INTERNATIONAL STANDARD

ISO 37153

First edition
2017-12

Smart community infrastructures — Maturity model for assessment and improvement

Infrastructures communautaires intelligentes — Modèle de maturité pour l'évaluation et l'amélioration

STANDARDSISO.COM : Click to view the full PDF of ISO 37153:2017

Reference number
ISO 37153:2017(E)

© ISO 2017

STANDARDSISO.COM : Click to view the full PDF of ISO 37153:2017

COPYRIGHT PROTECTED DOCUMENT

© ISO 2017, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

 © ISO 2017 – All rights reserved

Contents

Page

STANDARDSISO.COM : Click to view the full PDF of ISO 37153:2017

© ISO 2017 – All rights reserved

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 268, *Sustainable cities and communities*, Subcommittee SC 1, *Smart community infrastructures*.

STANDARDSISO.COM : Click to view the full PDF of ISO 37153:2017

 © ISO 2017 – All rights reserved

Introduction

The United Nations (UN) sustainable development agenda, "Transforming Our World: The 2030 Agenda for Sustainable Development", was adopted by world leaders in New York in September 2015. Through 17 Sustainable Development Goals (SDGs) and 169 targets, this agenda aims to end poverty and promote prosperity and well-being by 2030, while reducing the adverse impact of human activities on the environment. The UN SDGs address cities directly through Goal 11, which aims to "Make cities inclusive, safe, resilient and sustainable".

According to the SDGs, cities and communities are well positioned as "hubs for idea, commerce, culture, science, productivity, [and] social development." At the same time, cities, which are growing rapidly in many parts of the world, are facing a number of challenges in meeting the needs of their citizens in an equitable and sustainable way.

As urban populations grow, the demand for community infrastructures such as energy, water, transportation, waste, and information and communications technology (ICT) will also continue to grow in the coming decades, driven by major trends such as population growth and increased urbanization. According to the report "Infrastructure 2030" by the Organization for Economic Cooperation and Development (OECD), total cumulative infrastructure investment requirements — for new and improvements to existing community infrastructure — will be approximately $53 trillion (USD) over the next two decades (2010 to 2030).

The appropriate development of community infrastructure is fundamental to supporting the operations and activities of communities, while helping communities overcome urban challenges and make progress in supporting all 17 of the SDGs. It can also play an important role in helping communities overcome urban challenges. In addition to providing a high quality of service to support a decent standard of living for all city residents, community infrastructure should also be economically efficient and endeavour to reduce the environmental impact of urban activity.

In order for communities to develop community infrastructure efficiently, and in a manner that will enable continual improvements in all aspects of performance, it is helpful to have a tool to gauge the current level of maturity of community infrastructure relative to desired future improvements. For such a process, a maturity model is widely recognized as an efficient and effective tool. A maturity model describes the practices and processes needed at each level to reliably and sustainably achieve a corresponding level of desired performance. For example, the capability maturity model (CMM) as presented in the ISO/IEC 15504 series performs this function in the field of software development. Documents such as ISO 18091 and ISO 37101 also promote a CMM-like framework for local governments or communities.

This document describes a community infrastructure maturity model (CIMM) and a standardized approach for the assessment and improvement using the CIMM. The CIMM aids all stakeholders to understand the level of performance, process and interoperability of community infrastructure and their contribution to the community, helps them in setting targets for improvement that will guide investments and helps them to identify gaps in current levels of community infrastructure.

The CIMM can be expressed conceptually as a series of levels, each of which builds off the levels shown in Figure 1. The details are described in Clauses 4 and 5.

STANDARDSISO.COM : Click to view the full PDF of ISO 37153:2017

© ISO 2017 – All rights reserved

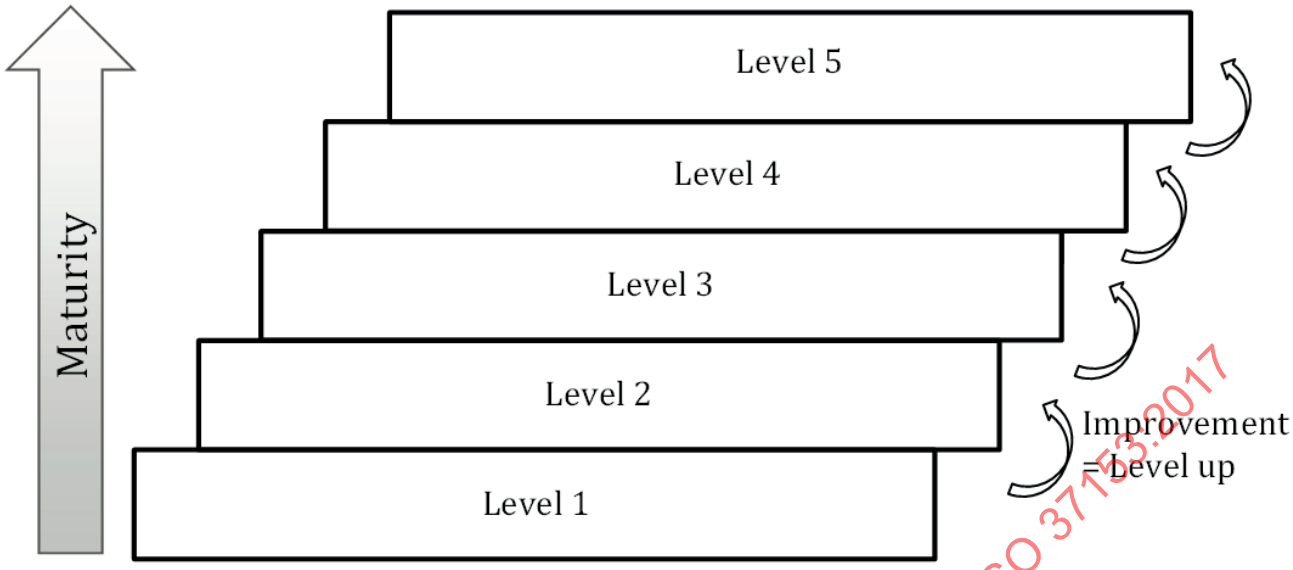


Figure 1 — Conceptual expression of community infrastructure maturity model (CIMM)

To promote continual improvements, it is important to make decisions based on a systematic overall picture of the characteristics of community infrastructure. Therefore, this document provides a systematic framework for assessment, the CIMM, which includes the five reference levels of maturity in each of the characteristics of the community infrastructure.

