DIN EN IEC 61850-7-420

DIN

ICS 33.040.40

Einsprüche bis 2019-07-10
Vorgesehen als Ersatz für
DIN EN 61850-7-420:2009-10

Entwurf

Kommunikationsnetze und -systeme für die Automatisierung in der elektrischen Energieversorgung – Teil 7-420: Grundlegende Kommunikationsstruktur – Verteilte Energieerzeuger und logische Knoten der Verteilungsautomation (IEC 57/1997/CD:2018); Text Englisch

Communication networks and systems for power utility automation –
Part 7-420: Basic communication structure –
Distributed energy resources and distribution automation logical nodes
(IEC 57/1997/CD:2018);
Text in English

Anwendungswarnvermerk

Dieser Norm-Entwurf mit Erscheinungsdatum 2019-05-10 wird der Öffentlichkeit zur Prüfung und Stellungnahme vorgelegt.

Weil die beabsichtigte Norm von der vorliegenden Fassung abweichen kann, ist die Anwendung dieses Entwurfs besonders zu vereinbaren.

Stellungnahmen werden erbeten

- vorzugsweise online im Norm-Entwurfs-Portal von DIN unter www.din.de/go/entwuerfe bzw. für Norm-Entwürfe der DKE auch im Norm-Entwurfs-Portal der DKE unter www.entwuerfe.normenbibliothek.de, sofern dort wiedergegeben;
- oder als Datei per E-Mail an dke@vde.com möglichst in Form einer Tabelle. Die Vorlage dieser Tabelle kann im Internet unter www.din.de/go/stellungnahmen-norm-entwuerfe oder für Stellungnahmen zu Norm-Entwürfen der DKE unter www.dke.de/stellungnahme abgerufen werden;
- oder in Papierform an die DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik in DIN und VDE, Stresemannallee 15, 60596 Frankfurt am Main.

Die Empfänger dieses Norm-Entwurfs werden gebeten, mit ihren Kommentaren jegliche relevanten Patentrechte, die sie kennen, mitzuteilen und unterstützende Dokumentationen zur Verfügung zu stellen.

Gesamtumfang 378 Seiten

DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik in DIN und VDE

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Nationales Vorwort

Das internationale Dokument IEC 57/1997/CD:2018 „Communication networks and systems for power utility automation – Part 7-420: Basic communication structure – Distributed energy resources and distribution automation logical nodes“ (CD, en: Committee Draft) ist unverändert in diesen Norm-Entwurf übernommen worden.

Das internationale Dokument wurde vom TC 57 „Power systems management and associated information exchange“ der Internationalen Elektrotechnischen Kommission (IEC) erarbeitet und den nationalen Komitees zur Stellungnahme vorgelegt.

Die Internationale Elektrotechnische Kommission (IEC) und das Europäische Komitee für Elektrotechnische Normung (CENELEC) haben vereinbart, dass ein auf IEC-Ebene erarbeiteter Entwurf für eine Internationale Norm zeitgleich (parallel) bei IEC und CENELEC zur Umfrage (CDV-Stadium) und Abstimmung als FDIS (en: Final Draft International Standard) bzw. Schluss-Entwurf für eine Europäische Norm gestellt wird, um eine Beschleunigung und Straffung der Normungsarbeit zu erreichen. Dokumente, die bei CENELEC als Europäische Norm angenommen und ratifiziert werden, sind unverändert als Deutsche Normen zu übernehmen.

Da der Abstimmungszeitraum für einen FDIS bzw. Schluss-Entwurf FprEN nur 6 Wochen beträgt, und dann keine sachlichen Stellungnahmen mehr abgegeben werden können, sondern nur noch eine „JA/NEIN“-Entscheidung möglich ist, wobei eine „NEIN“-Entscheidung fundiert begründet werden muss, wird bereits der CD als DIN-Norm-Entwurf veröffentlicht, um die Stellungnahmen aus der Öffentlichkeit frühzeitig berücksichtigen zu können.

Für dieses Dokument ist das nationale Arbeitsgremium K 952 „Netzleittechnik“ der DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik in DIN und VDE (www.dke.de) zuständig.

Für den Fall einer undatierten Verweisung im normativen Text (Verweisung auf ein Dokument ohne Angabe des Ausgabedatums und ohne Hinweis auf eine Abschnittsnummer, eine Tabelle, ein Bild usw.) bezieht sich die Verweisung auf die jeweils aktuellste Ausgabe des in Bezug genommenen Dokuments.

Für den Fall einer datierten Verweisung im normativen Text bezieht sich die Verweisung immer auf die in Bezug genommene Ausgabe des Dokuments.

Der Zusammenhang der zitierten Dokumente mit den entsprechenden deutschen Dokumenten ergibt sich, soweit ein Zusammenhang besteht, grundsätzlich über die Nummer der entsprechenden IEC-Publikation. Beispiel: IEC 60068 ist als EN 60068 als Europäische Norm durch CENELEC übernommen und als DIN EN 60068 ins Deutsche Normenwerk aufgenommen.

Das Präsidium des DIN hat mit Präsidialbeschluss 1/2004 festgelegt, dass DIN-Normen, deren Inhalt sich auf internationale Arbeitsergebnisse der Informationsverarbeitung gründet, unter bestimmten Bedingungen allein in englischer Sprache veröffentlicht werden dürfen. Diese Bedingungen sind für den vorliegenden Norm-Entwurf erfüllt.

Da sich die Benutzer des vorliegenden Norm-Entwurfs der englischen Sprache als Fachsprache bedienen, wird der englische Text der IEC 57/1997/CD:2018 veröffentlicht. Zu deren Abschnitt 1, der den Anwendungsbereich festlegt, und Abschnitt 3, der die Begriffe festlegt, wurde eine Übersetzung angefertigt und als informativer Nationaler Anhang NA des vorliegenden Norm-Entwurfs hinzugefügt. Für einige der verwendeten Begriffe existieren keine gebräuchlichen deutschen Benennungen, da sich die deutschen Anwender in der Regel ebenfalls der englischen Benennungen bedienen. Dieser Norm-Entwurf steht nicht in unmittelbarem Zusammenhang mit Rechtsvorschriften und ist nicht als Sicherheitsnorm anzusehen.

Es ist vorgesehen, auch bei der entsprechenden zukünftigen Deutschen Norm auf die deutsche Sprachfassung zu verzichten und diese in der englischsprachigen Fassung zu veröffentlichen.

Es wird auf die Möglichkeit hingewiesen, dass einige Elemente dieses Dokuments Patentrechte berühren können. IEC ist nicht dafür verantwortlich, einige oder alle diesbezüglichen Patentrechte zu identifizieren.

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Das Original-Dokument enthält Bilder und Tabellen in Farbe, die in der Papierversion in einer Graustufen-Darstellung wiedergegeben werden. Elektronische Versionen dieses Dokuments enthalten die Bilder und die Tabellen in der originalen Farbdarstellung.

Änderungen

Gegenüber DIN EN 61850-7-420:2009-10 wurden folgende Änderungen vorgenommen:

a) Diese Edition 2 enthält zusätzliche operative Funktionen für viele Netzcodes, die kürzlich als obligatorisch oder notwendig für bestimmte Vorgänge identifiziert wurden. Infolgedessen wurden viele Löschungen und Änderungen an den in Edition 1 vorhandenen LNs vorgenommen, da die Änderung der Definition von Betriebsfunktionen viele strukturelle Änderungen am Modell zur Folge hatte. Es wird auch erwartet, dass zusätzliche operative Funktionen hinzugefügt werden, da diese identifiziert und besser definiert sind;

b) Eine weitere Änderung ist die Notwendigkeit, verschiedene Arten von DERs aufzunehmen, insbesondere Speicher-DERs (derzeit modelliert in IEC 61850-90-9) und schließlich steuerbare Lasten, die als DERs fungieren können;

c) Darüber hinaus mussten die Modelle für DERs verschiedene Modellierungskonzepte erweitern, da DERs typischerweise sehr komplexe Systeme sind, die oft lokal von Power-Management-Systemen aggregiert und gesteuert werden. Diese neuen Konzepte werden in Abschnitt 4.2 näher erläutert;

d) Infolgedessen wurden die logischen Knoten, die mit DER-Anlagen und anderen höherwertigen DER-Strukturen verbunden sind, signifikant verändert. Die logischen Knoten, die einzelnen Typen von DERs zugeordnet sind, wie Kolbenmotoren, Photovoltaiksysteme, Brennstoffzellen und Kraft-Wärme-Kopplung, wurden jedoch nicht wesentlich verändert;

e) Die deutsche Fassung wurde in Abschnitt 3 an die aktuellen Standardtexte angepasst.

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Nationaler Anhang NA
(informativ)

Auszugsweise Übersetzung

Reihenfolge und Inhalt der folgenden Abschnitte sind identisch mit denen in den jeweiligen Abschnitten der Englischen Fassung.

1 Anwendungsbereich

1.1 Allgemeines

Diese Internationale Norm legt die Informationsmodelle nach IEC 61850 für den Austausch von Informationen mit dezentralen Energieversorgungs- (DER) und Verteilungsautomatisierungssystemen (DA) fest. DER-Systeme umfassen verteilungsbezogene Erzeugungssysteme, Energiespeichersysteme sowie Anlagen-DER-Managementsysteme einschließlich aggregierter DER wie etwa Anlagensteuerungssysteme, DER-Energiemanagementsysteme für Anlagen (EMS), Gebäude-EMS, Bereichs-EMS, Gemeinschafts-EMS, Mikronetz-EMS usw. DA-Anlagen umfassen Anlagen zur Steuerung von Verteilungsstromkreisen einschließlich automatischer Schalter, Fehleranzeigesysteme, Kondensatorbatterien, Spannungsregler und anderer Strommanagementsysteme.

Die DER-Informationsmodell-Norm IEC 61850 nutzt nach Möglichkeit die logischen Knoten nach IEC 61850-7-4 und legt gleichzeitig die DER- und DA-spezifischen logischen Knoten fest, um die notwendigen Datenobjekte für die DER- und DA-Funktionen zu liefern.

1.2 Namensraum-Informationen

Diese neue Version des Namensraums ist durch die folgenden Parameter gekennzeichnet:

- UML-Modelldatei, die diese Namensraum-Version wiedergibt: wg10uml02v20draft19-wg18uml02v11b-wg17uml02v21-jwg25uml02v04c-tc17umlv0-tc38umlv0.eap, UML-Modellversion WG10UML02v20draft19
- Namensraum-ID: IEC 61850-7-420
- Namensraum-Version: 2018
- Namensraum-Revision: A
- Namensraum-Veröffentlichung: 3
- Namensraum-Veröffentlichungsdatum: 07.05.2018
- Namensraum-Veröffentlichungsphase: CD2
- Namensraum-Ausgaben: 642-646, 648, 651, 654, 666, 701, 703, 704, 888-889, 903-907, 916, 917, 921-923, 945-947, 955-960, 975-976, 978-989, 992-995, 999-1001, 1003-1006, 1008-1024, 1027-1028, 1031-1033, 1035, 1073-1074, 1087-1090, 1094-1115, 1124, 1126, 1132, 1134, 1153, 1158, 1182, 1183, 1206, 1210, 1215-1219, 1225, 1314, 1320, 1323, 1366, 1392-1394, 1414
- Seit dem Datum angewendete Namensraumausgaben:

1.3 Versionsangaben

Datum:	12 März 2019
Dokumentenversion:	Ed 2.0, v01
Lizenzbedingungsversion:	v0

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1.4 Code-Elemente

Diese IEC-Norm enthält Code-Elemente, d. h. Elemente, die für die direkte Verarbeitung durch einen Computer vorgesehen sind. Dieser Inhalt ist jeder Text zwischen den Markierern <CODE BEGINS> und <CODE ENDS> oder jeder Inhalt, der in dieser Norm eindeutig als Code-Element gekennzeichnet ist.

