall the course was highly scored with 14 saying it was good or excellent and 3 saying it was satisfactory. Many thankyou and appreciative comments were recorded.

The highlight of this course for the organizers was how well the participants interacted with the trainers. There were lots of excellent questions asked. It was also good to see we could conduct training online and get good results. The Secretariat managed the Zoom system very well and ensured that all microphones were on mute so there were limited interruptions. One participant had to use a phone so occasionally we heard the sound of children in the background, but it did not interfere too much with the presentation.

Lessons Learned:

Try to include some practical component or a video showing real equipment.

5. Next Steps/ Follow-up

All participants have provided a set of agreed actions they intend to follow to progress the implementation of OIML R 46 in their economies. Not many participants have implemented R 46 yet so there is a great deal of work to be completed. Annexe 4 provides a compilation of the participant's action plans. The Secretariat will follow up in 6 months and then again in 12 months to see what has been achieved.

The Chair of the WG on Utility Meters should consider if there is a need to follow up on this training in any way.

Annexe 1: Program Verification and Pattern Approval of electricity meters and EV Supply Equipment

Monday 18 January

| Time (UTC/GMT +8 hrs) | Details | Presenter |
|-----------------------------|--|-------------------|
| 11:00 – 11:45 | Session 1: Introduction of electrical energy measurement | Dr. Huang Hongtao |
| 11:45 – 12:00 | Break Time | |
| 12:00 – 12:45 | Session 1: Introduction of electrical energy measurement | Dr. Huang Hongtao |
| 12:45 – 13:00 | Q&A | Dr. Huang Hongtao |

Tuesday 19 January

| Time | Details | Presenter |
|---------------|--|---------------------|
| 11:00 – 11:45 | Session 2: Electricity meter verification of R46 and legal metrology system in China | Mr. Zheng Jianzhong |
| 11:45 – 12:00 | Break Time | |
| 12:00 – 12:45 | Session 2: Electricity meter verification of R46 and legal metrology system in China | Mr. Zheng Jianzhong |
| 12:45 – 13:00 | Q&A | Mr. Zheng Jianzhong |

Wednesday 20 January

| Time | Details | Presenter |
|---------------|---|----------------|
| 11:00 – 11:45 | Session 3: Understanding of Electricity meter & its application | Mr. Ji-Hyun UM |
| 11:45 – 12:00 | Break Time | |
| 12:00 – 12:45 | Session 3: Understanding of Electricity meter & its application | Mr. Ji-Hyun UM |
| 12:45 – 13:00 | Q&A | Mr. Ji-Hyun UM |

Thursday 21 January

| Time | Details | Presenter |
|---------------|---|-----------------|
| 11:00 – 11:45 | Session 4: Understanding of EV Supply Equipment | Mr. Min-Joo Ham |
| 11:45 – 12:00 | Break Time | |
| 12:00 – 12:45 | Session 4: Understanding of EV Supply Equipment | Mr. Min-Joo Ham |
| 12:45 – 13:00 | Q&A | Mr. Min-Joo Ham |
| 13.00– 13:30 | Action Plans | APLMF |

Annexe 2: List of Participants

| Pos. | Title | Name | Economy | Institution |
|------|-------|----------------------------|-----------------|---|
| 1 | Mr. | Phillip Mitchel | Australia | National Measurement Institute |
| 2 | Mr. | Namkha Dorji | Bhutan | Bhutan Standards Bureau |
| 3 | Mr. | Tenzin Dorji | Bhutan | Bhutan Standards Bureau |
| 4 | Mr. | Andrew Benko | Canada | Innovation, Science, Economic Development |
| 5 | Mr. | Ho Tsung-Han | Chinese Taipei | Industrial Technology Research Institute |
| 6 | Mr. | Ping-Ju Tseng | Chinese Taipei | Bureau of Standards, Metrology and Inspection, MOEA |
| 7 | Mr. | Masrofin Zaki | Indonesia | Ministry of Trade |
| 8 | Mr. | Hargho Mahatma Wady | Indonesia | Ministry of Trade |
| 9 | Mr. | Tomohiro Horie | Japan | Japan Electric Meters Inspection Corporation (JEMIC) |
| 10 | Mr. | Bounkone Yonglorxiong | Lao PDR | Department of Standardization and Metrology (DoSM) |
| 11 | Mr. | Vannakon Tonpheng | Lao PDR | Department of Standardization and Metrology |
| 12 | Mr. | Syarizal Zainal Abidin | Malaysia | National Metrology Institute of Malaysia (NMIM) |
| 13 | Mrs | Baigalmaa Baasanjav | Mongolia | Mongolian Agency for Standard and Metrology |
| 14 | Ms | Lkhagvasuren Myagmar | Mongolia | Mongolian Agency for standard and metrology |
| 15 | Mr. | Fernando Rodriguez Cabezas | Peru | Ministry of Production/ INACAL |
| 16 | Mrs | Lady Diana Pereira Marin | Peru | Government Institute / INACAL |
| 17 | Mr. | Humphrey Tautai | Solomon Islands | Consumer Affairs and Price Control Division |
| 18 | Ms | Ramita PINSUWANNAKUB | Thailand | Central Bureau of Weights and Measures |
| 19 | Ms | Siriwan KONGMEA | Thailand | Bureau of Weights and Measures |
| 20 | Mr | Nghi DANG CONG | Vietnam | Quality Assurance and Testing Center 2, Electricity, Electronics Metrology Laboratory |