An assessment using the CIMM could be used to compare different communities but can also be used to make a comparison between the current and future states of infrastructure in a single community by defining the object and scope of the assessment. For example, in the "Plan-Do-Check-Action (PDCA)" cycle of development of community infrastructure, this document could be particularly helpful in the "Plan" and "Check" phases, helping users to assess the current performance, process and interoperability, and to check progress toward achieving desired improvements.

More specifically, this document supports the following stakeholders:

— citizens
  — to improve their quality of life;
— owners of community infrastructure
  — to identify which performance characteristics of the infrastructure should be prioritized;
  — to identify what technical performance aspects should be given priority for improvement;
— suppliers of community infrastructure
  — to determine which community infrastructure products will meet the specified requirements;
  — to identify directions for the development of future community infrastructure products and services;
— operators of community infrastructure
  — to determine the current performance of the community infrastructure they operate;

STANDARDSISO.COM : Click to view the full PDF of ISO 37153:2017

© ISO 2017 – All rights reserved

  - to determine the appropriate performance improvement processes;
- investors
  - to determine which types of infrastructure investments will best meet the desired level of performance;
- city planners or government decision makers
  - to assess city planning and identify which infrastructure to prioritize;
- all stakeholders
  - to ensure investment in community infrastructure that maximizes performance and minimizes life-cycle costs;
  - to promote the harmonization of the needs of residents, community managers and the environment;
  - to promote the sustainable development and resilience of communities.

STANDARDSISO.COM : Click to view the full PDF of ISO 37153:2017

© ISO 2017 – All rights reserved

STANDARDSISO.COM : Click to view the full PDF of ISO 37153:2017

Smart community infrastructures — Maturity model for assessment and improvement

1 Scope

This document provides the basis, requirements and guidance for a maturity model for the assessment of technical performance, process and interoperability of community infrastructure(s) as well as its contribution to the community, and guidance for future improvements.

This document is applicable to

a) all types of community infrastructure, including, but not limited to, energy, water, transportation, waste and ICT,

b) single types of community infrastructure or multiple types of community infrastructure, and

c) all types of communities, regardless of geographical locations, size, economic structure, stage of economic development, and

d) all applicable stages of infrastructure life cycle (e.g. planning/design, construction, operation, decommission).

NOTE Utilization of natural systems, such as green infrastructure, is also considered as one type of infrastructure.

STANDARDSISO.COM : Click to view the full PDF of ISO 37153:2017

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/TS 37151:2015, *Smart community infrastructures – Principles and requirements for performance metrics*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
maturity model
model derived from one or more specified assessment model(s), that identifies the set of phased development or progress levels showing the assessment categories for community infrastructure(s)

3.2
maturity level
point on an ordinal scale of community infrastructure maturity that characterizes the maturity of the community infrastructure assessed in the scope of the maturity model used

© ISO 2017 – All rights reserved

3.3
impact
change to the economy, environment and other community issues, whether adverse or beneficial, resulting from community infrastructures

3.4
achievement criteria table
table populated with predefined requirements for characteristics to be achieved at the levels, which consists of sets of characteristics and their maturity levels derived from CIMM

3.5
community infrastructure maturity model
CIMM
maturity model applied to community infrastructure, which provides common maturity level definitions to assess the community infrastructure

3.6
performance
measurable result

Note 1 to entry: Performance can relate to either quantitative or qualitative findings.

Note 2 to entry: Performance can relate to the management of activities, processes, products (including strategies, programmers, projects, plans and services), systems or organizations.

[SOURCE: ISO 37101:2016, 3.29]

3.7
process
series of actions or events taking place in a defined manner leading to the accomplishment of an expected result

Note 1 to entry: "Defined" in this context does not necessarily mean documented. A defined process includes, but is not limited to, adaptive means.

[SOURCE: ISO/IEC 15944-1:2011, 3.53, modified — Note 1 to entry has been added.]

3.8
interoperability
ability of systems to provide services to and accept services from other systems and to use these services to enable them to operate effectively together

Note 1 to entry: "Systems" in this context means community infrastructures.

Note 2 to entry: "Services" in this context includes information such as data and knowledge.

[SOURCE: ISO 21007-1:2005, 2.30, modified — the definition has been slightly revised and Notes 1 and 2 to entry have been added.]

3.9
community
group of people with an arrangement of responsibilities, activities and relationships

Note 1 to entry: In the context of this document, a community shares geographic areas.

3.10
community infrastructure
systems of facilities, equipment and services that supports the operations and activities of a community

Note 1 to entry: Community infrastructure includes, but is not limited to, energy, water, transportation, waste and information and communication technologies (ICT).

STANDARDSISO.COM : Click to view the full PDF of ISO 37153:2017

© ISO 2017 – All rights reserved

3.11
smart community infrastructure
community infrastructure with enhanced technological performance that is designed, operated and maintained to contribute to sustainable development and the resilience of the community

[SOURCE: ISO/TS 37151:2015, 3.3]

3.12
sustainability
state of the global system, including environmental, social and economic aspects, in which the needs of the present are met without compromising the ability of future generations to meet their own needs

Note 1 to entry: The environmental, social and economic aspects interact, are interdependent and are often referred to as the three dimensions of sustainability.

Note 2 to entry: Sustainability is the goal of sustainable development (3.13).

[SOURCE: ISO Guide 82:2014, 3.1]

3.13
sustainable development
development that meets the environmental, social and economic needs of the present without compromising the ability of future generations to meet their own needs

Note 1 to entry: Derived from the Brundtland Report.

[SOURCE: ISO Guide 82:2014, 3.2]

3.14
life cycle
consecutive and interlinked stages of a product system, from raw material acquisition or generation from natural resources to final disposal

[SOURCE: ISO 14044:2006, 3.1]

3.15
metric
defined measurement method and the measurement scale

[SOURCE: ISO/IEC 14598-1:1999, 4.20, modified — Note 1 and Note 2 to entry have been removed.]