Mit dem Erwerb dieser IEC-Norm ist eine Urheberrechtslizenz verbunden, die es dem Käufer erlaubt, Software, die Code-Elemente aus dieser Norm enthält, direkt oder über Vertriebshändler an Endnutzer zu verkaufen und vorbehaltlich der IEC-Softwarelizenzbedingungen, die verfügbar sind unter: http://iec.ch:

Die in dieser IEC-Norm enthaltenen Code-Elemente sind darüber hinaus als maschinenlesbare Datei unter: www.iec.ch/public/{IECCommitteeName}/{CodeComponentZIPFullName} {Tatsächliche URL steht noch nicht fest} verfügbar.

Code-Elemente sind in diesem Dokument in den Tabellen in den Abschnitten 6, 7, 8, 9 und 10 enthalten. Eine separate Datei wird die elektronischen Versionen dieser Code-Elemente enthalten.

1.5 Änderungen gegenüber Edition 1 von IEC 61850-7-420

In dieser Edition 2 wurden Betriebsfunktionen für viele Netzcodes hinzugefügt, die vor Kurzem als verbindlich oder für bestimmte Operationen erforderlich identifiziert wurden. Aus diesem Grund wurden zahlreiche Löschungen und Änderungen der LN in Edition 1 vorgenommen, da die Änderung der Festlegung der Betriebsfunktion zu vielen strukturelle Änderungen des Modells geführt hat. Darüber hinaus wird erwartet, dass weitere Betriebsfunktionen hinzugefügt werden, sobald diese identifiziert und besser festgelegt sind.

Eine weitere Änderung besteht in dem Erfordernis, verschiedene Arten von DER in bestimmte Speicher-DER (derzeit als Modell in IEC 61850-90-9) sowie gegebenenfalls steuerbare Lasten, die als DER fungieren können, einzubinden.

Darüber hinaus sind die erforderlichen Modelle für DER enthalten, um die verschiedenen Modellkonzepte zu erweitern, da DER typischerweise sehr komplexe Systeme sind, die oftmals aggregiert und lokal durch Energiemanagementsysteme gesteuert werden. Diese neuen Konzepte werden ausführlicher in 4.2 behandelt.

Aus diesem Grund wurden die mit DER-Anlagen und anderen übergeordneten DER-Strukturen verbundenen logischen Knoten erheblich verändert. Die mit einzelnen Arten von DER wie etwa Kolbenmotoren, photovoltaischen Betriebsanlagen, Brennstoffzellen und Kraft-Wärme-Kopplung verbundenen logischen Knoten wurden nicht wesentlich verändert.

1.6 IEC 61850-7-420 im Vergleich zu IEC 61850-7-520

Abschnitt 4 behandelt die erforderlichen Konzepte und Konstrukte für das DER-Management, die benötigt werden, um die Struktur und die Verfahren der Informationsmodelle nach IEC 61850 zu verstehen. Das Begleitdokument IEC 61850-7-520 wird als die Edition 2 aktualisiert und zusätzliche Informationen wie etwa Anwendungsfälle, Systemkonfigurations-Sprachkonstrukte für DER-Verfahren zur Implementierung logischer Geräte, die Entwicklung von Profilen und andere unterstützende Implementierungsinformationen enthalten.

3 Begriffe [N1]

3.1 Allgemeines

Für die Anwendung dieses Dokuments gelten die Begriffe nach IEC 61850-2, IEC 61850-7-2 und IEC 61850-7-520 und die folgenden Begriffe.

[N1] Nationale Fußnote: In IEC-Schriftstück wird der Abschnitt fälschlicherweise „Begriffe“ genannt. Dieser muss „Begriffe und Abkürzungen“ lauten. Änderung ist bei IEC beantragt.

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Die Festlegung in Verbindung mit elektrischen Energiespeichersystemen wird mit dem IEC TC120-Dokument[1] abgestimmt.

3.2 Begriffe

3.2.1
Umgebungstemperatur
(en: ambient temperature)
Temperatur des Mediums in unmittelbarer Nähe eines Geräts

[QUELLE: IEC/TS 62257-8-1:2007, Definition 3.15 geändert]

3.2.2
Bereichsstromversorgungssystem
(en: area electric power system)
(EPS)
ein EPS, das lokale EPS versorgt

[QUELLE: IEEE 1547:2018]

3.2.3
Einstellung der Stromversorgung:
(en cease to energize)
die Einstellung der Lieferung der Wirkleistung im Beharrungszustand und unter transienten Bedingungen, und Beschränkung des Blindleistungsaustauschs

Anmerkung 1 zum Begriff: Dies kann zu einer vorübergehenden Einstellung oder einem Leistungseinbruch führen.

Anmerkung 2 zum Begriff: Eine Abschaltung, Isolierung oder ein Leistungseinbruch wird hierdurch nicht notwendigerweise impliziert oder ausgeschlossen.

Anmerkung 3 zum Begriff: Der begrenzte Blindleistungsaustausch kann gegebenenfalls anhalten, z. B. durch Filterbänke.

Anmerkung 4 zum Begriff: Energiespeichersysteme dürfen weiterhin laden, müssen die Ladeaktivität jedoch einstellen, sobald der maximale Ladezustand (maximale gespeicherte Energie) erreicht wurde.

[QUELLE: IEEE 1547:2018]

3.2.4
Kraft-Wärme-Kopplung
(en combined heat and power (CHP) co-generation)
(KWK)
die Erzeugung von Wärme, die für nicht-elektrische Zwecke und zur Erzeugung elektrischer Energie genutzt wird

[QUELLE: IEV 602-01-24, modifiziert]

Anmerkung 1 zum Begriff: Konventionelle Kraftwerke emittieren die produzierte Wärme als nutzloses Nebenprodukt der Stromerzeugung in die Umwelt. Bei der Kraft-Wärme-Kopplung wird die überschüssige Wärme für Haushalts- oder industrielle Heizzwecke erfasst oder – in Form von Dampf – zum Betrieb einer Dampfturbine in Verbindung mit einem Klimagerätkompressor genutzt. Alternativ kann die Produktion von Wärme der Hauptzweck der Kraft-Wärme-Kopplung sein. In diesem Fall wird die überschüssige Wärme zur Stromerzeugung genutzt.

[1] In Bearbeitung

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3.2.5
Common Data Class
(en comon data class)
CDC
in IEC 61850-7-3 festgelegte Klassen häufig verwendeter Datenstrukturen

3.2.6
Element
(en: component)
eine Instanz einer festgelegten LN-Klasse

3.2.7
veraltetes Element
(en: deprecated element)
ein als veraltet markiertes Element wird in dieser Edition der Norm zu Zwecken der Abwärtskompatibilität beibehalten, soll aber in Zukunft auslaufen Ein per Festlegung veraltetes Element gibt an, was ersatzweise verwendet werden sollte

3.2.8
Gerät
(en: device)
ein materielles Element oder eine Baugruppe solche Elemente, das/die eine erforderliche Funktion ausüben soll(en)

[QUELLE: IEV 151-11-20]

Anmerkung 1 zum Begriff: Ein Gerät kann Teil eines größeren Geräts sein.

3.2.9
dezentrale Energieversorgung
(en: Distributed Energy Resource)
DER
die Erzeugung, Speicherung und steuerbare auf Nieder- oder Mittelspannungs-Verteilungsebene angeschlossene Last

Anmerkung 1 zum Begriff: Die DER kann die damit verbundenen Schutz-, Steuerungs- und Überwachungskapazitäten beinhalten und aus aggregierten DER-Einheiten bestehen.

Anmerkung 2 zum Begriff: DER können mit den Bereichs- und/oder lokalen Energieversorgungssystemen (EPS) interagieren, indem sie Energie durch die EPS liefern, ihr Verhalten auf der Grundlage der EPS-Bedingungen anpassen und/oder andere EPS-bezogene Dienste zu regulatorischen, vertraglichen oder Marktzwecken liefern.

3.2.10
dezentrale Energieversorgungs (DER)-Einheit – DER-Einheit
(en: distributed energy resource (DER) unit – DER unit)
DER-Einheit
ein individuelles DER-Gerät in einer Gruppe von DER, die gemeinsam ein System bilden

[QUELLE: IEEE 1547:2018]

3.2.11
dezentrales Energieversorgungs (DER)-System – DER-System
(en: distributed energy resource (DER) system – DER system)
DER-System
eine Sammlung von DER-Einheiten

[QUELLE: IEEE 1547:2018]

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3.2.12
elektrischer Anschlusspunkt
(en: electrical connection point)
(ECP)
der Punkt der elektrischen Verbindung zwischen der DER-Energiequelle (Erzeugung oder Speicherung) und jedem Stromsystem (EPS)

Jede DER-Einheit (Erzeugung oder Speicherung) verfügt über einen ECP, der diese mit lokalen Stromsystemen verbindet. Gruppen von DER-Einheiten haben einen ECP, der diese mit dem Stromsystem an einem bestimmten Standort oder einer bestimmten Anlage verbindet; eine Gruppe von DER-Einheiten hat einen ECP, der sie mit dem Stromversorgungssystem verbindet.

Anmerkung 1 zum Begriff: Für die ECP zwischen einem Stromversorgungs-EPS und einem Anlagen- oder Standort-EPS ist dieser Punkt identisch mit dem Verknüpfungspunkt (en: point of common coupling / PCC) in IEEE 1547 “Standard für den Netzanschluss verteilter Erzeugungsanlagen mit dem Elektrizitätsversorgungsnetz”.

3.2.13
Stromsystem
(en: electric power system)
(EPS)
Anlagen, die elektrischen Strom an eine Last liefern

[QUELLE: IEEE 1547:2018]

Ereignis
Ereignismeldung

a) etwas, das zu einem bestimmten Zeitpunkt stattfindet [QUELLE: IEV 111-16-04];

b) überwachte Informationen über die Änderung des Zustands eines Betriebsgeräts [QUELLE: IEV 371-02-04]

Anmerkung 1 zum Begriff: Im Stromsystembetrieb besteht ein Ereignis üblicherweise aus Statusinformationen und/oder Statusübergängen (Status, Alarm oder Befehl), die den Zustand des Stromsystems wiedergeben.

