



BSI Standards Publication

Virtual Power Plants

Part 2: Use Cases

National foreword

This Published Document is the UK implementation of IEC TS 63189-2:2023.

The UK participation in its preparation was entrusted to Technical Committee GEL/8, Systems Aspects for Electrical Energy Supply.

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

Contractual and legal considerations

This publication has been prepared in good faith, however no representation, warranty, assurance or undertaking (express or implied) is or will be made, and no responsibility or liability is or will be accepted by BSI in relation to the adequacy, accuracy, completeness or reasonableness of this publication. All and any such responsibility and liability is expressly disclaimed to the full extent permitted by the law.

This publication is provided as is, and is to be used at the recipient's own risk.

The recipient is advised to consider seeking professional guidance with respect to its use of this publication.

This publication is not intended to constitute a contract. Users are responsible for its correct application.

This publication is not to be regarded as a British Standard.

© The British Standards Institution 2023
Published by BSI Standards Limited 2023

ISBN 978 0 55 00400 7

ICS 29.240.01

Compliance with a Published Document cannot confer immunity from legal obligations.

This Published Document was published under the authority of the Standards Policy and Strategy Committee on 30 November 2023.

Amendments/corrigenda issued since publication

Date	Text affected
------	---------------



IEC TS 63189-2

Edition 1.0 2023-10

TECHNICAL SPECIFICATION



**Virtual Power Plants-
Part 2: Use Cases**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 29.240.01

ISBN 978-2-8322-7623-5

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

CONTENTS

FOREWORD..... 4

INTRODUCTION..... 6

1 Scope..... 7

2 Normative references 7

3 Terms and definitions 7

4 System requirements..... 9

 4.1 General considerations 9

 4.2 Basic requirements 9

 4.2.1 General 9

 4.2.2 Privacy 9

 4.2.3 Cyber security 9

 4.2.4 Adaptability, flexibility and interoperability 9

 4.2.5 Communication and information..... 10

 4.2.6 Reliability 10

 4.3 Operational risks of VPPs 10

 4.3.1 General 10

 4.3.2 Major 10

 4.3.3 Moderate 10

 4.3.4 Minor 10

5 Business roles 11

 5.1 VPP participant..... 11

 5.2 DER owner 11

 5.3 System operator 11

 5.4 Electricity market operator 11

6 Actors..... 11

7 Application scenarios and functions 11

 7.1 Overview 11

 7.2 Functions..... 12

8 VPP use case..... 12

 8.1 Overview 12

 8.2 Use case template 12

 8.3 Use case matrix 12

 8.4 Use case development..... 13

 8.4.1 General 13

 8.4.2 Description of the use case 14

 8.4.3 Diagrams of use case 26

 8.4.4 Technical details..... 42

 8.4.5 Step by step analysis of use case..... 49

 8.4.6 Information exchanged 68

9 Summary of standards gap analysis 70

10 Conclusion and recommendations 70

Bibliography..... 72

Figure 1 – Use case matrix development methodology..... 13

Table 1 – Use case list	14
Table 2 – Scope and objectives of use case	16
Table 3 – Narrative of use case	19
Table 4 – Key performance indicators	22
Table 5 – Use case conditions	24
Table 6 – Diagrams of use case.....	26
Table 7 – Diagram(s) of actors.....	43
Table 8 – Grouping of China	44
Table 9 – Grouping of Japan.....	45
Table 10 – Grouping of Australia.....	46
Table 11 – Grouping of Germany	47
Table 12 – References.....	47
Table 13 – Scenario conditions	49
Table 14 – Steps of scenarios.....	54
Table 15 – Information exchanged	68
Table 16 – Conclusion of use cases.....	71

INTERNATIONAL ELECTROTECHNICAL COMMISSION

VIRTUAL POWER PLANTS –

Part 2: Use cases

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) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at <https://patents.iec.ch>. IEC shall not be held responsible for identifying any or all such patent rights.

IEC TS 63189-2 has been prepared by subcommittee 8B: Decentralized electrical energy systems of IEC technical committee 8: System aspects of electrical energy supply. It is a Technical Specification.

The text of this Technical Specification is based on the following documents:

Draft	Report on voting
8B/136/DTS	8B/198/RVDTS

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Technical Specification is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the IEC 63189 series, published under the general title *Virtual power plants*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

IMPORTANT – The "colour inside" logo on the cover page of this document 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 virtual power plants use cases are developed to facilitate the standardization in this area from a system perspective. The use cases capture the basic information, business roles, actors, scenarios, and processes from practical business applications, pilot projects, and academic researches of virtual power plants in different countries. This document is developed to capture the requirements in the form of use cases that contain the scenarios and steps in a logical sequence so that it cannot only be understood by interested parties to obtain their related requirements, develop a virtual power plant, or operate a virtual power plant, but also establish a nomenclature for the functions, roles, etc. Meanwhile, the use cases in the document apply to any types of DER aggregation (physical, virtual, small and large), and also to microgrids.

Interested parties for this document include, but are not limited to:

- virtual power plant operator
- distributed generation operator
- demand response service operator
- electrical energy storage operator
- electric vehicle operator
- electric vehicle charging station with storage
- power system operator
- electricity market operator
- transmission and/or distribution company
- energy service company
- energy information provider
- regulator

The major objectives of this document include:

- to build common understanding of the business, system and functional requirements and thus to facilitate further development of VPPs;
- to investigate future standardization needs, in order to ensure the easy implementation, performance and interoperability of VPPs;
- to serve as an input to the IEC Use Case management repository, the purpose of which is to collect, administer, maintain, and analyze generic use cases.

VIRTUAL POWER PLANTS –

Part 2: Use cases

1 Scope

This document is applicable to virtual power plants (VPPs) that consist of distributed generation, controllable loads, and electrical energy storages.

This part of IEC 63189 is to provide VPPs use cases that capture the basic information, business roles, actors, scenarios, and processes.

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.

IEC SRD 62913-1:2019¹, *Generic smart grid requirements – Part 1: Specific application of the Use Case methodology for defining generic smart grid requirements according to the IEC systems approach*

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:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1

aggregator

party who contracts with a number of other network users (e.g. energy consumers) in order to combine the effect of smaller loads or distributed energy resources for actions such as demand response or ancillary services

[SOURCE: IEC 60050-617:2017, 617-02-18]

3.2

controllable load

CL

load of particular consumers which under contract shall be reduced, for a limited period of time, at the request of the distribution supply undertaking

Note 1 to entry: Controllable load can be increased as well as reduced, according to the request of the distribution supply undertaking.

¹ This publication was withdrawn.