3.16
characteristic
distinguishing feature

[SOURCE: ISO 17566:2011, 2.2]

STANDARDSISO.COM : Click to view the full PDF of ISO 37153:2017

4 Basis of community infrastructure maturity model

4.1 Outline

This document provides requirements and guidance on a methodology to assess the performance, process and interoperability of community infrastructures and their contribution to community-wide priorities on five levels based on the community infrastructure maturity model (CIMM), and to identify improvement points for the levels.

For the assessment and improvement, an achievement criteria table shall be developed and utilized.

Clause 4 provides an overview of the entire methodology, including definitions and requirements. Clause 5 describes how to develop the achievement criteria table. Clause 6 describes how to utilize the table for assessment and improvement.

© ISO 2017 – All rights reserved

4.2 Achievement criteria table

The achievement criteria table of target community infrastructure(s) comprises

— characteristics to assess the performance, process and interoperability of community infrastructure(s) or their contribution to the community;

— objectives justifying the inclusion of each characteristic;

— five levels of characteristics;

— descriptions or definitions of criteria for those characteristics which define each level.

The CIMM provides reference levels of maturity of the community infrastructure(s). See 4.5 and 5.4.3 for details.

Table 1 outlines the basic structure of an achievement criteria table. Annex C provides examples of the achievement criteria table (ACT) for community infrastructure.

Table 1 — Basic structure of an achievement criteria table

Characteristics	Objectives	Level				
		1	2	3	4	5
CH1	Objective of CH1	Def.	Def.	Def.	Def.	Def.
CH2	Objective of CH2	Def.	Def.	Def.	Def.	Def.
CH3	Objective of CH3	Def.	Def.	Def.	Def.	Def.
…	…	…	…	…	…	…
NOTE 1 “CH1”, “CH2” and “CH3” represent the characteristics. NOTE 2 “Def.”(“definition”) represents a description of the criteria for the characteristics to be met at each level of the maturity model. These definitions can be expressed by quantitative, qualitative or descriptive measures.						

4.3 Assessment aspects of the community infrastructure

This document provides two aspects for the assessment of the community infrastructure(s) as shown below.

— Technical assessment: assessment of performance, process and interoperability of community infrastructure(s) (e.g. capacity of a power generation plant):

— Contribution assessment: assessment of the contribution of community infrastructure(s) to community-wide priorities (e.g. the unemployment rate of a community affected by a road-building project).

A technical assessment could be a useful aid as an assessment tool for operators, supervisory authorities and community infrastructure vendors.

Contribution assessment could be a useful aid as an assessment tool for government decision makers and development agencies.

Table 2 outlines the conceptual relationship of the two assessment aspects.

NOTE 1 For details on relating community issues to community infrastructure performances, see ISO/TS 37151:2015, 5.3.

NOTE 2 Annex A provides a more detailed description of the difference between technical assessment and contribution assessment.

NOTE 3 Community issues are the challenges that the community faces. Obviously, the issues and their priorities vary between different communities.

STANDARDSISO.COM : Click to view the full PDF of ISO 37153:2017

© ISO 2017 – All rights reserved

Table 2 — Relationship between the assessment aspects

Technical assessment	Contribution assessment			
Characteristics (performance, process and interoperability of community infrastructures)	Contribution of community infrastructures to community-wide issues			
	Impact 1 (e.g. gross product of a community)	Impact 2 (e.g. unemployment rate of a community)	Impact 3 (e.g. poverty rate of a community)	[...]
Characteristic A (e.g. capacity of services)	***	*		
Characteristic B (e.g. investment efficiency of services)	**	**		
Characteristic C (e.g. greenhouse gas emissions from services)	*	***		
[...]				

NOTE 1 The number of "*" indicates the degree of relations between the performance of the infrastructure listed in the row and the impact listed in the column.

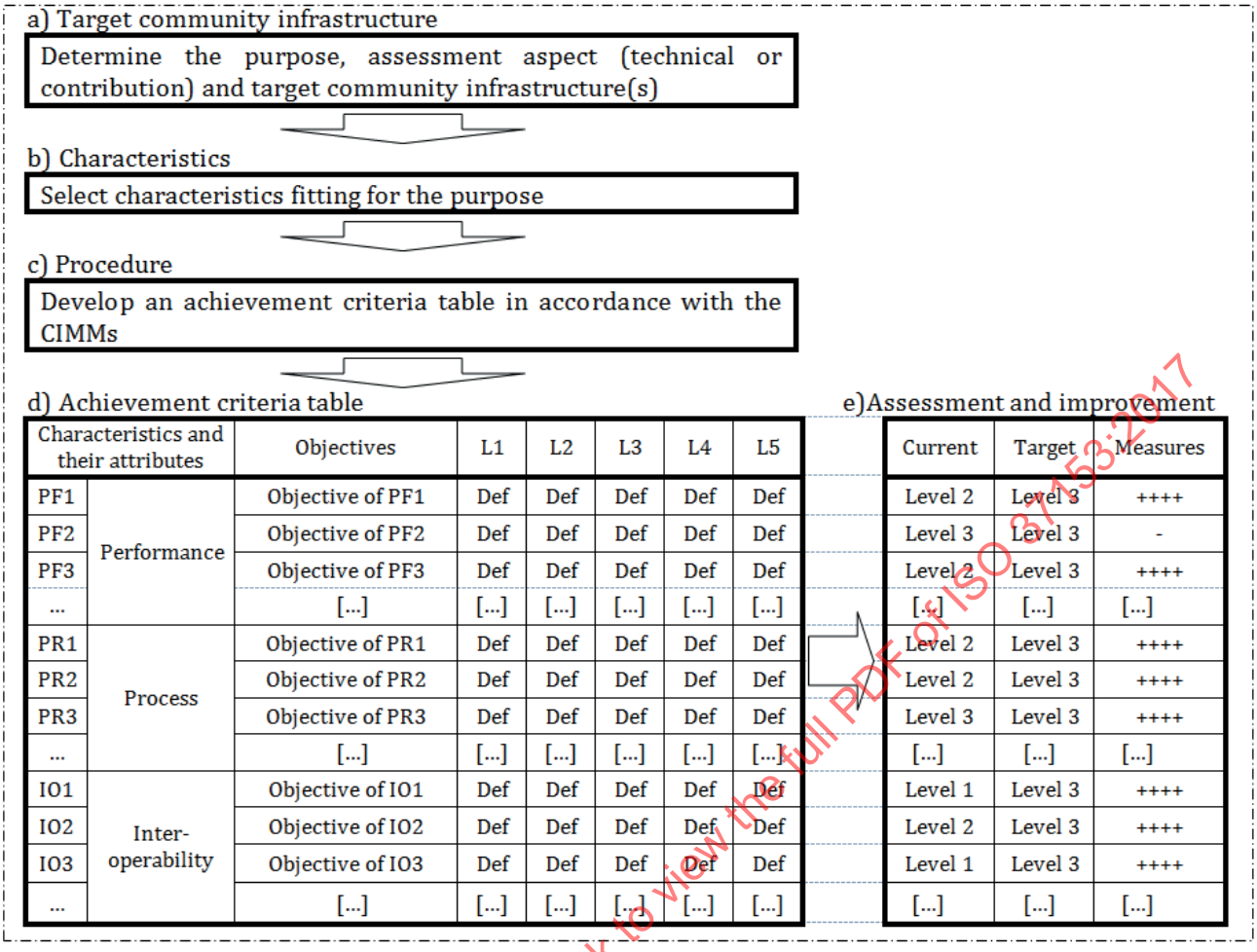
NOTE 2 Taken from ISO/TS 37151:2015, Table 2, modified.