3.2.14
Brennstoffzelle
(en: fuel cell)
a) ein Stromerzeuger, der chemische Energie direkt durch Ionisation und Oxidation des Brennstoffs verwendet [QUELLE: IEV 602-01-33];

b) eine Zelle, die chemische Energie aus dauerhaft zugeführten Reaktionsmitteln durch einen elektrochemischen Prozess in elektrische Energie umwandeln kann [QUELLE: IEV 482-01-05]

3.2.15
Brennstoffzellenstack
(en: fuel cell stack)
in Reihe verbundene einzelne Brennstoffzellen

Anmerkung 1 zum Begriff: Brennstoffzellen werden zu Stacks zusammengeschlossen, um die Spannung zu erhöhen.

[QUELLE: US DOE]

3.2.16
Funktion
(en: function)
eine Computer-Subroutine; genauer: eine Subroutine, die eine Berechnung mit von einem Programm gelieferten Variablen durchführt und einem Programm ein einzelnes Ergebnis liefert

[QUELLE: Merriam-Webster Dictionary]

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Anmerkung 1 zum Begriff: Dieser Begriff ist sehr allgemein und kann oftmals für verschiedene Konzepte in unterschiedlichen Zusammenhängen verwendet werden. Im Zusammenhang mit computerbasierten Technologien wird der Begriff jedoch zur Beschreibung von Software- oder Computerhardware-Aufgaben verwendet werden.

3.2.17
Generator
(en: generator)

a) ein Energiewandler, der nicht-elektrische Energie in elektrische Energie umwandelt [QUELLE: IEV 151-13-35];

b) ein Gerät, das kinetische Energie in elektrische Energie umwandelt, im Allgemeinen durch elektromagnetische Induktion

Die umgekehrte Umwandlung elektrischer Energie in mechanische Energie erfolgt durch einen Elektromotor. Motoren und Generatoren haben viele Gemeinsamkeiten. Die Hauptbewegungsquelle für mechanische Energie kann ein Kolbenmotor oder eine Dampfturbine, Wasser, das durch eine Wasserkraftturbine oder ein Wasserrad fällt, ein Verbrennungsmotor, eine Windturbine, eine Handkurbel oder jede andere Quelle mechanischer Energie sein. [QUELLE: WIKI 2007-12]

3.2.18
Information
(en: information)

a) Informationen oder Kenntnisse, die in für die Kommunikation, Speicherung oder Verarbeitung geeigneten Formen dargestellt werden können [QUELLE: IEV 701-01-01];

b) Kenntnisse in Bezug auf Objekte wie etwa Fakten, Ereignisse, Gegenstände, Prozesse oder Ideen einschließlich Konzepte, die eine Bedeutung in einem bestimmten Zusammenhang haben [QUELLE: ISO/IEC 2382-1, Definition 01.01.01]

Anmerkung 1 zum Begriff: Informationen können beispielsweise durch Schilder, Symbole, Bilder oder akustisch dargestellt werden.

3.2.19
Informationsaustausch
(en: information exchange)
Kommunikationsprozess zwischen zwei oder mehr computerbasierten Systemen, um Informationen zu übertragen und zu empfangen

Anmerkung 1 zum Begriff: Der Austausch von Informationen zwischen Systemen erfordert interoperable Kommunikationsdienste.

3.2.20
Sonneneinstrahlung
(en: insolation)
empfangene Sonnenstrahlung

[QUELLE: Merriam-Webster Dictionary]

3.2.21
Wechselrichter
(en: inverter)

a) statischer Stromrichter (en: static power converter / SPC);

b) Gerät, das Gleichstrom in Wechselstrom umwandelt, System, das Gleichstrom aus Array-Feldern in Wechselstrom umwandelt, das zur Umwandlung von Strom in für die anschließende Nutzung durch den Energieversorger geeigneten Strom verwendet wird

[QUELLE: IEC 61727:2004, Definition 3.8]

Anmerkung 1 zum Begriff: Jeder statische Stromrichter mit Steuerungs-, Schutz- und Filterfunktionen, der zur Verbindung einer elektrischen Energiequelle mit einem Versorgungssystem verwendet wird. Manchmal auch bezeichnet als Stromrichter-Teilsystem, Umrichtersystem, Festkörper-Umrichter oder Stromrichtereinheit.

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3.2.22
Bestrahlungsstärke
(en: irradiance)
Dichte der auf eine gegebene Oberfläche auftreffenden Strahlung, üblicherweise angegeben als Watt je Quadratzentimeter oder Quadratmeter

[QUELLE: Merriam-Webster Dictionary]

Anmerkung 1 zum Begriff: "Bestrahlungsstärke" wird verwendet, wenn elektromagnetische Strahlung auf die Oberfläche auftrifft. "Spezifische Ausstrahlung" oder "Abstrahlung" wird verwendet, wenn die Strahlung von der Oberfläche austritt. Die SI-Größen für all diese Mengen sind Watt je Quadratmeter ($W \cdot m^{-2}$), während die CGS-Einheiten ERGS pro Quadratzentimeter je Sekunde sind ($erg \cdot cm^{-2} \cdot s^{-1}$, oftmals in der Astronomie verwendet). Diese Größen werden manchmal auch als Stärke bezeichnet, doch diese Verwendung führt zu Verwechslungen mit der Strahlungsstärke, für die andere Einheiten gelten.

3.2.23
lokales Stromversorgungssystem
(en: local electric power system)
(local EPS)
ein in einem einzelnen Raum oder eine Gruppe von Räumen enthaltenes EPS

[QUELLE: IEEE 1547:2018]

3.2.24
Messwert
(en: measured value)
physikalische oder elektrische Größe, Eigenschaft oder Bedingungen, die zu messen ist

[QUELLE: IEC 61850-7-4]

Anmerkung 1 zum Begriff: Messwerte werden üblicherweise überwacht, dürfen aber auch aus anderen Werten berechnet werden. Messwerte gelten darüber hinaus üblicherweise als analoge Werte.

Anmerkung 2 zum Begriff: Das Ergebnis der Messung einer analogen Größenordnung oder einer bestimmten Größe.

3.2.25
Membran
(en: membrane**)**
trennende Schicht in einer Brennstoffzelle, die als Elektrolyt dient (ein Ionentauscher) sowie als Barrierefilm, der die Gase in den Anoden- und Kathodenkammern der Brennstoffzelle trennt

[QUELLE: US DOE]

3.2.26
überwachen
(en: monitor)
die regelmäßige Prüfung ausgewählter Werte im Hinblick auf ihre Übereinstimmung mit festgelegten Werten, Wertebereichen oder Schaltzuständen

[QUELLE: IEV 351-22-03]

3.2.27
photovoltaische Zelle
(en: photovoltaic cell)
Gerät, in dem der photovoltaische Effekt genutzt wird

[QUELLE: IEV 521-04-34]

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3.2.28
photovoltaisches System
(en: photovoltaic system)

a) ein vollständiger Satz von Bauteilen, die Sonnenlicht durch den photovoltaischen Prozess in Strom umwandeln, einschließlich der Array- und der Systemperipherie-Bauteile [QUELLE: US DOE];

b) ein System umfasst alle Umrichter (einen oder mehrere) und damit verbundene BOS (Systemperipherie-Bauteile (en: balance-of-system components) wie in IEC 61836 beschrieben als Photovoltaik-Erzeugungsanlage [QUELLE: IEC 61727:2004, Definition 3.7]

Anmerkung 1 zum Begriff: Die Bauteilliste und die Systemkonfiguration eines photovoltaischen Systems variieren je nach Anwendung und können außerdem die folgenden Teilsysteme enthalten: Stromaufbereitung, Energiespeicherung, Systemüberwachung und -steuerung sowie Schnittstelle zum öffentlichen Versorgungsnetz.

3.2.29
Photovoltaik
(en: photovoltaics)
PV
in Verbindung mit oder Nutzung der Erzeugung einer Spannung, wenn Strahlungsenergie auf die Grenze zwischen unterschiedlichen Substanzen (als zwei verschiedene Halbleiter) auftrifft

[QUELLE: Merriam-Webster Dictionary]

3.2.30
PCC – Verknüpfungspunkt
(en: Point of Common Coupling)
Punkt in einem Stromsystem, der elektrisch einer bestimmten Last oder einem Generator am nächsten gelegen ist, an dem andere Lasten oder Generatoren angeschlossen sind oder sein können

Anmerkung 1 zum Begriff: Diese Lasten können Geräte, Ausrüstungen oder Systeme oder Anlagen eines bestimmten Netznutzers sein.

Anmerkung 2 zum Begriff: Der Punkt, an dem das lokale EPS mit einem Bereichs-EPS verbunden ist [IEEE 1547]. Das lokale EPS kann dezentrale Energieversorgung beinhalten.

[QUELLE: IEV 614-01-12 - modifiziert]

3.2.31
Leistungsumrichten
(en: power conversion)
das Leistungsumrichten ist der Prozess der Umwandlung von Leistung von einer Form in eine andere Form

Dies können elektromechanische oder elektrochemische Prozesse sein

In der Elektrotechnik hat das Leistungsumrichten eine spezifischere Bedeutung, nämlich die Umwandlung von Strom von einer Form in eine andere Form. Dies kann ganz einfach ein Transformator sein, der Wechselstromspannung umwandelt, aber auch weitaus komplexere Systeme umfassen. Der Begriff kann sich darüber hinaus auf eine Klasse elektrischer Maschinen beziehen, die verwendet werden, um eine Stromfrequenz in eine andere Frequenz umzuwandeln

Eine Möglichkeit, Leistungsumrichtersysteme zu klassifizieren, richtet sich danach, ob der Eingang und Ausgang Wechselstrom (AC) oder Gleichstrom (DC) sind, daher gilt:

DC zu DC

– DC-zu-DC-Umrichter
– Spannungsregler
– Linearregler

AC zu DC

– Gleichrichter
– Netzstromversorgungseinheit (PSU)

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– Schaltnetzteil

DC zu AC

– Wechselrichter

AC zu AC

– Transformator/Autotransformator
– Spannungsregler

[QUELLE: WIKI 2007-12]

3.2.32
Antriebsmaschine
(en: prime mover)
Gerät, das als Energiequelle für die Erzeugung elektrischer Energie dient

Anmerkung 1 zum Begriff: Beispiele hierfür sind Dieselmotoren, Solarzellen, Gasturbinen, Windturbinen, Wasserkraftturbinen, Batteriespeicher, Wasserspeicher, Luftspeicher usw.

3.2.33
PV-Anlage
(en: PV array)
a) eine mechanisch integrierte Baugruppe aus Modulen oder Zellen und einer tragenden Struktur, die eine gleichstromerzeugende Einheit bilden.

   Eine Anlage umfasst nicht die Fundamente, Nachverfolgungssysteme, die Wärmesteuerung oder ähnliche Bauteile;

b) eine mechanisch und elektrisch integrierte Baugruppe aus PV-Modulen und anderen notwendigen Bauteilen, die eine gleichstromversorgende Einheit bildet [QUELLE: IEC 60364-7-712:2002, Definition 712.3.4]

Anmerkung 1 zum Begriff: Eine Anlage kann aus einem einzelnen PV-Modul, einem einzelnen PV-Strang oder mehreren parallel geschalteten Strängen oder mehreren parallel geschalteten PV-Teilanlagen und den damit verbundenen elektrischen Bauteilen bestehen. Für die Zwecke dieser Norm gilt die Ausgangsseite der Trenneinrichtung der PV-Anlage als ihre Grenze. Zwei oder mehr PV-Anlagen, die nicht parallel auf der Erzeugerseite der Stromrichtereinheit miteinander verbunden sind, sind als unabhängige PV-Anlagen zu betrachten.

