



BSI Standards Publication

# Recommendations for small renewable energy and hybrid systems for rural electrification

Part 9-5: Integrated system —  
Selection of stand-alone lighting  
kits for rural electrification

NO COPYING WITHOUT BSI PERMISSION EXCEPT AS PERMITTED BY COPYRIGHT LAW

### National foreword

This Published Document is the UK implementation of IEC/TS 62257-9-5:2013. It supersedes DD IEC/TS 62257-9-5:2007 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee GEL/82, Photovoltaic Energy Systems.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2013

Published by BSI Standards Limited 2013

ISBN 978 0 580 79710 1

ICS 27.160

**Compliance with a British Standard cannot confer immunity from legal obligations.**

This Published Document was published under the authority of the Standards Policy and Strategy Committee on 30 April 2013.

### Amendments issued since publication

Amd. No.	Date	Text affected
----------	------	---------------

---



# TECHNICAL SPECIFICATION



---

**Recommendations for small renewable energy and hybrid systems for rural electrification –  
Part 9-5: Integrated system – Selection of stand-alone lighting kits for rural electrification**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

PRICE CODE **XH**

ICS 27.160

ISBN 978-2-83220-733-8

**Warning! Make sure that you obtained this publication from an authorized distributor.**

## CONTENTS

FOREWORD.....	9
INTRODUCTION.....	12
1 Scope.....	13
2 Normative references.....	14
3 Terms and definitions.....	15
4 System limits.....	19
4.1 System description.....	19
4.1.1 Components.....	19
4.1.2 Product categories.....	20
4.1.3 Lighting kit parts.....	22
4.1.4 Additional system elements.....	23
4.2 System measurements and observations.....	23
4.2.1 General.....	23
4.2.2 Product design, manufacture, and marketing aspects.....	24
4.2.3 Product durability and workmanship aspects.....	26
4.2.4 Lighting durability aspects.....	29
4.2.5 Battery performance aspects.....	30
4.2.6 Solar module aspects.....	31
4.2.7 Run time aspects.....	31
4.2.8 Light output aspects.....	33
4.2.9 Battery-charging circuit efficiency.....	33
4.2.10 Self-certification aspects.....	34
4.2.11 Water protection integrated assessment.....	34
5 Product specification.....	35
5.1 General.....	35
5.2 Applications.....	35
5.3 Quality assurance principles.....	36
5.3.1 General.....	36
5.3.2 Rationale for dividing quality, warranty, and performance.....	36
5.4 Product specification framework description.....	37
5.4.1 General.....	37
5.4.2 Blank product specification document.....	37
5.4.3 Tolerances.....	41
5.4.4 Quality standards criteria.....	42
5.4.5 Warranty requirements criteria.....	47
5.4.6 Performance targets criteria.....	47
6 Quality test method.....	50
6.1 General.....	50
6.2 Applications.....	50
6.3 Sampling requirements.....	51
6.4 Laboratory requirements.....	51
6.5 Testing requirements.....	51
6.6 Recommended tests programme.....	53
6.6.1 General.....	53
6.6.2 Product sampling.....	54
6.6.3 Test preparation.....	54

6.6.4	Batch A tests .....	55
6.6.5	Batch B tests .....	56
6.6.6	Batch C / potentially destructive tests .....	56
6.6.7	Report preparation.....	57
6.7	Reporting .....	57
7	Market check method .....	57
7.1	General .....	57
7.2	Applications.....	58
7.3	Sampling requirements.....	58
7.4	Laboratory requirements .....	58
7.5	Testing requirements.....	58
7.6	Recommended tests programme .....	60
7.7	Report requirements.....	60
8	Initial screening method.....	60
8.1	General .....	60
8.2	Applications.....	60
8.3	Sampling requirements.....	60
8.4	Laboratory requirements .....	61
8.5	Testing requirements.....	61
8.6	Recommended tests programme .....	63
8.7	Reporting .....	63
9	Field screening method .....	64
9.1	General .....	64
9.2	Applications.....	64
9.3	Sampling requirements.....	64
9.4	Laboratory requirements .....	64
9.5	Testing requirements.....	64
9.6	Recommended tests programme .....	66
9.6.1	General .....	66
9.6.2	Product sampling .....	66
9.6.3	Test sample preparation .....	67
9.6.4	Manufacturer information request .....	67
9.6.5	Visual screening .....	67
9.6.6	Light output .....	67
9.6.7	Full-battery run time .....	67
9.6.8	Solar-day run time .....	67
9.6.9	Water protection assessment.....	67
9.6.10	Durability testing.....	67
9.6.11	Results check and report generation.....	67
10	Standardized specifications sheets.....	67
10.1	General .....	68
10.2	Applications.....	68
10.2.1	General .....	68
10.2.2	Guidance.....	68
10.2.3	Framework for SSS guidelines document.....	68
Annex A (informative)	Recommended quality standards and performance targets for off-grid lighting market support programme qualification .....	73