4.4 Overview of the methodology

The methodology includes the development of an achievement criteria table, a procedure to assess the target community infrastructure(s), and a procedure to improve the maturity level of the target community infrastructure. Figure 2 provides an overview of the methodology (see Clauses 5 and 6 for details). A procedure for the assessment and improvement is described in Clause 6.

STANDARDSISO.COM : Click to view the full PDF of ISO 37153:2017

© ISO 2017 – All rights reserved



Characteristics and their attributes		Objectives	L1	L2	L3	L4	L5	Current	Target	Measures
PF1	Performance	Objective of PF1	Def	Def	Def	Def	Def	Level 2	Level 3	++++
PF2		Objective of PF2	Def	Def	Def	Def	Def	Level 3	Level 3	-
PF3		Objective of PF3	Def	Def	Def	Def	Def	Level 2	Level 3	++++
...		[...]	[...]	[...]	[...]	[...]	[...]	[...]	[...]	[...]
PR1	Process	Objective of PR1	Def	Def	Def	Def	Def	Level 2	Level 3	++++
PR2		Objective of PR2	Def	Def	Def	Def	Def	Level 2	Level 3	++++
PR3		Objective of PR3	Def	Def	Def	Def	Def	Level 3	Level 3	++++
...		[...]	[...]	[...]	[...]	[...]	[...]	[...]	[...]	[...]
IO1	Inter-operability	Objective of IO1	Def	Def	Def	Def	Def	Level 1	Level 3	++++
IO2		Objective of IO2	Def	Def	Def	Def	Def	Level 2	Level 3	++++
IO3		Objective of IO3	Def	Def	Def	Def	Def	Level 1	Level 3	++++
...		[...]	[...]	[...]	[...]	[...]	[...]	[...]	[...]	[...]

NOTE "++++" means improvement measures for filling the gaps.

Figure 2 — Overview of the methodology

4.5 Community infrastructure maturity model

The community infrastructure maturity model (CIMM) provides the overall picture of the maturity of the community infrastructure(s) with five reference levels. Table 3 shows generic definitions and descriptions of the maturity levels in the CIMM.

NOTE Each level assumes that the requirements of the lower levels have been fulfilled.

Table 3 — Generic definition of the community infrastructure maturity model (CIMM)

Level	Definition	Description
5	Sustainably optimizing	Continually improving to satisfy future needs
4	Improving	Partially started towards future needs
3	Fulfilled	Satisfies current needs in a defined manner
2	Partially fulfilled	Needs are identified but not satisfied
1	Initial	Not started yet

STANDARDSISO.COM : Click to view the full PDF of ISO 37153:2017

 © ISO 2017 – All rights reserved

5 Requirements and guidance to develop an achievement criteria table

5.1 General

To develop an achievement criteria table, users (e.g. experts, consultants/city planners or owners/operators of community infrastructures) should take the following steps:

a) determine the purpose, assessment aspect and target community infrastructure(s);

b) select characteristics that fit the purpose (see 5.3 for details);

c) define the characteristics for each of the five maturity levels in accordance with the CIMMs (see 5.4 for details);

d) organize the characteristics and the maturity levels into the criteria in a table.

Once the achievement criteria table has been developed, other users may use the table for their assessment needs.

When choosing target infrastructure(s), users may choose anything from a single piece of infrastructure to multiple infrastructures.

5.2 Guidance to determine purposes

To determine the purpose of the assessment, users should

a) determine the target community (e.g. city, state, nation, region),

b) identify and prioritize the community issues in the target community (e.g. unemployment, poverty, congestion),

c) identify and analyse the relevant community infrastructure(s) and its impacts on the prioritized community issues,

d) define the purpose of the assessment and improvement of the community infrastructure(s) identified in b) in the community determined in a).

To prioritize community issues, users may refer to the following documents depending on the target communities:

— for a nation, the UN SDGs or a specific national development plan;

— for a region, the UN SDGs or a specific regional development plan;

— for a city, the UN SDGs or a specific urban development plan.

NOTE Community issues are the challenges that the community faces. Obviously, the issues and their priorities vary between different communities.

5.3 Requirements and guidance to identify characteristics

5.3.1 General

Users shall select characteristics of the community infrastructure(s) in accordance with the purpose of the assessment and the assessment aspect.

For a technical assessment of community infrastructure(s), users shall select technical characteristics in accordance with the requirements given in ISO/TS 37151.

STANDARDSISO.COM : Click to view the full PDF of ISO 37153:2017

© ISO 2017 – All rights reserved

For a contribution assessment, users shall select community-wide characteristics (preferably indicators or metrics) with societal merits, taking into account the whole function of multiple community infrastructures, through a comprehensive perspective.