3.2.34
PV-Modul
(en: PV module)
die kleinste vollständig von der Umgebung abgeschirmte Baugruppe miteinander verbundener Zellen

[QUELLE: IEC/TS 62257-7-1:2006, Definition 3.34]

Anmerkung 1 zum Begriff: Umgangssprachlich auch als "Solarmodul" bezeichnet.

3.2.35
PV-Strang
(en: PV string)
ein Netzwerk aus in Reihe geschalteten Modulen

[QUELLE: IEC/TS 62257-7-1:2006, Definition 3.36]

3.2.36
Kolbenmotor
Hubkolbenmotor
(en: reciprocating engine
piston engine)
ein Motor, in dem die Vorwärts- und Rückwärtsbewegung eines Kolbens oder mehrerer Kolben in die Drehbewegung einer Welle umgewandelt wird

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[QUELLE: Merriam-Webster Dictionary]

Anmerkung 1 zum Begriff: Die häufigste Form des Kolbenmotors ist der Verbrennungsmotor, der mit Benzin, Dieselkraftstoff, Öl oder Erdgas betrieben wird, um Druck zu erzeugen. In DER-Systemen ist die häufigste Form der Dieselmotor.

Reformat
(en: reformate)
Kohlenwasserstoff-Brennstoff, der zu Wasserstoff und anderen Produkten zur Anwendung in Brennstoffzellen verarbeitet wurde

[QUELLE: US DOE]

3.2.37
Sollwert
(en: set point)
Bereich oder Punkt, an dem sich ein variabler physiologischer Zustand (wie etwa die Körpertemperatur oder das Gewicht) tendenziell stabilisiert

[QUELLE: Merriam-Webster Dictionary]

3.2.38
Sollwertstellbefehl
(en: set point command)
Befehl, in dem der Wert für den erforderlichen Zustand des Betriebsmittels an eine gesteuerte Station übertragen und dort gespeichert wird

[QUELLE: IEV 371-03-11]

Anmerkung 1 zum Begriff: Ein Sollwert ist üblicherweise eine analoger Wert, der ein kontrollierbares Ziel für einen Prozess oder Grenzen oder andere Parameter für die Beherrschung des Prozesses vorgibt.

3.2.39
Standardprüfbedingungen
(en: standard test conditions)
STC
ein Standardsatz von Referenzbedingungen, der für die Prüfung und Bewertung von photovoltaischen Zellen und Modulen verwendet wird

Die Standardprüfbedingungen sind:

a) Temperatur der PV-Zelle von 25 °C;

b) Bestrahlungsstärke in der Ebene der PV-Zelle oder des Moduls von 1 000 W/m^2;

c) Lichtspektrum entsprechend einer atmosphärischen Luftmasse von 1,5.

[QUELLE: IEC/TS 62257-7-1:2006, Definition 3.46]

3.2.40
Turbine
(en: turbine)
Maschine zur Erzeugung mechanischer Drehenergie aus der Energie in einem Flüssigkeitsstrom

Die ursprünglich in Form von Druckhöhen- oder Druckenergie vorhandene Energie wird durch Leitung durch ein System aus stationären und beweglichen Turbinenschaufeln in Bewegungsenergie umgewandelt.

[QUELLE: US DOE]

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UML from wg10uml02v20draft19-wg18uml02v11b-wg17uml02v21-jwg25uml02v04c-tc17umlv0-tc38umlv0.eap

Document history

Name of intervening person	Document received		Brief description of the changes introduced	Document sent	
	From	Date		To	Date
L. Guise		2016-11-22		7-420 TF	
F. Cleveland		2018-01-10	Adding Grid Codes and updating DER characteristics and capabilities	7-420 TF	
L. Guise		2018-03-14	Updating high level models	WG 17	
F. Cleveland		2018-03-17	Making some detailed corrections on DOs	7-420 TF	
L. Guise		2018-03-26	Added a new section dealing with spreading information between the different DER model components (5.5), plus other additional info on how operational functions may as well use ECP reference Many model errors detected by jCleanCIM fixed. Abbreviations list completed	7-420 TF	
L. Guise		2018-04-10	Some fine-tuning, and also starting addressing some comments brought by Germany.	7-420 TF	
F. Cleveland		2018-04-22	Editorial updates Updates to add definitions, use of direct commands versus operational functions, and separation of Gen, Sto, Lod, and DER	7-420 TF	
L. Guise		2018-05-09	Final model check (abbreviations, captions, titles, ..) and minor fixes		

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COMMUNICATION NETWORKS AND SYSTEMS FOR POWER UTILITY AUTOMATION –

Part 7-420: Basic communication structure – Distributed energy resources and distribution automation logical nodes

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INTRODUCTION

Increasing numbers of DER (distributed energy resources) systems are being interconnected to electric power systems throughout the world. As DER technology evolves and as the impact of dispersed generation on distribution power systems becomes a growing challenge – and opportunity – nations worldwide are recognizing the economic, social, and environmental benefits of integrating DER technology within their electric infrastructure.

The manufacturers of DER devices are facing the age-old issues of what communication standards and protocols to provide to their customers for monitoring and controlling DER devices, in particular when they are interconnected with the electric power system. In the past, DER manufacturers developed their own proprietary communication technology. However, as distribution system operators (DSOs), aggregators, and other energy service providers start to manage DER devices which are interconnected with the power system, they are finding that coping with these different communication technologies present major technical difficulties, implementation costs, and maintenance costs. Therefore, DSOs and DER manufacturers recognize the growing need to have one international standard that defines the communication and control interfaces for all DER devices. Such standards, along with associated guidelines and uniform procedures would simplify implementation, reduce installation costs, reduce maintenance costs, and improve reliability of power system operations.

The information concepts discussed in this document are focused on DER systems, but may also be applicable to central-station generation installations that are comprised of groupings of multiple units of the same types of energy conversion systems that are covered in this document. This applicability to central-station generation is strongest for photovoltaics and fuel cells, due to their modular nature.

Communications for DER plants involve not only local communications between DER units and the plant management system, but also between the DER plant and the operators or aggregators who manage the DER plant as a virtual source of energy and/or ancillary services.

In particular, new DER functions are being defined, and in some cases, becoming mandatory. The mandatory “grid codes” have been defined by various groups in terms of power system interconnection and operational requirements. These grid codes have also been assessed for the communication requirements which are now included in this DER information model.

In basic terms, “communications” can be separated into four parts:

- information modelling (the types of data to be exchanged – nouns),
- services modelling (the read, write, or other actions to take on the data – verbs),
- communication protocols (mapping the noun and verb models to actual bits and bytes),
- telecommunication media (fibre optics, radio systems, wireless systems, and other physical equipment)

The general technology for information modelling has developed to become well-established as the most effective method for managing information exchanges. In particular, the IEC 61850-7-x information models for the exchange of information within substations have become International Standard. Many of the components of this standard can be reused for information models of other types of devices.

This document addresses the IEC 61850 information modelling for DER, although some types and aspects of DER information models have been developed or are being developed separately through technical reports before they are added to this international standard DER model. These consist of the following:

- IEC 61850-90-6: Use of IEC 61850 for Distribution Automation Systems
- IEC 61850-90-8: Object model for electric mobility
- IEC 61850-90-9: Use of IEC 61850 for Electrical Storage Systems
- IEC 61850-90-15: DER Grid Integration using IEC 61850

Other IEC 61850 documents address the services modelling (IEC 61850-7-2) and the mapping to communication protocols (IEC 61850-8-x). In addition, a systems configuration language (SCL) for DER (IEC 61850-6-x) is expected to be developed to address the configuration of DER plants.

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1 Scope

1.1 General

This International Standard defines the IEC 61850 information models to be used in the exchange of information with distributed energy resources (DER) and Distribution Automation (DA) systems. DER systems include distribution-connected generation systems, energy storage systems, and controllable loads, as well as facility DER management systems, including aggregated DER, such as plant control systems, facility DER energy management systems (EMS), building EMS, campus EMS, community EMS, microgrid EMS, etc. DA equipment includes equipment used to manage distribution circuits, including automated switches, fault indicators, capacitor banks, voltage regulators, and other power management devices.

The IEC 61850 DER information model standard utilizes existing IEC 61850-7-4 logical nodes where possible, while defining DER and DA specific logical nodes to provide the necessary data objects for DER and DA functions.

1.2 Namespace information

The parameters which are identifying this new release of this namespace are:

- UML model file which reflects this namespace edition: wg10uml02v20draft19-wg18uml02v11b-wg17uml02v21-jwg25uml02v04c-tc17umlv0-tc38umlv0.eap, UML model version WG10UML02v20draft19
- Namespace id : IEC 61850-7-420
- Namespace Version : 2018
- Namespace Revision : A
- Namespace release: 3
- Namespace release date : 2018-05-07
- Namespace publication stage: CD2
- Namespace tissues: 642-646, 648, 651, 654, 666, 701, 703, 704, 888-889, 903-907, 916, 917, 921-923, 945-947, 955-960, 975-976, 978-989, 992-995, 999-1001, 1003-1006, 1008-1024, 1027-1028, 1031-1033, 1035, 1073-1074, 1087-1090, 1094-1115, 1124, 1126, 1132, 1134, 1153, 1158, 1182, 1183, 1206, 1210, 1215-1219, 1225, 1314, 1320, 1323, 1366, 1392-1394, 1414
- Namespace tissues applied since date:

1.3 Versioning information

Date:	23 May 2018
Document version:	Ed 2.0, v01
Licensing conditions version:	v0

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In this document, code components are contained in the tables located within clauses 6, 7, 8, 9, and 10. A separate file will contain the electronic versions of these code components.

1.5 Changes from IEC 61850-7-420 Edition 1

This Edition 2 has added operational functions for many grid codes that have recently been identified as mandatory or necessary for specific operations. As a result, many deletions and modifications were made to LNs existing in Edition 1 since the change to defining operational functions caused many structural changes to the model. It is also expected that additional operational functions will be added as these are identified and better defined.

Another change is the need to include different types of DER, in particular storage DERs (currently modelled in IEC 61850-90-9) and eventually controllable loads that can act as DERs.

In addition, the models for DERs needed to extend various modelling concepts since DERs are typically very complex systems which are often aggregated and controlled locally by power management systems. These new concepts are discussed in more detail in clause 4.2.

As a result the Logical Nodes associated with DER plants and other higher level DER structures have been significantly altered. However, the Logical Nodes associated with individual types of DER, such as reciprocating engines, photovoltaic systems, fuel cells, and combined heat and power, have not been significantly modified.

1.6 IEC 61850-7-420 versus IEC 61850-7-520

Clause 4 covers the concepts and constructs for managing DERs that are needed to understand the IEC 61850 DER information model structure and methods. The companion document, IEC 61850-7-520, will be updated to edition 2 and will include additional information such as use cases, system configuration language constructs for DER, methods for implementing logical devices, developing profiles, and other implementation support.