Photograph of participants with Dr Osman President of APLMF



Annexe 3: Summary of Economy Reports

| Economy | Adequate legislation? | Who carries out inspections? | Carries out certification of quantity? | Implement OIML R 46? | Problems to overcome-to implement OIML R46 effectively |
|-----------------------|---|---|--|---|---|
| Australia | No Legislation in place, | Other, varies, generally industry using rules established by regulator. | Yes | Partially implemented - OIML R 46 is not formally adopted, but national requirements are largely aligned. | No specific problem but see the consistency of international testing and interpretation of requirements as very important to provide a level playing field for manufacturers. |
| Bhutan | No Measurement Act. Legal metrology has undertaken based on the Consumer Protection Act | industry | No, currently it is ensured by industry themselves | Not implemented yet | This recommendation not yet implemented |
| Canada | Yes | 3rd party | Yes | Partially implemented, Partial harmonization | Adaptability with Canadian legislation |
| Chinese Taipei | Yes | Inspectors | Yes | Partially implemented | |
| Indonesia | Yes | Inspectors | Yes | Partially implemented Disturbance test, durability test, Mechanical test, are not fully tested as in R46, only Testing verification of current dependence applied | Limited facilities for Type Test and verification provide tool and standard to test other than calibration testing, such as climate test, mechanical test and durability test |

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|-----------------|-----|-------------------------|------------|---|--|
| Japan | Yes | 3rd party, industry | Yes | Partially implemented | Type approval and verification of static electricity meters (smart meters). Method for estimating the expected lifetime (mean time to failure) of smart meters in relation to an appropriate verification period. Metrological control of EV supply equipment may be an important issue in the future if EVs are used widely. Certification of the software embedded in these measuring instruments will be another important issue. |
| Lao PDR | Yes | Inspectors 3rd party | Yes | Partially implemented | I need to understand OIML R 46, then know how to use it in my country. |
| Malaysia | Yes | N/A | Yes | Partially implemented | The requirement of OIML R46 difficult to meet and industry usually follow IEC where the standard is lower |
| Mongolia | Yes | Inspectors Industry | Yes Yes | Partially implemented | The capacity of Verification laboratory and personnel. The capacity of standard equipment. Knowledge OIML R46. Training and practice |
| Peru | Yes | Inspectors | Yes | Not implemented yet Have implemented IEC standards 62058-31, IEC 62052-11, IEC 62053-21, IEC 62053-22 | Infrastructure, equipment, staff training demonstrate that the development and testing requirements are equivalent to the IEC standards already implemented |

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| Solomon Islands | No, not included in Weights and Measures regulation | industry | Certification of quantity for electricity meters is done by the industry. | Partially implemented , industry makes sure they import verified and calibrated electricity meters from their suppliers. | Regulators and the authority should be working together and must have a proper facility to test and to calibrate electricity meters. Currently, there is no laboratory. |
| Thailand | No, Lack of information, advice from experts, instruments, and budget | Electricity Authority of Thailand | No, we do not verify electricity meters. If the institute could verify meters, the net content would be assured. Some meters are imported and implemented without testing report. | Not implemented yet , Not verified legally by the Bureau of Weights and Measures. However, the Metropolitan Electricity Authority and Provincial Electricity Authority have standard laboratories to test, calibrate, and print out test/calibration report of each electricity meter. Test procedures are referred from the IEC and Thai Industrial Standards Institutes (TISI). | Budgets to train officers, instruments, and advice from experts to verify electricity from the beginning including sectional structure. Budgets to train officers, instruments, and advises from experts to verify electricity from the beginning including sectional structure. |
| Vietnam | Yes | Third-party | Yes | Not implemented yet | |