For such characteristics, users should refer to the Sustainable Development Goals (SDGs) adopted by the United Nations in 2015 or to the national development goals of each nation.

It is possible that additional characteristics could come from regulations, industry standards and specifications.

Table 4 outlines an example of how to identify the characteristics.

Table 4 — Example of how to identify characteristics

Purpose	Key stakeholders	Key stakeholders' needs	Characteristics	Objectives of characteristics
Assessment and improvement of maturity of the target community infrastructures (e.g. energy, water, transportation, waste, ICT)	Citizens (e.g. residents), owners, sponsors, planners, operators, suppliers, etc.	Availability, affordability (e.g. economic, societal, environmental sustainability)	Characteristic 1	Objective 1
			Characteristic 2	Objective 2
			…	…

5.3.2 Additional recommendation for characteristics

The following recommendations are given to aid users in their selection of appropriate characteristics to define the maturity level classification.

A characteristic should

— be a metric, i.e. measureable through monitoring, surveying or some other type of assessment method,

— be easily used for rating (it is suggested that the users avoid "YES/NO" or other "Either/OR" classifications because those are difficult to place on a five-level scale.),

— allow for the ability to obtain accurate and precise results.

NOTE Reviewing and revising the selected characteristics based on practical verification can help users constantly improve characteristics, which become better suited to their needs.

5.4 Guidance to define criteria of maturity levels

5.4.1 General

Users should develop, in accordance with the general descriptions given in the following subclauses, the descriptions of criteria of five maturity levels for each identified characteristic, which will be compiled in the achievement criteria table.

To define the maturity levels, users should

a) classify each identified characteristic as one of three attributes: performance, process or interoperability (see 5.4.2 for details),

NOTE 1 Users do not have to develop characteristics for all three attributes if it is not appropriate to do so.

b) develop the five-level criteria for each characteristic on the basis of the reference maturity models for each classification (see 5.4.3 for details).

NOTE 2 The selection of attributes depends on the identified community issues (see 5.2), such as water infrastructure in terms of interoperability.

STANDARDSISO.COM : Click to view the full PDF of ISO 37153:2017

 © ISO 2017 – All rights reserved

5.4.2 Attribute of characteristics

In developing an achievement criteria table for community infrastructure(s), users should define maturity levels according to the characteristics of performance, process and interoperability.

Performance characteristics are those used to assess the performances of community infrastructure(s), for example

— the levels of community infrastructure service;

— the effects on the environment or other aspects of the community directly attributable to infrastructure operations.

Process characteristics are those used to assess, for example,

— the levels of processes for community infrastructure such as introduction, maintenance and operation carried out by community managers/administrators/operators;

— the activities to plan, manage and monitor community infrastructure services.

Interoperability characteristics are those used to assess how well different infrastructure elements can work in concert or to assist one another, for example

— the cooperation, alignment and harmonization of multiple community infrastructures;

— the cooperation, alignment and harmonization of infrastructure services and various services/issues within a community;

— the relationships with other communities.

5.4.3 Definition of the criteria

5.4.3.1 General

Users should define the five-level criteria of maturity levels for each characteristic depending on its attribute (see 5.4.3.2 for details).

Additionally, for all attributes, users should follow this guidance in developing the characteristics:

— If it is difficult to describe a criterion with a single constant value, users should utilize variables.

— If a characteristic is not clearly classifiable as either performance, process or interoperability, users should designate it to the classification which is most suitable in accordance with the assessment purpose.

NOTE For detailed guidelines on describing specific maturity levels, see Annex B (detailed explanation for the CIMM definitions).

5.4.3.2 Maturity levels by attributes of characteristics

Depending on the attribute, i.e. performance, process or interoperability, users should develop the five-level criteria of each characteristic on the basis of the following maturity models for each attribute.

Tables 5, 6 and 7 correspond to the maturity models for performance, process and interoperability characteristics, respectively, where “needs” includes both aspects – the technical and the contribution to solving community issues. Details are given in Annex B.

The CIMM for performance characteristics is defined in Table 5, which is derived from the generic CIMM in Table 3.

STANDARDSISO.COM : Click to view the full PDF of ISO 37153:2017

© ISO 2017 – All rights reserved

Table 5 — CIMM for performance characteristics

Level	Definition	Description
5	Sustainably optimizing	Satisfies quality and capacity for future needs
4	Improving	Development started that will satisfy future needs
3	Fulfilled	Satisfies quality and capacity for current needs
2	Partially fulfilled	Physically functioning but does not satisfy current needs
1	Initial	No functioning infrastructure

The CIMM for process characteristics is defined in Table 6, which is derived from the generic CIMM in Table 3.

Table 6 — CIMM for process characteristics

Level	Definition	Description
5	Sustainably optimizing	Procedures for continual improvement of processes are implemented with the appropriate resources (e.g. human, financial and natural)
4	Improving	Processes are quantitatively implemented
3	Defined	Processes are defined and implemented
2	Managed	Needs related to processes are identified but the processes are not defined
1	Initial	No established processes

The CIMM for interoperability characteristics is defined in Table 7, which is derived from the generic CIMM in Table 3.

Table 7 — CIMM for interoperability characteristics

Level	Definition	Description
5	Sustainably optimizing	Continual improvement of interoperability is in place
4	Improving	Common platform to achieve interoperability is established
3	Fulfilled	Connection and cooperation across community infrastructures are defined and established
2	Assessed	Needs for connection and cooperation across community infrastructures are assessed but not defined
1	Initial	Infrastructures are independently operated

STANDARDSISO.COM : Click to view the full PDF of ISO 37153:2017

6 Guidance for assessment and improvement

6.1 General

This clause gives guidance on assessing the maturity of the target community infrastructure(s) with an achievement criteria table, and improving the performance, process and interoperability of community infrastructure(s) and their contribution to community-wide priorities.

6.2 Guidance for assessment

For assessment, users should follow these procedures as a minimum:

a) Prepare necessary documents, for example analysis of policies relevant to the target community infrastructure(s), records pertaining to the current situation of the target community infrastructure(s).

© ISO 2017 – All rights reserved

b) Select the appropriate achievement criteria table in accordance with Clause 5 or the target infrastructure(s).

c) Evaluate the target community infrastructure(s) according to each characteristic in the achievement criteria table and decide its proper assessment level.

d) Record the results of assessment.