2 Normative references

The following referenced documents are indispensable for the application 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 61850-7-2 Ed. 2.1, *Communication networks and systems in substations – Part 7-2: Basic communication structure for substations and feeder equipment – Abstract communication service interface (ACSI)*

IEC 61850-7-3 Ed. 2.1, *Communication networks and systems in substations – Part 7-3: Basic communication structure for substations and feeder equipment – Common data classes*

IEC 61850-7-4 Ed. 2.1, *Communication networks and systems in substations – Part 7-4: Basic communication structure for substations and feeder equipment – Compatible logical node classes and data classes*

IEC 61850-7-520, *Communication networks and systems in substations – Part 7-520: Distributed energy resources – modelling concepts and guidelines*

IEC/TR 61850-90-10, *Communication networks and systems in substations – Part 90-10: IEC 61850 objects for scheduling* (under preparation)

IEC 61850-7-410, *Communication networks and systems for power utility automation – Part 7-410: Hydroelectric power plants – Communication for monitoring and control*

ISO 4217, *Codes for the representation of currencies and funds*

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3 Terms and definitions

3.1 General

For the purposes of this document, the terms and definitions given in IEC 61850-2, IEC 61850-7-2 and IEC 61850-7-520 apply.

The definition related to electrical energy storage systems will be aligned with IEC TC120 document[1].

3.2 Terms and definitions

3.2.1

ambient temperature

temperature of the medium in the immediate vicinity of a device

[IEC/TS 62257-8-1:2007, definition 3.15 modified]

3.2.2

area electric power system (area EPS)

An EPS that serves local EPSs

[IEEE 1547:2018]

3.2.3

cease to energize:

Cessation of active power delivery under steady-state and transient conditions and limitation of reactive power exchange.

NOTE 1—This may lead to momentary cessation or trip.

NOTE 2—This does not necessarily imply, nor exclude disconnection, isolation, or a trip.

NOTE 3—Limited reactive power exchange may continue as specified, e.g., through filter banks.

NOTE 4—Energy storage systems are allowed to continue charging but are allowed to cease from actively charging when the maximum state of charge (maximum stored energy) has been achieved.

[IEEE 1547:2018]

3.2.4

combined heat and power (CHP) co-generation

production of heat which is used for non-electrical purposes and also for the generation of electric energy

[IEV 602-01-24, modified]

NOTE Conventional power plants emit the heat produced as a useless by-product of the generation of electric energy into the environment. With combined heat and power, the excess heat is captured for domestic or industrial heating purposes or – in form of steam – is used for driving a steam turbine connected to an air-conditioner compressor. Alternatively, the production of heat may be the primary purpose of combined heat and power, whereas excess heat is used for the generation of electric energy.

[1] Under consideration

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205 **3.2.5**

206 **common data class**
207 **CDC**

208 classes of commonly used data structures which are defined in IEC 61850-7-3

209 **3.2.6**

210 **Component**

211 An instance of defined LN class.

212 **3.2.7**

213 **deprecated element**

214 An element marked as deprecated is still maintained in this edition of the standard, for backwards
215 compatibility purpose, but is intended to be phased out in the future. A deprecated element by definition
216 indicates what should be used instead.

217 **3.2.8**

218 **device**

219 material element or assembly of such elements intended to perform a required function

220 [IEV 151-11-20]

221 NOTE A device may form part of a larger device.

222 **3.2.9**

223 **distributed energy resource**
224 **DER**

225 generation, storage, and controllable load connected at the low or medium voltage distribution level.

226 Note 1: DER may include associated protection, control, and monitoring capabilities, and may consist of aggregated DER units.

227 Note 2: DER may interact with the area and/or local electric power systems (EPS) by providing energy through the EPSs, by
228 adapting their behaviour based on EPS conditions, and/or by providing other EPS-related services for regulatory, contractual, or
229 market reasons.

230 **3.2.10**

231 **distributed energy resource (DER) unit – DER unit**
232 **DER unit**

233 An individual DER device inside a group of DER that collectively form a system.

234 [IEEE 1547:2018]

235 **3.2.11**

236 **distributed energy resource (DER) system – DER system**
237 **DER system**

238 A collection of DER Units.

239 [IEEE 1547:2018]

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3.2.12

electrical connection point
ECP

point of electrical connection between the DER source of energy (generation or storage) and any electric power system (EPS)

Each DER (generation or storage) unit has an ECP connecting it to its local power system; groups of DER units have an ECP where they interconnect to the power system at a specific site or plant; a group of DER units plus local loads have an ECP where they are interconnected to the utility power system.

NOTE For those ECPs between a utility EPS and a plant or site EPS, this point is identical to the point of common coupling (PCC) in the IEEE 1547 "*Standard for Interconnecting Distributed Resources with Electric Power Systems*".

3.2.13

electric power system
EPS

facilities that deliver electric power to a load

[IEEE 1547:2018]

event
event information

a) something that happens in time [IEV 111-16-04]

b) monitored information on the change of state of operational equipment

[IEV 371-02-04]

NOTE In power system operations, an event is typically state information and/or state transition (status, alarm, or command) reflecting power system conditions.

3.2.14

fuel cell

a) generator of electricity using chemical energy directly by ionisation and oxidation of the fuel [IEV 602-01-33];

b) cell that can change chemical energy from continuously supplied reactants to electric energy by an electrochemical process [IEV 482-01-05]

3.2.15

fuel cell stack

individual fuel cells connected in series

NOTE Fuel cells are stacked to increase voltage.

[US DOE]

3.2.16

function

a computer subroutine; specifically: one that performs a calculation with variables provided by a program and supplies the program with a single result

[Merriam-Webster dictionary]

NOTE This term is very general and can often be used to mean different ideas in different contexts. However, in the context of computer-based technologies, it is used to imply software or computer hardware tasks.

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3.2.17

generator

a) energy transducer that transforms non-electric energy into electric energy [IEV 151-13-35];

b) device that converts kinetic energy to electrical energy, generally using electromagnetic induction

The reverse conversion of electrical energy into mechanical energy is done by an electric motor, and motors and generators have many similarities. The prime mover source of mechanical energy may be a reciprocating or turbine steam engine, water falling through a hydropower turbine or waterwheel, an internal combustion engine, a wind turbine, a hand crank, or any other source of mechanical energy. [WIKI 2007-12]

3.2.18

information

a) intelligence or knowledge capable of being represented in forms suitable for communication, storage or processing [IEV 701-01-01];

b) knowledge concerning objects, such as facts, events, things, processes, or ideas, including concepts, that within a certain context has a particular meaning [ISO/IEC 2382-1, definition 01.01.01]

NOTE Information may be represented for example by signs, symbols, pictures, or sounds.

3.2.19

information exchange

communication process between two or more computer-based systems in order to transmit and receive information

NOTE The exchange of information between systems requires interoperable communication services.

3.2.20

insolation

solar radiation that has been received

[Merriam-Webster dictionary]

3.2.21

inverter

a) static power converter (SPC);

b) device that converts DC electricity into AC electricity, equipment that converts direct current from the array field to alternating current, the electric equipment used to convert electrical power into a form or forms of electrical power suitable for subsequent use by the electric utility

[IEC 61727:2004, definition 3.8]

NOTE Any static power converter with control, protection, and filtering functions used to interface an electric energy source with an electric utility system. Sometimes referred to as power conditioning subsystems, power conversion systems, solid-state converters, or power conditioning units.

3.2.22

irradiance

density of radiation incident on a given surface usually expressed in watts per square centimetre or square meter

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[Merriam-Webster dictionary]

NOTE "Irradiance" is used when the electromagnetic radiation is incident on the surface. "Radiant excitance" or "radiant emittance" is used when the radiation is emerging from the surface. The SI units for all of these quantities are watts per square metre ($W \cdot m^{-2}$), while the cgs units are ergs per square centimetre per second ($erg \cdot cm^{-2} \cdot s^{-1}$, often used in astronomy). These quantities are sometimes called intensity, but this usage leads to confusion with radiant intensity, which has different units.

3.2.23

local electric power system (local EPS):

An EPS contained entirely within a single premises or group of premises.

[IEEE 1547:2018]

3.2.24

measured value

physical or electrical quantity, property or condition that is to be measured

[IEC 61850-7-4]

NOTE 1 Measured values are usually monitored, but may be calculated from other values. They are also usually considered to be analogue values.

NOTE 2 The result of a sampling of an analogue magnitude of a particular quantity.

3.2.25

membrane

the separating layer in a fuel cell that acts as electrolyte (an ion-exchanger) as well as a barrier film separating the gases in the anode and cathode compartments of the fuel cell

[US DOE]

3.2.26

monitor

to check at regular intervals selected values regarding their compliance to specified values, ranges of values or switching conditions

[IEV 351-22-03]

3.2.27

photovoltaic cell

device in which the photovoltaic effect is utilized

[IEV 521-04-34]

3.2.28

photovoltaic system

a) a complete set of components for converting sunlight into electricity by the photovoltaic process, including the array and balance of system components [US DOE];

b) a system comprises all inverters (one or multiple) and associated BOS (balance-of-system components) and arrays with one point of common coupling, described in IEC 61836 as PV power plant [IEC 61727:2004, definition 3.7]

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NOTE The component list and system configuration of a photovoltaic system varies according to the application, and can also include the following sub-systems: power conditioning, energy storage, system monitoring and control and utility grid interface.

3.2.29

photovoltaics
PV

of, relating to, or utilizing the generation of a voltage when radiant energy falls on the boundary between dissimilar substances (as two different semiconductors)

[Merriam-Webster dictionary]

3.2.30

PCC – Point of Common Coupling

point in an electric power system, electrically nearest to a particular load or generator, at which other loads or generators are, or may be, connected

Note 1 to entry: These loads can be either devices, equipment or systems, or distinct network users' installations.

NOTE 2 The point where a local EPS is connected to an area EPS [IEEE 1547]. The local EPS may include distributed energy resources.

[SOURCE: IEV 614-01-12 - modified]

3.2.31

power conversion

power conversion is the process of converting power from one form into another

This could include electromechanical or electrochemical processes.

In electrical engineering, power conversion has a more specific meaning, namely converting electric power from one form to another. This could be as simple as a transformer to change the voltage of AC power, but also includes far more complex systems. The term can also refer to a class of electrical machinery that is used to convert one frequency of electrical power into another frequency.

One way of classifying power conversion systems is according to whether the input and output are alternating current (AC) or direct current (DC), thus:

DC to DC
– DC to DC converter
– Voltage stabiliser
– Linear regulator
AC to DC
– Rectifier
– Mains power supply unit (PSU)
– Switched-mode power supply
DC to AC
– Inverter
AC to AC
– Transformer/autotransformer
– Voltage regulator
[WIKI 2007-12]

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3.2.32

prime mover

equipment acting as the energy source for the generation of electricity

NOTE Examples include diesel engine, solar panels, gas turbines, wind turbines, hydro turbines, battery storage, water storage, air storage, etc.

3.2.33

PV array

a) a mechanically integrated assembly of modules or panels and support structure that forms a d.c. electricity-producing unit

An array does not include foundation, tracking apparatus, thermal control, and other such components.

b) a mechanically and electrically integrated assembly of PV modules, and other necessary components, to form a DC power supply unit [IEC 60364-7-712:2002, definition 712.3.4]

NOTE A PV array may consist of a single PV module, a single PV string, or several parallel-connected strings, or several parallel-connected PV sub-arrays and their associated electrical components. For the purposes of this standard the boundary of a PV array is the output side of the PV array disconnecting device. Two or more PV arrays, which are not interconnected in parallel on the generation side of the power conditioning unit, shall be considered as independent PV arrays.