Annex B (informative) Example quality standards, warranty requirements, and performance targets for bulk procurement qualification (“sample tender”) .....	77
Annex C (informative) Recommended SSS guidelines .....	82
Annex D (normative) Manufacturer self-reported information.....	91
Annex E (normative) Product sampling .....	95
Annex F (normative) Visual screening.....	98
Annex G (normative) Sample preparation .....	107
Annex H (normative) Power supply setup procedure .....	109
Annex I (normative) Light output test .....	113
Annex J (normative) Lumen maintenance test.....	118
Annex K (normative) Battery test .....	126
Annex L (informative) Battery testing recommended practices .....	133
Annex M (normative) Full-battery run time test.....	136
Annex N (normative) Full discharge preparation.....	144
Annex O (normative) Grid charge test.....	147
Annex P (normative) Electromechanical charge test.....	150
Annex Q (normative) Outdoor photovoltaic module I-V characteristic test.....	153
Annex R (normative) Solar charge test.....	160
Annex S (normative) Charge controller behaviour test .....	174
Annex T (normative) Light distribution test.....	185
Annex U (normative) Physical and water ingress protection test .....	197
Annex V (normative) Level of water protection .....	201
Annex W (normative) Mechanical durability test.....	208
Annex X (informative) Example test report templates .....	216
Annex Y (informative) Photometer beam for relative luminous flux measurements .....	244
Annex Z (informative) Photometer tube for relative luminous flux measurements .....	249
Annex AA (normative) Field testing methods.....	250
Annex BB (informative) Battery durability test.....	256
Figure 1 – Fixed Separate (fixed indoors) system—example arrangement of components .....	20
Figure 2 – Portable Separate system—example arrangement of components .....	21
Figure 3 – Portable integrated system—example arrangement of components .....	21
Figure 4 – Fixed integrated (fixed outdoors) system-example arrangement of components .....	22
Figure 5 - Division of a lighting kit into subsystems—illustrative example .....	23
Figure 6 – Recommended sequence of testing for QTM .....	54
Figure 7 – Recommended sequence of testing for FSM .....	66
Figure 8 – First portion of example SSS.....	71
Figure H.1 – 4-wire test configuration with input filter capacitors.....	110
Figure I.1 – Conceptual schematic of the light output test setup, including the 11 × 11 grid, Cartesian coordinate axes for rotation reference, and the DUT .....	115
Figure J.1 – Schematic of a photometer tube .....	120
Figure J.2 – Example lumen maintenance plot.....	125

Figure L.1 – Battery testing flowchart for the battery test (Annex K).....	134
Figure M.1 – Interior view of photometer box with suspended light.....	138
Figure M.2 – Plot of example results from the full-battery run time test .....	140
Figure Q.1 – PV module I-V curve testing rack.....	156
Figure R.1 – Schematic of the power supply and DUT connection for the solar charge efficiency test .....	162
Figure R.2 – Example “true” and simulated I-V curves plotted with the deviation ratio .....	164
Figure R.3 – Example time series plot of the solar charging cycle showing the maximum power available from the PV simulator, actual power supplied by the PV simulator, and power delivered to the batteries .....	172
Figure R.4 – Example time series plot of the solar charging cycle showing the instantaneous battery-charging circuit efficiency and solar operation efficiency .....	173
Figure S.1 – Schematic of the DC power supply-DUT connection using a series protection resistor.....	177
Figure T.1 – Schematic of a task light suspended 0,75 m above a photometer.....	189
Figure T.2 – Schematic of “rotary disk” setup, with the DUT shown.....	191
Figure T.3 –Side view of desktop light measuring setup.....	192
Figure T.4 – Example plot of usable area as a function of minimum illuminance.....	194
Figure T.5 – Example of resulting surface plot of light distribution from the brightest “face” of the multi-plane method or illuminance on a plane method .....	195
Figure T.6 – Example of resulting polar plot of illuminance from the multi-plane or rotating disk method .....	196
Figure W.1 – Three-dimensional Cartesian coordinate system for drop test reference.....	211
Figure W.2 – Cable strain angle ( $\gamma$ ) schematics for a PV module junction box (left) and a separate light point (right) .....	213
Figure Y.1 – Interior view of completed photometer box.....	244
Figure Y.2 – Exterior view of completed photometer box.....	245
Figure Y.3 – Photometer box dimensions (in cm) .....	246
Figure Y.4 – Photometer box assembly pieces and list of materials (dimensions in cm) .....	247
Figure Z.1 – Completed photometer tube .....	249
Table 1 – Application of product specifications .....	36
Table 2 – Qualification as separate PV module .....	38
Table 3 – Truth-in-advertising tolerance .....	38
Table 4 – Safety and durability standards .....	39
Table 5 – End-user support standards .....	40
Table 6 – End-user support requirements .....	40
Table 7 – Run time criteria for performance targets .....	40
Table 8 – Lighting service criteria for performance targets .....	40
Table 9 – Additional features criteria for performance targets .....	41
Table 10 – Truth-in-advertising criteria for quality standards .....	43
Table 11 – Notes on common truth-in-advertising aspects .....	44
Table 12 – Safety and durability criteria for quality standards .....	45
Table 13 – Recommended level of water protection by product category.....	46
Table 14 – End-user support criteria for quality standards .....	47