If no such achievement criteria tables exist, users should follow Clause 5 to create an appropriate achievement criteria table.

6.3 Guidance for improvement

6.3.1 Analysis for improvement

For improvement, users should follow these procedures:

a) Set the target level of each characteristic desired for improvement.

b) Identify and analyse the gaps between the target level and the current situations assessed.

c) Develop a plan or measures in order to fill the gaps and achieve the target level.

Users should periodically implement such procedures based on the PDCA cycle.

NOTE Assessment and improvement use the same achievement criteria table. Whether the metric that indicates the goal of improvement is all of the indicator, a part of an indicator or a group of indicators, depends on the future vision of the community infrastructure(s).

While making an improvement plan, it is recommended that the feasibility, operability and effect of the plan is evaluated, and a benchmark included in the plan to judge if the plan is executed successfully. It is also recommended that the effect is compared with the cost of the plan.

6.3.2 Implementation of improvement

There are various means for implementing the improvement plans, such as

— improving the performance characteristics, exchanging/repairing the hardware or physical equipment;

— improving the process characteristics, implementing an advanced maintenance activity based on the data monitoring;

— improving the interoperability characteristics, enhancing data sharing and practical usage among different types of infrastructures.

After implementing the improvement plan, an evaluation should be conducted to check that the desired effect has been achieved.

Users should retain the documents detailing the improvement plan at each assessment stage for future analysis.

NOTE Annex D provides a basic example of practical implementation for continual improvement of community infrastructure(s).

STANDARDSISO.COM : Click to view the full PDF of ISO 37153:2017

© ISO 2017 – All rights reserved

Annex A
(informative)

Conceptual description of the assessment aspects

A.1 General

Figure A.1 gives a conceptual description of the target community infrastructure and its technical and contribution assessments for the needs of community infrastructure and community-wide priorities.

The community infrastructure consists of a physical infrastructure, and its operator and servicing. The servicing is an activity to create further value related to the physical infrastructure and its operations. The target community infrastructure cooperates with other community infrastructures.

A.2 Two aspects of assessments

The activities of community infrastructure affect the environment, residents and community managers. The activities of community infrastructure also affect community-wide environmental/social/economic priorities.

There are two aspects for the assessments. One is to assess the community infrastructure performance itself, and the other to assess the contribution of community infrastructure to community-wide priorities.

In this document, the former is referred to as a "technical assessment", and the latter is referred to as a "contribution assessment". In Figure A.1, the technical assessment is represented by a wide arrow from "Target community infrastructure" toward "Needs" and the contribution assessment is represented by a wide arrow heading from "Target community infrastructure" toward "Community-wide priorities in environment, social or economy".

A.3 Three characteristics for assessments

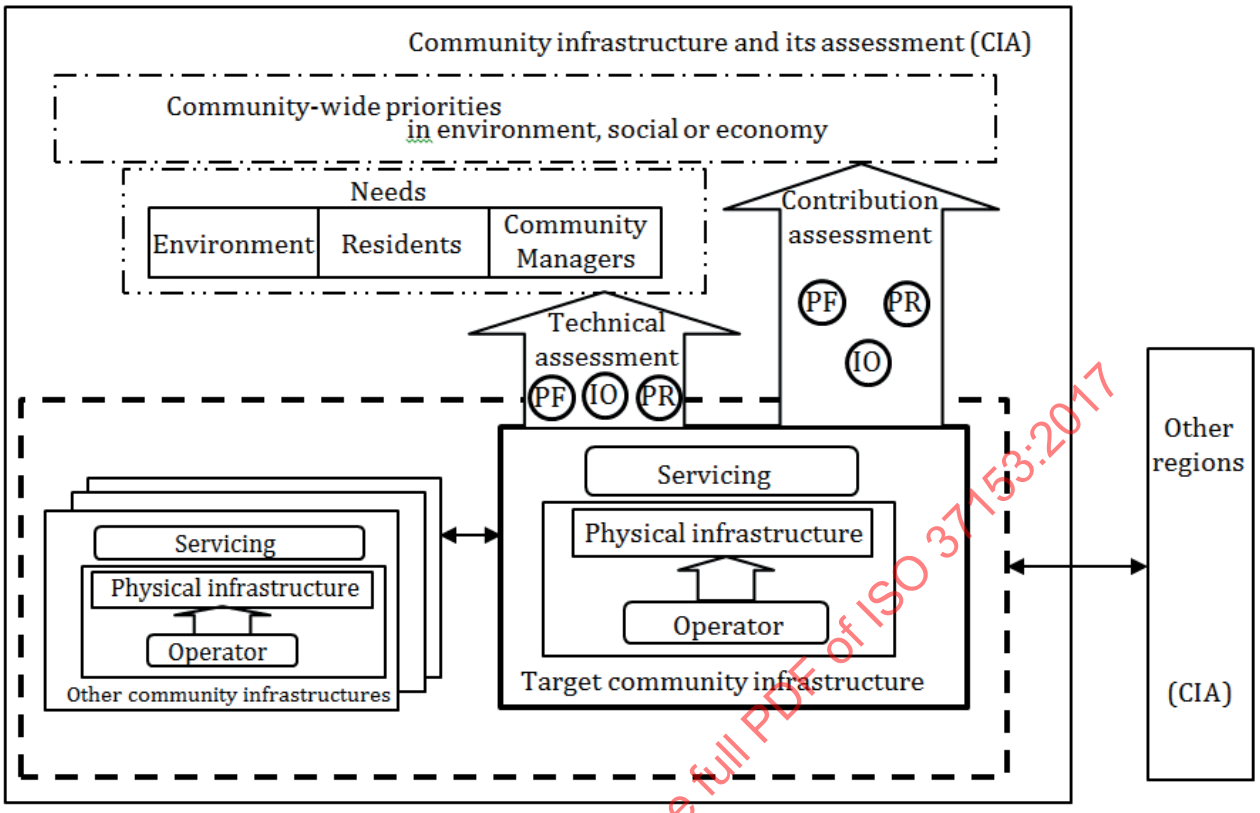
Metrics related to performance characteristics are used to assess the performance of community infrastructure or its contribution to community-wide priorities. These are expressed as "PF" in Figure A.1. In the case of technical assessment of community infrastructure, the metrics for performance characteristics should be selected first from ISO/TS 37151.