3.2.34

PV module

the smallest complete environmentally protected assembly of interconnected cells

[IEC/TS 62257-7-1:2006, definition 3.34]

NOTE Colloquially referred to as a "solar module".

3.2.35

PV string

a circuit of series-connected modules
[IEC/TS 62257-7-1:2006, definition 3.36]

3.2.36

reciprocating engine

piston engine

an engine in which the to-and-fro motion of one or more pistons is transformed into the rotary motion of a crankshaft

[Merriam-Webster dictionary]

NOTE The most common form of reciprocating engines is the internal combustion engine using the burning of gasoline, diesel fuel, oil or natural gas to provide pressure. In DER systems, the most common form is the diesel engine.

reformate

hydrocarbon fuel that has been processed into hydrogen and other products for use in fuel cells

[US DOE]

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436 **3.2.37**

437 **set point**

438 the level or point at which a variable physiological state (as body temperature or weight) tends to
439 stabilize

440 [Merriam-Webster Dictionary]

441 **3.2.38**

442 **set point command**

443 command in which the value for the required state of operational equipment is transmitted to a controlled
444 station where it is stored

445 [IEV 371-03-11]

446 NOTE A setpoint is usually an analogue value which sets the controllable target for a process or sets limits or other parameters
447 used for managing the process.

448 **3.2.39**

449 **standard test conditions**
450 **STC**

451 a standard set of reference conditions used for the testing and rating of photovoltaic cells and modules

452 The standard test conditions are:

453 a) PV cell temperature of 25 °C;

454 b) irradiance in the plane of the PV cell or module of 1 000 W/m^2;

455 c) light spectrum corresponding to an atmospheric air mass of 1,5

456 [IEC/TS 62257-7-1:2006, definition 3.46]

457 **3.2.40**

458 **turbine**

459 machine for generating rotary mechanical power from the energy in a stream of fluid

460 The energy, originally in the form of head or pressure energy, is converted to velocity energy by passing
461 through a system of stationary and moving blades in the turbine.

462 [US DOE]

463

464 ## 3.3 Abbreviated terms

465 The following additional abbreviations are expected to be added to the 61850-7-4 list of abbreviations.

466

467 Table 1 shows normative terms that are combined to create data object names.

468 Table 1 – Normative abbreviations for data object names

Term	Description
Avar	Absorbing reactive power (VAr)
Cea	Cease

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Term	Description
Cnst	constraining, constrained
Dyn	Dynamic
Ecp	Electrical connection point
Elc	Electric, Electrical
Engz	Energize
Eps	Electric Power System
Expc	Expected
Frm	Frame
Goto	Go to a limit rather than staying within a limit
Ivar	Injecting reactive power (VAr)
Ms	Measure, measurement
Ple	Pole
Rpd	Ramp Down
Rpu	Ramp Up
Rtn	Return
Sink	Sink
Soe	State of energy
Srv	Service
Susc	Susceptance (in siemens)
Tau	Tau
Trn	Turn
Use	Use, usable
Wst	Waste

469

470 Here is as well the abbreviations list currently considered in the IEC 61850-7-4 Ed 2.1[2] and partly used
471 in the current document.

472

[2] Under consideration

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473

474 Table 2 shows normative terms that are
475 combined to create data object names.

476 Table 2 – Normative abbreviations for data
477 object names

Term	Description
A	Current; phase A (L1)
AC	AC, alternating current
AGC	Automatic generation control
ASG	Analogue setting CDC
AWatt	Wattmetric component of current
Abr	Abrasion
Abs	Absolute
Absb	Absorbing
Acc	Accuracy; acceleration (deprecated: use Accl instead)
Accl	Acceleration
Accm	Accumulated
Ack	Acknowledgement, acknowledge
Acs	Access
Act	Action, activity, active, activate
Actr	Actuator
Acu	Acoustic
Addr	Address
Adj	Adjustment
Admin	Administrative
Adp	Adapter, adaptation
Aff	Affected
Age	Ageing
Ahr	Ampere hours
Air	Air
Alg	Algorithm
Alm	Alarm
Als	Alarm set
Alt	Altitude
Altn	Alternate
Amnt	Amount
Amp	Ampere, current DC or non-phase-related AC
An	Analogue
Anc	Ancillary
Ane	Anemometer
Ang	Angle
Ap	Access point
Apc	Analogue point control
App	Apparent
Ar	Amperes reactive (reactive current)
Arc	Arc
Area	Area
Arr	Array
Asyn	Asynchronous
At	At
Auth	Authorisation
Auto	Automatic
Aux	Auxiliary
Av	Average
Avl	Availability
Ax	Axial
Azi	Azimuth
B	Bushing; phase B (L2)
BG	Before Gain
Bac	Binary-controlled analogue value
Bar	Barrier
Base	Base
Bat	Battery
Bck	Backup
Bec	Beacon
Beh	Behaviour
Ber	Bit error rate
Bias	Bias
Bl	Blade
Blb	Bulb
Blk	Block, blocked
Blow	Blowby
Bnd	Band, bandwidth
Boil	Boiler
Bot	Bottom
Brcb	Buffered report control block
Brg	Bearing
Brk	Brake
Bsc	Binary status control
Bst	Boost
Bt	Heartbeat
Bub	Bubbling
Bus	Bus
Byp	Bypass
C	Carbon; phase C (L3)
C2H2	Acetylene
C2H4	Ethylene
C2H6	Ethane
CB	Circuit breaker
CE	Cooling equipment (see also Cl)
CG	Core ground
CH4	Methane
CHP	Combined heat and power
CO	Carbon monoxide
CO2	Carbon dioxide
Cab	Cable
Cal	Calorie, caloric

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Term	Description
Cam	Cam, e.g. rotating non-circular disk
Can	Cancel
Cap	Capability, capacity
Capac	Capacitance
Car	Carrier
Cbr	Calibration
Ccw	Counter clockwise
Ccy	Currency
Cds	Condensation
Ceil	Ceiling
Cel	Cell
Cf	Crest factor
Cff	Coefficient
Cfg	Configuration
Cg	Combusted Gas
Ch	Channel
Cha	Charger
Chg	Change
Chk	Check
Chr	Characteristic
Chs	Chassis
Circ	Circulating, circuit
Cl	Cooling, coolant, cooling system (see also CE)
Clc	Calculate, calculated
Clip	Clip
Clk	Clock
Cloud	Cloud
Clr	Clear
Cls	Close, closed
Cm	Centimetres
Cmbu	Combustible, combustion
Cmd	Command
Cmpl	Completed, completion, complete
Cmut	Commute, commutator
Cndct	Conductivity, Conducting
Cnt	Counter
Cntt	Contractual
Cnv	Converter
Col	Coil
Comm	Communication
Comp	Compensation
ConfRev	Configuration revision (confRev from IEC 61850-7-2)
Conn	Connected, connections
Cons	Constant (general)
Cor	Correction
Core	Core
Cost	Cost
Crank	Crank

Term	Description
Crd	Coordination
Crit	Critical
Crl	Correlation
Crp	Creeping, slow movement
Crv	Curve
Csmp	Consumption, consumed
Ctl	Control
Ctr	Center
Cum	Cumulative
Cur	Current
Cut	Cut, cut-out, cut-in
Cvr	Cover, cover level
Cw	Clockwise
Cwb	Crowbar
Cyc	Cycle
D	Derivate
DC	DC, direct current
DER	Distributed energy resource
DExt	De-excitation
DPCSO	Double point controllable status output
DQ0	Direct, quadrature, and zero axis quantities
DS	Device state
DT	Daylight saving time
Dam	Dam
Damp	Damping
Date	Date, date and time of action
Day	Day
Db	Deadband
Dcl	DC-link
Dct	Direct
De	De (prefix)
Dea	Dead
Dec	Decrease
Deg	Degrees
Dehum	De-humidifier
Del	Delta
Den	Density
Dep	Dependent
Desc	Description
Det	Detected
Detun	Detuning
Dev	Device
Dew	Dew
Dff	Diffuse
Dfl	Deflector (used in Pelton turbines)
Dft	Default
Dia	Diaphragm
Diag	Diagnostics
Dif	Differential, difference

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Term	Description
Dig	Digital
Dip	Dip
Dir	Direction
Dis	Distance
Dist	Distribution
Dith	Dither
Dl	Delay
Dlt	Delete
Dlv	Delivery
Dmd	Demand
Dn	Down, downstream
Dpc	Double point control
Dpt	Departure
Drag	Drag hand
Dropout	Dropout
Drp	Droop
Drt	Derate
Drtb	Draft tube
Drv	Drive
Dsa	Disable, disabled
Dsc	Discrepancy
Dsch	Discharge
Dscon	Disconnected
Dsp	Displacement
Dtc	Detection
Dur	Duration
Dust	Dust
Dv	Deviation
Dw	Delta Omega
Dyn	Dynamic
ECP	Electrical connection point
EE	External equipment
EF	Earth fault
EFN	Earth-fault neutraliser (Petersen coil)
EMA	E-mobility Account
ENG	Enumerated status setting CDC
ENS	Enumerated status CDC
EPC	Emergency Power Control
EV	Electrical Vehicle
EVSE	EV Supply Equipment
Echo	Echo
Edt	Edit, edited
Efc	Efficiency
El	Elevation
Ela	Elasticity
Em	Emission
Emg	Emergency
En	Energy
Ena	Enabled, enable, allow operation

Term	Description
Enc	Enumerated control
Encl	Enclosure
End	End
Eng	Engine
Ent	Entity, entities
Entr	Entry, entries
Env	Environment
Eq	Equalization, equal, equivalent
Err	Error
Est	Estimated
Ev	Evaluation
Evn	Even
Evt	Event
Ex	External
ExIm	Export/import
Exc	Exceeded
Excl	Exclusion
Exp	Expired
Exps	Expansion
Expt	Export
Ext	Excitation
F	Float
FA	Fault arc
FPM	Fuel processing module
Fa	"Fire all" sequence (to thyristors)
Fact	Factor
Fail	Failure
Fan	Fan
Fbc	Field breaker configuration
Fer	Frame error rate
Fil	Filter, filtration system
Fire	Fire
Fish	Fish
Fix	Fixed
Fld	Field
Flk	Flicker
Fll	Fall
Flm	Flame
Flood	Flood
Flsh	Flash, flashing
Flt	Fault
Flush	Flush
Flw	Flow, flowing
Fol	Follower, following
Forc	Forced
Fu	Fuse
Fuel	Fuel
Full	Full
Fun	Function