Table 15 – Criteria for warranty standards .....	47
Table 16 – Run time criteria for performance targets.....	48
Table 17 – Run time benchmarks .....	48
Table 18 – Lighting service criteria for performance targets .....	49
Table 19 – Lighting service benchmarks .....	49
Table 20 – Additional function criteria for performance targets.....	50
Table 21 – Applications of product specifications .....	50
Table 22 – QTM testing requirements .....	52
Table 23 – Applications of product specifications .....	58
Table 24 – Typical MCM testing guidelines .....	59
Table 25 – Applications of product specifications .....	60
Table 26 – ISM testing requirements.....	62
Table 27 – Applications of product specifications .....	64
Table 28 – FSM testing requirements.....	65
Table 29 – Applications of product specifications .....	68
Table 30 – Recommended precision requirements for metrics on a continuous scale.....	70
Table A.1 – Qualification as separate PV module.....	73
Table A.2 – Truth-in-advertising tolerance .....	74
Table A.3 – Safety and durability standards.....	75
Table A.4 – End-user support requirements .....	76
Table A.5 – Run time criteria for performance targets.....	76
Table A.6 – Lighting service criteria for performance targets.....	76
Table B.1 – Product classes qualified for bulk procurement .....	77
Table B.2 – Qualification as separate PV module.....	77
Table B.3 – Truth-in-advertising tolerance .....	78
Table B.4 – Safety and durability standards.....	79
Table B.5 – End-user support requirements .....	80
Table B.6 – Run time criteria for performance targets .....	80
Table B.7 – Lighting service criteria for performance targets.....	80
Table B.8 – Run time criteria for performance targets .....	80
Table B.9 – Lighting service criteria for performance targets.....	80
Table B.10 – Additional features criteria for performance targets .....	81
Table C.1 – Requirements for retesting to update SSS .....	82
Table C.2 – Recommended precision requirements for metrics on a continuous scale .....	83
Table C.3 – Elements in the header / overall performance SSS section .....	84
Table C.4 – Elements in the general information SSS section .....	86
Table C.5 – Elements in the performance details section .....	87
Table C.6 – Elements in the light output SSS section.....	88
Table C.7 – Elements in the special features SSS section .....	88
Table C.8 – Elements in the durability SSS section.....	88
Table C.9 – Elements in the solar module details SSS section.....	89
Table C.10 – Elements in the battery details SSS section .....	89
Table C.11 – Elements in the marks and certifications SSS section .....	89