Metrics related to process characteristics are used to assess management capability of the community infrastructure or contribution to the community-wide priorities. These are expressed as "PR" in Figure A.1.

Metrics related to interoperability characteristics are used to assess cooperation capability/effect of community infrastructure or contribution to community-wide priorities. These are expressed as "IO" in Figure A.1.

STANDARDSISO.COM : Click to view the full PDF of ISO 37153:2017

© ISO 2017 – All rights reserved



Key

PF	performance
PR	process
IO	interoperability
wide arrows	assessment results
slim arrows	physical interactions

NOTE This figure applies to the assessment of a single infrastructure with interaction between other infrastructures. In order to assess a complex system composed of multiple infrastructures as a whole, the target community infrastructure can be extended as shown by the dotted line.

Figure A.1 — Example of a picture of the community activities in a broad sense

STANDARDSISO.COM : Click to view the full PDF of ISO 37153:2017

© ISO 2017 – All rights reserved

Annex B
(informative)

Detailed explanation for the CIMM definitions

To support users in creating the achievement criteria table, additional CIMM definitions for performance, process and interoperability characteristics composed of key elements are given in this annex. The original CIMM and additional definitions for key elements of performance, process and interoperability are described in Tables B.1, B.2, and B.3, respectively.

STANDARDSISO.COM : Click to view the full PDF of ISO 37153:2017

© ISO 2017 – All rights reserved

© ISO 2017 – All rights reserved

Table B.1 — Guidance for technical and contribution assessments for performance characteristics

Key elements		Maturity level				
		Level 1 (initial)	**Level 2 (partially fulfilled)**	**Level 3 (fulfilled)**	**Level 4 (improving)**	**Level 5 (sustainably optimizing)**
Table 5 (5.4.3.2)		No functioning infrastructure	Physically functioning but does not satisfy current needs	Satisfies quality and capacity for current needs	Development started that will satisfy future needs	Satisfies quality and capacity for future needs
Technical assessment	**Functioning situation**	No functioning infrastructure	Physically functioning	Stably functioning with no critical issues	Stably functioning and improving with no critical issues	Stably functioning and optimizing without any issues using state-of-art technologies
	Service requirements	No services	Satisfies quality, capacity and coverage partially for the current needs	Satisfies quality, capacity and coverage fully for the current needs	Satisfies quality, capacity and coverage partially for the future needs	Satisfies quality, capacity and coverage fully for the future needs
Contribution assessment	**Contribution to community-wide priorities**	No consideration about contribution	Community current needs are identified	Contributing to community current needs with no critical issues	Future community-wide priorities are identified, and it started the development for them	Contributing to the future community-wide priorities

STANDARDSISO.COM : Click to view the full PDF of ISO 37153:2017

Table B.2 — Guidance for technical and contribution assessments for process characteristics

Key elements		Maturity level				
		Level 1 (initial)	**Level 2 (managed)**	**Level 3 (defined)**	**Level 4 (improving)**	**Level 5 (sustainably optimizing)**
Table 6 (5.4.3.2)		No established processes	Needs related to processes are identified but the processes are not defined	Processes are defined and implemented	Processes are quantitatively implemented	Procedures for continual improvement of processes are implemented with the appropriate resources (e.g. human, financial and natural)
Technical assessment	**Management and operation**	Needs are not identified, and management plans are not formulated	Needs are identified, and the management and operation plans are formulated, but not fully implemented	Management and operation plans, at least management plans for configuration, work, risk and maintenance, are established	Management and operation based on quantitative analyses are effectively established; improvements based on the analyses are being promoted	Optimal management and operation based on the evaluation of efficiency and effectiveness are established; efficient optimum process utilizing advanced technologies is implemented
	Servicing	Needs for servicing are not identified	Needs for servicing are identified, but not fully implemented	Servicing is defined and implemented	Servicing is monitored and analysed	Servicing is continuously boosting its value creations
Contribution assessment	**Contribution to community-wide priorities**	No consideration for community needs	Needs for community are identified, and plans for contribution are formulated (e.g. a master plan)	Plans for contribution to the community needs are established	Contribution to community-wide priorities is quantitatively and/or qualitatively evaluated, and reflected for its improvement	Continual improvement process is implemented; contribution to community- wide priorities is continuously evaluated and improving

STANDARDSISO.COM : Click to view the full PDF of ISO 37153:2017

© ISO 2017 – All rights reserved

© ISO 2017 – All rights reserved

Table B.3 — Guidance for technical and contribution assessments for interoperability characteristics

Key elements		Maturity level				
		Level 1 (initial)	**Level 2 (assessed)**	**Level 3 (fulfilled)**	**Level 4 (improving)**	**Level 5 (sustainably optimizing)**
Table 7 (5.4.3.2)		Infrastructures are independently operated	Needs for connection and cooperation across community infrastructures are assessed but not defined	Connection and cooperation across community infrastructures is defined and established	Common platform to achieve interoperability is established	Continual improvement of interoperability is in place
Technical assessment	**Management and operation**	No cooperation	Cooperation across infrastructures and/or communities are assessed but individually implemented	Cooperation across infrastructures and/or communities is defined and established	Integrated management and services across infrastructures and/or communities are established	Integrated management and services across infrastructures and/or communities are continuously improving
	Closeness and scale	Information is not shared	Information is being shared between infrastructures and/or communities by means of data exchange	Operation based on shared data and process is established	Operation based on shared systems is established	Operation based on shared systems is continuously improving with state-of-the-art technologies
Contribution assessment	**Contribution to community-wide priorities**	No consideration for community needs	Needs for community are identified and plans are formulated	Plans for contribution to the community needs are established	Contribution to community-wide priorities is quantitatively and/or qualitatively evaluated, and reflected in its improvement	Continual improvement process is implemented; contribution to community-wide priorities is continuously evaluated and improving

STANDARDSISO.COM : Click to view the full PDF of ISO 37153:2017

Annex C
(informative)

Examples of the achievement criteria table (ACT)

C.1 General

This annex shows examples of an ACT for community infrastructures.