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Term	Description
Fwd	Forward
Gain	Gain
Gas	Gas
Gbx	Gearbox
Gdv	Guide vane
Gen	General
Glob	Global
Gm	Grand master
Gn	Generator
Gnd	Ground
GoCBRef	GOOSE control block reference
Gocb	GOOSE control block
Gr	Group
Gra	Gradient
Grd	Guard
Gri	Grid
Gross	Gross
Gs	Grease
Gte	Gate
Gust	Gust
H	Harmonics (phase-related)
H2	Hydrogen
H2O	Water (chemical aspect: liquid, steam, etc.)
HP	Hot point
HPh	Harmonics phase
Ha	Harmonics (non-phase-related AC)
Har	Harmonic
Hb	Harmonic bin
Hd	Head
Health	Health
Heat	Heater, heating, heat (see also Ht)
Hello	Hello signal, Live signal, "I am alive" signal
Hi	High, highest
Hlf	Half
Hold	Hold
Hor	Horizontal
Horn	Horn
Ht	Heating, heating system (see also Heat)
Htex	Heat-exchanger
Hub	Hub
Hum	Humidity
Hy	Hydraulic, hydraulic system
Hyd	Hydrological, hydro, water
Hys	Hysteresis
Hz	Frequency
Hz1	Frequency at side 1
Hz2	Frequency at side 2
I	Integral, integration
ING	Integer status setting CDC

Term	Description
INS	Integer status CDC
ISCSO	Integer status controllable status output
Ia	Information available
Iafm	Information available force majeure
Iano	Information available non-operative
Ianofo	Information available non-operative forced outage
Ianopca	Information available non-operative planned corrective action
Ianos	Information available non-operative suspended
Ianosm	Information available non-operative scheduled maintenance
Iao	Information available operative
Iaog	Information available operative generating
Iaogfp	Information available operative generating with full performance
Iaogpp	Information available operative generating with partial performance
Iaong	Information available operative non-generating
Iaongel	Information available operative non-generating out of electrical specification
Iaongen	Information available operative non-generating out of environment specification
Iaongrs	Information available operative non-generating requested shutdown
Iaongts	Information available operative non-generating technical standby
Ice	Ice
Id	Identity, identifier
Ieee	IEEE definition
IeeeKH	Proportional gain HF (High Frequency). Defined in IEEE 421.5
IeeeKH1	Proportional gain HF positive. Defined in IEEE 421.5
IeeeKH11	Lead gain HF positive. Defined in IEEE 421.5
IeeeKH17	Lead gain HF negative. Defined in IEEE 421.5
IeeeKH2	Proportional gain HF negative. Defined in IEEE 421.5
IeeeKI	Proportional gain IF (Intermediate Frequency). Defined in IEEE 421.5
IeeeKI1	Proportional gain IF positive. Defined in IEEE 421.5
IeeeKI11	Lead gain IF positive. Defined in IEEE 421.5
IeeeKI17	Lead gain IF negative. Defined in IEEE 421.5
IeeeKI2	Proportional gain IF negative. Defined in IEEE 421.5
IeeeKL	Proportional gain LF (Low Frequency). Defined in IEEE 421.5
IeeeKL1	Proportional gain LF positive. Defined in IEEE 421.5
IeeeKL11	Lead gain LF positive. Defined in IEEE 421.5
IeeeKL17	Lead gain LF negative. Defined in IEEE 421.5
IeeeKL2	Proportional gain LF negative. Defined in IEEE 421.5
IeeeKs1	Gain Ks1. Defined in IEEE 421.5

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Term	Description
IeeeKs2	Gain Ks2. Defined in IEEE 421.5
IeeeKs3	Gain Ks3. Defined in IEEE 421.5
IeeeM	Ramptrack lowpass degree M. Defined in IEEE 421.R
IeeeN	Ramptrack overall degree N. Defined in IEEE 421.5
IeeeT1	Time constant T1. Defined in IEEE 421.5
IeeeT10	Time constant T10. Defined in IEEE 421.5
IeeeT11	Time constant T11. Defined in IEEE 421.5
IeeeT2	Time constant T2. Defined in IEEE 421.5
IeeeT3	Time constant T3. Defined in IEEE 421.5
IeeeT4	Time constant T4. Defined in IEEE 421.5
IeeeT7	Time constant T7. Defined in IEEE 421.5
IeeeT8	Time constant T8. Defined in IEEE 421.5
IeeeT9	Time constant T9. Defined in IEEE 421.5
IeeeTH1	Time constant TH1 (High frequency positive). Defined in IEEE 421.5
IeeeTH10	Time constant TH10 (High frequency negative). Defined in IEEE 421.5
IeeeTH11	Time constant TH11 (High frequency negative). Defined in IEEE 421.5
IeeeTH12	Time constant TH12 (High frequency negative). Defined in IEEE 421.5
IeeeTH2	Time constant TH2 (High frequency positive). Defined in IEEE 421.5
IeeeTH3	Time constant TH3 (High frequency positive). Defined in IEEE 421.5
IeeeTH4	Time constant TH4 (High frequency positive). Defined in IEEE 421.5
IeeeTH5	Time constant TH5 (High frequency positive). Defined in IEEE 421.5
IeeeTH6	Time constant TH6 (High frequency positive). Defined in IEEE 421.5
IeeeTH7	Time constant TH7 (High frequency negative). Defined in IEEE 421.5
IeeeTH8	Time constant TH8 (High frequency negative). Defined in IEEE 421.5
IeeeTH9	Time constant TH9 (High frequency negative). Defined in IEEE 421.5
IeeeTI1	Time constant TI1 (Intermediate frequency positive). Defined in IEEE 421.5
IeeeTI10	Time constant TI10 (Intermediate frequency negative). Defined in IEEE 421.5
IeeeTI11	Time constant TI11 (Intermediate frequency negative). Defined in IEEE 421.5
IeeeTI12	Time constant TI12 (Intermediate frequency negative). Defined in IEEE 421.5
IeeeTI2	Time constant TI2 (Intermediate frequency positive). Defined in IEEE 421.5
IeeeTI3	Time constant TI3 (Intermediate frequency positive). Defined in IEEE 421.5
IeeeTI4	Time constant TI4 (Intermediate frequency positive). Defined in IEEE 421.5
IeeeTI5	Time constant TI5 (Intermediate frequency positive). Defined in IEEE 421.5
IeeeTI6	Time constant TI6 (Intermediate frequency positive). Defined in IEEE 421.5
IeeeTI7	Time constant TI7 (Intermediate frequency negative). Defined in IEEE 421.5
IeeeTI8	Time constant TI8 (Intermediate frequency negative). Defined in IEEE 421.5
IeeeTI9	Time constant TI9 (Intermediate frequency negative). Defined in IEEE 421.5
IeeeTL1	Time constant TL1 (Low frequency positive). Defined in IEEE 421.5
IeeeTL10	Time constant TL10 (Low frequency negative). Defined in IEEE 421.5
IeeeTL11	Time constant TL11 (Low frequency negative). Defined in IEEE 421.5
IeeeTL12	Time constant TL12 (Low frequency negative). Defined in IEEE 421.5
IeeeTL2	Time constant TL2 (Low frequency positive). Defined in IEEE 421.5
IeeeTL3	Time constant TL3 (Low frequency positive). Defined in IEEE 421.5
IeeeTL4	Time constant TL4 (Low frequency positive). Defined in IEEE 421.5
IeeeTL5	Time constant TL5 (Low frequency positive). Defined in IEEE 421.5
IeeeTL6	Time constant TL6 (Low frequency positive). Defined in IEEE 421.5
IeeeTL7	Time constant TL7 (Low frequency negative). Defined in IEEE 421.5
IeeeTL8	Time constant TL8 (Low frequency negative). Defined in IEEE 421.5
IeeeTL9	Time constant TL9 (Low frequency negative). Defined in IEEE 421.5
IeeeTw1	Time constant wash out Tw1. Defined in IEEE 421.5
IeeeTw2	Time constant wash out Tw2. Defined in IEEE 421.5
IeeeTw3	Time constant wash out Tw3. Defined in IEEE 421.5
IeeeTw4	Time constant wash out Tw4. Defined in IEEE 421.5
IeeeVHMax	Maximum limit set-point HF. Defined in IEEE 421.5
IeeeVHMin	Minimum limit set-point HF. Defined in IEEE 421.5
IeeeVIMax	Maximum limit set-point IF. Defined in IEEE 421.5
IeeeVIMin	Minimum limit set-point IF. Defined in IEEE 421.5
IeeeVLMax	Maximum limit set-point LF. Defined in IEEE 421.5
IeeeVLMin	Minimum limit set-point LF. Defined in IEEE 421.5
IeeeVsi1 Max	Input High Limit 1. Defined in IEEE 421.5
IeeeVsi1 Min	Input Low Limit 1. Defined in IEEE 421.5
IeeeVsi2 Max	Input High Limit 2. Defined in IEEE 421.5
IeeeVsi2	Input Low Limit 2. Defined in IEEE 421.5

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Term	Description
Min	
IeeeVstMax	Output High Limit. Defined in IEEE 421.5
IeeeVstMin	Output Low Limit. Defined in IEEE 421.5
Imb	Imbalance
Imp	Impedance non-phase-related AC
Impact	Impact
Impt	Import
In	Input
Ina	Inactivity
Inc	Integer control
Incl	Inclination
Incr	Increment, increase
Ind	Indication
Indp	Independent
Iner	Inertia
Inh	Inhibit
Inl	Inline
Inlet	Inlet
Inn	Inner
Ins	Insulation
Insol	Insolation
Inst	Instantaneous
Int	Integer
Intm	Intermediate
Intn	Internal
Intr	Interrupt, interruption
Intv	Interval
Inv	Inverter, inverted, inverse
Isc	Integer status control
Isld	Islanded
Iso	Isolation
Iu	Information unavailable
Ix	Index
Jmp	Jump
Jnt	Joint
K	Constant (regulation)
K0Fact	Zero-sequence (residual) compensation factor
KFact	K factor (harmonics)
Kck	Kicker
Key	Key, physical control device
L	Lower (action)
LDC	Line drop compensation
LDCR	Line drop compensation resistance
LDCX	Line drop compensation reactance
LDCZ	Line drop compensation impedance
LED	Light-emitting diode
LTC	Load tap changer
Last	Last

Term	Description
Ld	Lead
Ldp	Link discovery protocol
Leap	Leap (second)
Len	Length
Lev	Level
Lft	Lifting, lift
Lg	Lag
Life	Lifetime
Lim	Limit
Lin	Line
Liv	Live
Lkd	Locked
Lkg	Leakage
Ll	Last long (interval)
Lo	Low (state or value)
Loc	Local
Locb	Log control block
Lod	Load, loading
Log	Log
Lok	(use Lkd instead) Locked
Loop	Loop
Los	Loss
Ls	Last short (interval)
Lst	List
Lub	Lubrication
Lum	Luminosity
M	Minutes
MV	Measured value CDC
Mac	Media access control, MAC-address
Made	Made
Mag	Magnetic, magnitude
Maint	Maintenance
Man	Manual
Mat	Material
Mau	Medium access unit
Max	Maximum
Mbr	Membrane
Md	Motor drive
Mdul	Module
Meas	Measurement
Mech	Mechanical
Media	Media
Mem	Memory
Min	Minimum
Mir	Mirror
Mlt	Multiple
Mns	Mains
Mod	Mode
Mot	Motor