Table C.12 – Elements in the SSS information section.....	90
Table D.1 – Manufacturer self-reported information outcomes.....	91
Table E.1 – Product sampling outcomes .....	95
Table F.1 – Visual screening test outcomes.....	98
Table H.1 – Standard operating voltage for several common battery types .....	111
Table H.2 – Voltage and current reporting requirements .....	112
Table I.1 – Light output test outcomes .....	113
Table J.1 – Lumen maintenance test outcomes.....	118
Table J.2 – Lumen maintenance test minimum frequency of measurement for full screening test .....	121
Table J.3 – Lumen maintenance test minimum frequency of measurement for Initial screening test .....	124
Table K.1 – Battery test outcomes .....	126
Table K.2 – Recommended battery testing specifications according to battery chemistry.....	127
Table L.1 – Recommended battery deep discharge protection voltage specifications according to battery chemistry .....	135
Table L.2 – Recommended battery overcharge protection voltage specifications according to battery chemistry .....	135
Table M.1 – Full-battery run time test outcomes.....	137
Table O.1 – Grid charge test outcomes.....	147
Table P.1 – Mechanical charge test outcomes .....	150
Table Q.1 – Outdoor photovoltaic module I-V characteristics test outcomes.....	154
Table R.1 – Solar charge test outcome .....	160
Table R.2 – Simulated solar day power supply settings.....	165
Table S.1 – Charge controller behaviour test outcomes .....	175
Table T.1 – Light distribution test outcomes.....	186
Table T.2 – Summary of testing options for characterizing lamp distributions.....	186
Table T.3 – Table of example illuminance measurements on the brightest “face” of the 1 m <sup>2</sup> grid and usable area as a function of minimum illuminance .....	194
Table U.1 – Water exposure and physical ingress protection test outcomes.....	197
Table V.1 – Water exposure and physical ingress protection test outcomes.....	202
Table V.2 – Enclosure only level of water protection requirements.....	203
Table V.3 – Technical level of water protection requirements.....	203
Table V.4 – Example detailed assessment supporting technical level of water protection .....	205
Table V.5 – Overall level of water protection requirements.....	206
Table W.1 – Mechanical durability test outcomes.....	209
Table X.1 – Manufacturer self-reported information test report template .....	217
Table X.2 – Product sampling information test report template.....	219
Table X.3 – Visual screening results test report template .....	219
Table X.4 – Light output test report template.....	226
Table X.5 – Lumen maintenance test report template.....	227
Table X.6 – Battery test report template.....	228
Table X.7 – Full-battery run time test report template.....	228

Table X.8 – Grid charge test report template.....	230
Table X.9 – Electromechanical charge test report template.....	231
Table X.10 – Outdoor photovoltaic module I-V characteristics test report template .....	232
Table X.11 – Solar charge test report template .....	234
Table X.12 – Charge controller behaviour test report template.....	235
Table X.13 – Light distribution test report template .....	236
Table X.14 – Physical and water ingress protection test report template .....	237
Table X.15 – Mechanical durability test report template .....	238
Table X.16 – Summary test report template .....	241
Table AA.1 – Field test outcomes.....	250
Table AA.2 – Example run time test datasheet.....	252
Table BB.1 – Battery durability test outcomes .....	256

Currently in preview, click buy full version

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

---

### **RECOMMENDATIONS FOR SMALL RENEWABLE ENERGY AND HYBRID SYSTEMS FOR RURAL ELECTRIFICATION –**

#### **Part 9-5: Integrated system – Selection of stand-alone lighting kits for rural electrification**

### FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

The main task of IEC technical committees is to prepare International Standards. In exceptional circumstances, a technical committee may propose the publication of a technical specification when

- the required support cannot be obtained for the publication of an International Standard, despite repeated efforts, or
- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC 62257-9-5, which is a technical specification, has been prepared by IEC technical committee 82: Solar photovoltaic energy systems.

This second edition cancels and replaces the first edition issued in 2007. It constitutes a technical revision.

The main technical changes with regard to the previous edition are as follows:

- Overall, shifted from narrow focus on the needs of bulk procurement programmes to a wider framework for structuring quality assurance using appropriate methods for a range of stakeholders including governments, manufacturers, buyers, and others.
- Revised structure of document with modular methods (located in annexes) that are applied using four distinct test regimes.
- Added normative references and definitions to support new document structure.
- Added a framework for categorizing products based on the arrangement of components.
- Expanded the range of aspects that are considered and formalized a framework for product specification that can be customized based on stakeholder needs, with example, informative product specifications in the annexes.
- Added a “Quality test method” that prescribes a set of rigorous laboratory tests using randomly-selected samples. The description includes a comprehensive list of tests and guidance for test labs on staging.
- Added a “Market check method” that is a targeted set of tests to confirm results.
- Added an “Initial screening method” that provides rapid laboratory feedback on product quality and performance.
- Updated and strengthened the previously defined test programme using the “Field screening method” that can be achieved at low cost without laboratory facilities.
- Added a description for “Standardized specifications sheets” that can be used to disseminate test results to the market.
- Created or modified several key test procedures:
  - Full battery run time
  - Durability
  - Water protection assessment
  - Solar run time
  - Light output, distribution, and maintenance
  - Visual screening
  - Random product sampling

This technical specification shall be used in conjunction with:

