



Asia-Pacific
Economic Cooperation



Asia-Pacific
Legal Metrology Forum

Handbook on Electricity Meters

APEC/APLMF Training Courses in Legal Metrology
(CTI 10/2005T)

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

APEC Secretariat

35 Heng Mui Keng Terrace
Singapore 119616.
Tel: +65-6775-6012, Fax: +65-6775-6013
E-mail: info@apec.org
Website: www.apec.org

APLMF Secretariat

AIST Tsukuba Central 3-9
1-1-1 Umezono, Tsukuba, Ibaraki 305-8563, Japan
Tel: +81-29-861-4362, Fax: +81-29-861-4393
E-mail: sec@aplmf.org
Website: www.aplmf.org

© 2006 APEC Secretariat
APEC# 206-CT-03.3 ISBN 4-9903094-0-5

June 2006

Contents

1	Foreword	1
2	Summary Report	3
3	Agenda	5
4	Participants List	9
5	Lecture	
5.1	Introduction to the Training Course on Electricity Meters.....	11
	Electricity Distribution Systems	13
	Sine Wave and Phasor (Vector) Concepts.....	14
	Electricity Metering Circuits	19
	<u>Single Phase Load Analysis</u>	
	Single Phase 2-Wire Load	34
	Single Phase 2-Wire Service	36
	Single Phase 3-Wire Service	37
	<u>Polyphase Load Analysis</u>	
	Polyphase Phasors	40
	3 Phase 4 Wire Wye Service	42
	3 Phase 3-Wire Wye Delta Service	43
	<u>Measurement Concepts</u>	
	4 Quadrant Measurement.....	46
	Watts hours (Wh).....	47
	Reactive Volt-Ampere hours (VARh).....	49
	Volt-Ampere hours (VAh).....	51
	Demand Measurement	53
	Volt-Ampere Demand Measurement.....	61
	<u>Basic Induction Meters</u>	
	Motor Section	65
	Breaking Section.....	67
	Gear Train Section.....	68
	Electronic Metering	72
	Type Approval of Electricity Meters.....	84
	Verification and Test Method.....	89
	Reverification Intervals	95
	In-Service Compliance Programs	99
	Measurement Standards and Test Equipment.....	102
	Measurement Dispute Investigations.....	108

5.2	<u>Overview of the Electricity Meters in Japan</u>	
	Legislation	111
	Type Approval	115
	Verification	120
	Verification Standards	126
	Overview of International Standards on Electricity Meters	131
	Current Situation of the Revision of OIML Recommendation	134

6 Reports from the Trainees

6.1	Cambodia (This is a non-APEC economy.)	137
6.2	Chile.....	139
6.3	People’s Republic of China	141
6.4	Indonesia.....	144
6.5	Japan	146
6.6	Lao People’s Democratic Republic (This is a non-APEC economy.).....	149
6.7	Malaysia.....	153
6.8	Mongolia (This is a non-APEC economy.)	155
6.9	Papua New Guinea	158
6.10	Philippines	160
6.11	Chinese Taipei	164
6.12	Thailand	167
6.13	Viet Nam.....	171