Annexe 4: Summary of Action Plans

| Participant | Economy | Due dates | Activity | Who and how many people will be involved |
|-------------------------------|-----------|------------------|---|---|
| Phillip Mitchel | Australia | Early 2021 | Provide a summary of training | Manager and colleagues |
| | | 2021-2022 | Adoption of OIML R 46 | Australian industry and consumers |
| | | | Lead revision of OIML R 46 | OIML TC 12 Committee and consultation with industry and consumers |
| Namkha Dorji and Tenzin Dorji | Bhutan | 28 February 2021 | Knowledge sharing on type approval and verification of electricity meters to Metrology and Laboratory Service Division colleagues | Tenzin Dorji and Namkha Dorjji |
| | | 30 May 2021 | Awareness on verification of electricity meters to power companies and other stakeholders | Tenzin Dorji and Namkha Dorjji |
| | | 30 August 2021 | Complete draft proposal on Implementation of verification of electricity meters in the country | Tenzin Dorji and Namkha Dorjji |
| | | 30 November 2021 | Complete list of equipment required to be procured with cost details | Tenzin Dorji and Namkha Dorjji |
| | | 30 December 2021 | Draft Implementation plan of verification of electricity meters in the country | Tenzin Dorji and Namkha Dorjji |
| | | 26 February 2021 | Sharing of information: internal presentation about what was discussed at this course | approx. 30 people who work closely with the electricity program at MC |
| Andrew Benko | Canada | March 2021 | Form a WG to identify the applicability of R-46 to MC current requirements | WG of 8 people, representing different functional areas of MC |

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| | | June 2021 | Integration of specific new elements to MC Training Program | Same WG as above |
| | | N/A | N/A | N/A |
| Ho Tsung-Han | Chinese Taipei | N/A | N/A | N/A |
| Ping-Ju Tseng | Chinese Taipei | Jan-21 | Make a presentation to my director | Director of Directorate of Metrology |
| | | Feb-21 | Share knowledge with colleagues | Verification officer |
| | | March 2021 | Develop technical document related to verification of electricity meter | |
| Masrofin Zaki | Indonesia | May 2021 | training electrical energy measurement | other inspectors in the directorate of metrology (20-30 persons) |
| Hargho Mahatma Wady | Indonesia | 1st February 2021 | Share the information obtained in this training course with the colleagues of my group. | 10 members of Type Test Group |
| | | 31st March 2021 | Conduct a small seminar in JEMIC to report the outline of the training course. | 10 to 20 members including other groups of JEMIC |
| | | 1st June 2021 | Review the operation manuals of JEMIC for calibrating and testing electricity meters. | 10 to 20 members including other groups of JEMIC |
| Tomohiro Horie | Japan | Feb-21 | Share the knowledge for the colleagues | All relative officers on the watt-hour meter testing work |

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| Bounkone Yonglorxiong | Lao PDR | Apr-21 | Review of the watt-hour meter regulation that we already have | Director of the metrology centre and DoSM |
| | | Jul-21 | share the learning materials with the colleagues | officers of metrology centre |
| Vannakon Tonpheng | Lao PDR | Aug-21 | report to the leader about the content of the training | Director of the department of standardization and director of metrology centre |
| | | 2022 | Discussion about the latest requirement of OIML | Government and industry |
| Syarizal Zainal Abidin | Malaysia | 2022 | Apply the knowledge and information as the national standard | The electrical group in metrology |
| | | Feb-21 | Share experiences to my co-workers | 28 verification officers and verification officers of local areas |
| Baigalmaa Baasanjav | Mongolia | May 2021 | Start training session | verification and industrial metrology officers |
| | | Mar-21 | Standard development - revise national standards | ??? |
| Lkhagvasuren Myagmar | Mongolia | Apr-21 | Teach measurement technicians and engineers | trainees |
| | | January-February 2021 | Review and Analysis | ? 4 |
| Fernando Rodriguez Cabezas | Peru | March-April 2021 | Implementation | ? 4 |
| | | May-June 2021 | Corrective actions | ? 4 |
| | | Feb-21 | Training OIML R46 and EV supply equipment | Train 8 INACAL laboratory personnel involved in the calibration, verification and testing of electric energy meters |

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|---|------------------------|------------------|---|--|
| | | Apr-21 | Comparative Analysis | Comparison of the tests of the OIML standard versus the standards currently in force in Peru for electric energy meter |
| Lady Diana Pereira Marin | Peru | Jan-21 | inhouse training for inspectors | ?15 inspectors |
| | | 10 Feb 21 | training for state-own enterprise inspectors | ? 15 inspectors |
| Humphrey Tautai | Solomon Islands | Jan – Feb 2021 | Set up a working group to discuss guidelines for electricity meter verification | Government and Agencies involved in electricity meters in Thailand |
| | | Jan – March 2021 | Set up a working group to discuss guidelines for electricity meter verification | Government and Agencies involved in electricity meters in Thailand |
| Ramita PINSUWANNAKUB and Siriwan KONGMEA | Thailand | Mar – Aug 2021 | Study and Gather information about international standards and apply them to verification of electricity meters in Thailand. | a working group for electricity meter verification |
| | | Sep-Oct 2021 | Draft guidelines for electricity meter verification in Thailand | a working group for electricity meter verification |
| Nghi DANG CONG | Vietnam | 30/6/2021 | I will report to the Manager, the Director and my colleagues (4 people). I will organize a discussion with my colleagues, to consider the suitability for our Metrology Department. | My colleagues, about 4 peoples, my manager, Director and the Metrological Technology Department. |