C.2 Examples for electric power supply infrastructure

C.2.1 Main items for the sample ACT

This subclause gives examples of the ACT when defining target infrastructure for electric power supply infrastructures, which contain an electric power system including a power grid network (transmission and distribution) and power generation. This is built according to the methodology described in 4.4 and Clause 5.

To create the ACT, the following items are determined. Table C.1 gives the example of descriptions for the following items;

— "Target infrastructure" is the infrastructure(s) of the assessment target.

— "Purpose of assessment" is the objective of assessing the infrastructure(s) in the community.

— "Key stakeholders" are the people who use this ACT.

Table C.1 — Description of the target infrastructure, purpose of assessment and key stakeholders for the ACT

Item	Description
Target infrastructure	Electric power supply infrastructure (generation and grid)
Purpose of assessment	To satisfy requests from residents, industry, society or environment for the electric power supply infrastructure, which include quality of service, operation efficiency, service sustainability, resiliency and harmony among neighbourhood areas
Key stakeholders	Citizens, operators/owners of community infrastructure, city planners or government decision makers

C.2.2 Sub items for each characteristic in the ACT

The ACT is composed of multiple characteristics. It is recommended that the ACT is configured with characteristics induced from at least "14 needs" identified in ISO/TS 37151. Each characteristic has the following items.

— Minimum "Needs" are identified in ISO/TS 37151

— "Category" is identified as "performance characteristic" in ISO/TS 37151.

— "Attributes" is defined as a classification of the characteristic: performance characteristic, process characteristic, or interoperability characteristic.

— "Objective of characteristic" is derived from the purpose of the ACT.

STANDARDSISO.COM : Click to view the full PDF of ISO 37153:2017

© ISO 2017 – All rights reserved

— "Reference metrics" are the metrics to be referred to when assessing the target infrastructure.

C.2.2.1, C.2.2.2 and C.2.2.3 provide examples of characteristics to configure the ACT for the electric power supply infrastructure. Examples for performance, process and interoperability are selected in C.2.2.1, C.2.2.2 and C.2.2.3, respectively. Each corresponds to the one row of the table d) described in Figure 2.

C.2.2.1 Quality level of the power system

Table C.2 provides identified sub items for "Quality level of the power system" characteristics.

Table C.2 — Sub items for "Quality level of the power system" characteristic

Need/category/attribute	Availability	Stability	Performance
Objective of characteristic	To identify the quality levels of the power system, including its management and operation		
Reference metrics	— Average interruption duration per year per customer (ISO/TS 37151:2015, Annex A) — Average interruption frequency per year per customer (ISO/TS 37151:2015, Annex A) — How much the actual frequency of a system departs from the reference frequency — How much the actual voltage of a system departs from the reference voltage		
Five-level criteria of maturity levels			
Level	Description		
5	The power system is continuously stable corresponding to the future situation, including resource risks, environmental risks and emergency issues		
4	The power system is stable corresponding to the near future needs, including renewable energy connections and demand fluctuations/movements		
3	The power system is stable and has no critical quality issues that could adversely affect economic activities and social activities (e.g. frequency control, voltage control, supply and demand adjustment)		
2	There are issues in stable supply, such as negative impacts on economic activities and social activities in the community		
1	It has not been electrified in most of the region		

C.2.2.2 Grid configuration redundancy

Table C.3 provides identified Sub items for "Grid configuration redundancy" characteristic.

Table C.3 — Sub items for "Grid configuration redundancy" characteristic

Need/category/attribute	Resilience	Redundancy	Process
Objective of characteristic	To identify how redundancy grid configuration is built and how well the operation performs to maintain the request for power supply and grid quality		
Reference metrics	— Grid configuration redundancy (to satisfy N-1 condition, etc.) — Power outage time due to equipment/facility issues — Power outage time due to operational issues		
Five-level criteria of maturity levels			
Level	Description		
5	Automated switching or control mechanism for no outage has been built and has efficiently managed and operated for continual stability. The mechanism is continuously improved for more effectiveness and efficiency		

STANDARDSISO.COM : Click to view the full PDF of ISO 37153:2017

© ISO 2017 – All rights reserved

Table C.3 *(continued)*

4	Power plants and grid situation are monitored and analysed, and they effectively manage and operate the power system using this information to achieve stability
3	The power system has sufficient redundancy and/or robust structures. There are management and operation mechanisms or rules for power grid stability and they are managed and operated according to them
2	The power system does not have sufficient redundancy or robust structures to recover such as N-1 conditions or sufficient transmission line capacity
1	No consideration of redundant or robust configuration in the power system

C.2.2.3 Efficiency of management and operations for keeping the balance

Table C.4 provides identified sub items for "Efficiency of management and operations for keeping the balance" characteristic

Table C.4 — Sub items for "Efficiency of management and operations for keeping the balance" characteristic

Need/category/attribute	Operational efficiency	Operational efficiency	Interoperability
Objective of characteristic	To identify the level of efficiency of management and operations for keeping a balance between supply and demand through tie-lines among different regions.		
Reference metrics	— Amounts of interconnected power exchange by the tie-lines — Trends of total cost for management and operation in the power system — Economical loss by constraints on the interconnection of the tie-lines		
Five-level criteria of maturity levels			
Level	Description		
5	The continual improvement of stable and efficient service operations for power supply controls has been achieved with the effectiveness evaluation for their management and operations with cooperation in related electric companies It has been promoted and accepted by the neighbourhood regions. For the continual usage and long-term agreement, these are prerequisite conditions		
4	The balance between supply and demand through tie-lines in different regions is achieved by the quantitative management where unified management as achieved based on the accurate forecasts or analysed results of demand and supply data on all power generators and demands		
3	Fair and unified rules for the balance between supply and demand through tie-lines in different regions have been identified. The management and operation for the power grid between some regions have been achieved without large constraints based on these rules		
2	The management and operation for the balance between supply and demands are achieved through tie-lines in different regions. The power system has constraints on connected users' usage or operation in cases of lack of power supply etc.		
1	The power grid is not constructed		

STANDARDSISO.COM : Click to view the full PDF of ISO 37153:2017

© ISO 2017 – All rights reserved