- IEC 62257-1: Recommendations for small renewable energy and hybrid systems for rural electrification – Part 1: General introduction to rural electrification
- IEC 62257-2: Recommendations for small renewable energy and hybrid systems for rural electrification – Part 2: From requirements to a range of electrification systems
- IEC 62257-3: Recommendations for small renewable energy and hybrid systems for rural electrification – Part 3: Project development and management
- IEC 62257-4: Recommendations for small renewable energy and hybrid systems for rural electrification – Part 4: System selection and design
- IEC 62257-5: Recommendations for small renewable energy and hybrid systems for rural electrification – Part 5: Protection against electrical hazards
- IEC 62257-6: Recommendations for small renewable energy and hybrid systems for rural electrification – Part 6: Acceptance, operation, maintenance and replacement

It is also to be used with future parts of this series as and when they are published.

The text of this technical specification is based on the following documents:

Enquiry draft	Report on voting
82/731/DTS	82/759/RVC

Full information on the voting for the approval of this technical specification can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- transformed into an International standard,
- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

**IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.**

## INTRODUCTION

The IEC 62257 series intends to provide to different players involved in rural electrification projects (such as project implementers, project contractors, project supervisors, installers, etc.) guidelines for the setting up of renewable energy and hybrid systems with AC nominal voltage below 500 V, DC nominal voltage below 750 V and nominal power below 100 kVA.

These documents are recommendations

- to choose the right system for the right place,
- to design the system, and
- to operate and maintain the system.

These documents are focused only on rural electrification concentrating on but not specific to developing countries. They shall not be considered as all inclusive to rural electrification. The documents try to promote the use of renewable energies in rural electrification; they do not deal with clean mechanism developments at this time (CO<sub>2</sub> emission, carbon credit, etc.). Further developments in this field could be introduced in future steps.

This consistent set of documents is best considered as a whole with different parts corresponding to items for safety, sustainability of systems, and at the lowest life cycle cost as possible. One of the main objectives is to provide the minimum sufficient requirements, relevant to the field of application that is: small renewable energy and hybrid off-grid systems.

The purpose of this part of IEC 62257 series is to specify quality assurance strategies for stand-alone lighting kits, including product specifications, tests, and a standardized specifications sheet format. In addition to supporting the selection of products by project developers and implementers, quality assurance can help market support organizations, manufacturers, and governments achieve the goals they have for off-grid lighting projects.

## RECOMMENDATIONS FOR SMALL RENEWABLE ENERGY AND HYBRID SYSTEMS FOR RURAL ELECTRIFICATION –

### Part 9-5: Integrated system – Selection of stand-alone lighting kits for rural electrification

#### 1 Scope

This part of IEC 62257 applies to stand-alone rechargeable electric lighting appliances or kits that can be installed by a typical user without employing a technician.

This technical specification presents a quality assurance framework that includes product specifications (a framework for interpreting test results), test methods, and standardized specifications sheets (templates for communicating test results).

The intended users of this technical specification are listed below. In some clauses and subclauses of this technical specification, a description of the application of the subclause contents is offered to help provide context for each type of user.

- **Market support programmes** are programmes that support the off-grid lighting market with financing, consumer education, awareness, and other services. Market support programmes often use quality assurance to qualify for access to services like
  - greenhouse gas reduction certifications or other incentives,
  - access to financing (trade or consumer finance),
  - use of a buyer seal and certification (government or non-governmental institutional backing, consumer or “business to business” seals),
  - participation in a public product information database (e.g., standardized specifications sheets),
  - access to a business network or trade group,
  - business support and development services,
  - access to market intelligence, and
  - participation in consumer awareness campaigns.
- **Manufacturers and distributors** need to verify the quality and performance of products from different batches and potential business partners. Manufacturers and distributors often use quality assurance plans or requirements to
  - support quality control processes at a manufacturing plant or upon receipt of goods from a contract manufacturer, and
  - choose products to distribute.
- **Bulk procurement programmes** facilitate or place large orders for devices from a distributor or manufacturer. Bulk procurement programmes may use quality assurance to
  - provide devices to a particular, relatively small group of end-users whose needs are understood (e.g., project developers and implementers for an electrification project may include quality assurance requirements in the GS of an electrification project (see IEC/TS 62257-3)), and
  - organize a subsidy, buy-down, or giveaway programme that will serve a broad set of users.
- **Trade regulators** are typically government policymakers and officials who craft and implement trade and tax policy. Regulators may use quality assurance requirements to
  - qualify for exemption from tax or duties, and