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Term	Description
Mrg	Margin
Mrk	Market
Mst	Moisture
Msv	Main signaling voltage
Msvcb	Multicast sampled values control block
Mth	Method
Mult	Multiplier
Mvm	Movement, moving
N2	Nitrogen
NOx	Nitrogen oxide
NQS	Average partial discharge current
Nam	Name
Name	Name (reserved for use in data objects EEName and LNName only)
Ndl	Needle (used in Pelton turbines)
NdsCom	Needs commissioning
Neut	Neutral
Ng	Negative
Ngt	Nogotiation
Nhd	Net head
Night	Night
No	No, not
Nom	Nominal, normalising
Num	Number
Nxt	Next
O2	Oxygen
O3	Ozon, trioxygen
Obl	Obligation
Oc	Open circuit
Odd	Odd
Of	Offline
Off	Off, device disengaged, not running
Ofs	Offset
Oil	Oil
On	On, device applied, running
Oo	Out of
Op	Operate, operating, operation
Operate	Operate order to any device
Opn	Open, opened
Ord	Order
Out	Output
Ov	Over, override, overflow
Ovl	Overload
Ox	Oxidant
P	Proportional
PF	Power factor
PH	Acidity, value of pH
PNV	Phase-to-neutral voltage
POW	Point on wave switching

Term	Description
PP	Phase to phase
PPV	Phase to phase voltage
PT1	Low-pass exponential time rate filter
Pa	Partial
Pair	Pair, paired
Pap	Paper
Par	Parallel
Pas	Passive
Path	Path
Pcb	Power quality classifier bin
Pct	Percent, percentage
Pdm	Power quality demodulation
Pe	Electric Power
Per	Periodic, period
Ph	Phase to reference
Phs	Phase
Phy	Physical
Pi	Instantaneous real power
Pin	Pin
Pipe	Pipe
Pk	Peak
Pl	Plant
Plg	Plug
Pls	Pulse
Plt	Plate; long-term flicker severity
Pmp	Pump
Po	Polar
Pol	Polarizing
Polytr	Polytropic
Port	Port
Pos	Position
Pot	Potentiometer
Prc	Price, pricing
Pre	Pre-
Prec	Precondition, initial status
Pres	Pressure
Prg	Progress, in progress
Prim	Primary
Prio	priority
Prm	Permissive
Pro	Protection
Proc	Process
Proxy	Proxy
Prs	Presence
Prt	Parts, part
Ps	Positive
Psk	Penstock
Pss	PSS, power system stabiliser function
Pst	Post, short-term flicker severity

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Term	Description
Pt	Point
Pth	Pitch
Pwr	Power
Qty	Quantity
Qu	Queue
Qud	Quad
R	Raise, increase
Rad	Radiation
Ral	Rail
Ramp	Ramp
Rat	Ratio
Rb	Runner blade
Rcd	Record, recording
Rch	Reach
Rcl	Reclaim
Rct	Reaction
Rdy	Ready
Re	Retry
React	Reactance, reactive
Rec	Reclose
Rec1	Reclose after single phase fault
Rec13	Reclose after evolving fault
Rec3	Reclose after three phase fault
Recha	Recharge, recharging
Rect	Rectifier
Red	Redundant; (deprecated meaning) reduction
Ref	Reference
Reg	Regulation
Rel	Release
Req	Requested
Res	Residual
Reso	Resonance
Reuse	Reuse
Rf	Refreshment
Rin	Reinsertion
Ris	Resistance
Rl	Relation, relative
Rm	Mutual resistance
Rmp	Ramping, ramp
Rms	Root mean square
Rn	Rain
Rnbk	Runback
Rng	Range
Rod	Rod
Root	Root
Rot	Rotation, rotor
Rpt	Repeat, repetition
Rs	Reset, resettable
Rsl	Result

Term	Description
Rst	Restraint, restriction
Rsv	Reserve
Rt	Ride-through
Rte	Rate
Rtg	Rating
Rub	Run-up/back
Run	Run
Rv	Reverse
Rvc	Rapid voltage change
Rvrt	Revert
Rwy	Runaway, e.g. in runaway speed
Rx	Receive, received
S10	Coefficient S1.0
S12	Coefficient S1.2
SM	Servo, servo-motor
SNL	Speed-no-load, connected but not generating
SOx	Sulphur oxide
SPCSO	Single point controllable status output
SPG	Single point setting CDC
SPS	Single point status CDC
SPl	Single pole/phase
ST	Standard time
Saf	Safety
Sag	Sag
Sar	Surge arrestor
Sat	Saturation
Sc	Short circuit
Scale	Scale
Schd	Schedule
Scnd	Secondary
Sco	Supply change over
Sec	Security
Sel	Select
Self	Self
Seq	Sequence
Ser	Series, serial
Set	Setting
Sgcb	Setting group control block
Sh	Shunt
Shar	Shared
Shft	Shaft
Shld	Shielded
Sig	Signal
Sign	Sign
Sim	Simulation, simulated
Sld	Solidity
Slnt	Salinity, saline content
Slp	Sleep; slip
Smok	Smoke

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Term	Description
Smp	Sampling
Snd	Sound pressure
Snpt	Snapshot
Snr	Signal to noise ratio
Snw	Snow
Soc	State of charge
Sof	Switch on to fault
Spc	Single point control
Spcf	Specific
Spd	Speed
Spec	Spectra
Spir	Spiral
Spt	Setpoint
Sq	Square
Src	Source
Srfc	Surface
St	Status, state
Sta	Station, function at plant level
Stab	Stabilizer
Stat	Statistics
Stc	Stack
Std	Standard
Stdby	Standby
Step	Step
Stk	Stroke
Stl	Still, not moving
Stnd	Stand, standing
Sto	Storage, e.g. activity of storing data
Stop	Stop
Storm	Storm
Stow	Stow
Str	Start
Strg	String
Stt	Stator
Stuck	Stuck, cannot move
Sub	Sub
Sum	Sum
Sup	Supply
Sv	Sampled value
SvCBRef	SV control block reference
Svc	Service
Sw	Switch, switched
Swg	Swing
Swl	Power quality event swell
Syn	Synchronisation, synchronous, synchronism, synchrocheck
Sys	System
TP	Three pole/phase
Ta	Armature time constant

Term	Description
Tag	Tag (maintenance work in progress)
Tap	Tap
Task	Task
Td	Transformer derating
Td0p	Td0'
Td0s	Td0''
Tdd	Total demand distortion
Tdf	Transformer derating factor
Tdp	Td'
Tds	Td''
Tech	Technology
Term	Termination
Test	Test
Tgt	Target
Thd	Total harmonic distortion
Thm	Thermal
Ti	Telephone influence
Tilt	Tilt
Tm	Time
Tm1	Time constant 1
Tm2	Time constant 2
Tm3	Time constant 3
Tmh	Time in h
Tmm	Time in min
Tmms	Time in ms
Tmp	Temperature (°C)
Tms	Time in s
Tnk	Tank
Tns	Tension (stress)
Top	Top (position)
Topo	Topology
Torq	Torque
Tot	Total
Tow	Tower
Tp	Test Point
Tpc	Teleprotection
Tpy	Temporarily
Tq0p	Tq0'
Tq0s	Tq0''
Tqp	Tq'
Tqs	Tq''
Tr	Trip (electrical protection function)
Trf	Transformer
Trg	Trigger
Trip	Trip (non-electrical function)
Trk	Track, tracking
Trp	Transient Performance Class
Trs	Transient
Trunk	Trunk

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Term	Description
Ts	Total signed
Tu	Total unsigned
Tun	Tuning
Tur	Turbine
Tx	Transmit, transmitted
Typ	Type
UPS	Uninterruptible power supply
UTC	Coordinated Universal Time
Uhf	Ultra-high-frequency
Un	Un-; under
Unav	Unavailable
Unb	Unbalanced
Unld	Unload
Unt	Unit, production unit
Up	Up, upstream
Ups	Uninterruptible Power Supply
Urcb	Unbuffered report control block
Use	Use
Used	Used
Usvcb	Unicast sampled values control block
Util	Utility
V	Voltage
V1	Voltage at side 1
V2	Voltage at side 2
VA	Apparent power (volt amperes)
VAh	Apparent energy
VAr	Reactive power (volt amperes reactive)
VArh	Reactive energy
Va	Variation
Vac	Vacuum
Val	Value
Vbr	Vibration
Ver	Vertical
Viol	Violation
Vis	Visibility
Visc	Viscosity
Vlan	VLAN
Vld	Valid, validate, validated
Vlm	Volume
Vlv	Valve
Vol	Voltage DC or non-phase-related AC
VolAmpr	Non-phase-related AC reactive power
Vss	Steady state voltage
W	Active power
W200	Watts peak at 200 W/m2
Wac	Watchdog
Wash	Washout
Watt	Active power non-phase-related AC
Wav	Wave, waveform

Term	Description
Wd	Wind
Week	Week
Wei	Weak end infeed
Wet	Wet
Wgt	Weight
Wh	Watt hours
Wid	Width
Win	Window
Wkup	Wake up
Wld	Welding
Wnd	Winding
Wrm	Warm
Wrn	Warning
Wrs	Warning set
Wtr	Water (physical aspect: river, cooling, etc.)
Wup	Windup
X	Reactance (imaginary part of impedance)
X0	Zero sequence reactance
X1	Positive sequence reactance
X2	Negative sequence reactance X2
Xd	Synchronous reactance Xd
Xdir	X-direction
Xdp	Transient synchronous reactance Xd'
Xds	Subtransient reactance Xd''
Xm	Mutual reactance
Xq	Synchronous reactance Xq
Xqp	Transient synchronous reactance Xq'
Xqs	Subtransient reactance Xq''
Xsec	Cross-section
Ydir	Y-direction
Yw	Yaw
Z	Impedance
Zer	Zero
Zero	(use 'Zer' instead) Zero
Zm	Mutual impedance
Zn	Zone
Zro	Zero sequence
km	Kilometre
ppm	Parts per million

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481 # 4 Concepts and constructs for managing DERs

482 ## 4.1 Hierarchical concepts for DER facilities and plants

483 ### 4.1.1 DER stakeholders

484 The future power system will be radically changed with the introduction of high penetrations of DER systems
485 which will not only require different power system structures but also greatly expanded communication
486 capabilities.

487 Direct control of these DER systems by distribution system operators (DSOs) is neither technically feasible nor
488 contractually acceptable for the thousands if not millions of DER systems interconnected with the distribution
489 power system. At the same time, utilities are responsible for meeting the reliability and electrical requirements
490 within their distribution systems and therefore require information on the locations, capabilities, and operational
491 status of these DER systems. In addition, these DER systems can greatly assist in meeting these utility
492 requirements effectively and efficiently, thus making them proactive stakeholders in managing the electric
493 power system.

494 Information exchange is critical to accommodate these complex and dynamic power system requirements, and
495 management of these information exchanges needs to be organized and interoperable. Specifically, a
496 hierarchical approach is necessary for the various stakeholders (utilities, aggregators, facilities, markets, and
497 DER systems) to exchange information.

498 Figure 1 illustrates the extensive types of stakeholders in managing the power system with high penetrations of
499 DER. Each of these stakeholders have different business requirements and drivers which must be coordinated
500 and managed to ensure the operation of the power grid as safe, reliable, efficient, environmentally sensitive,
501 and least cost. Although the basic IEC 61850 information models focus on the interactions with the central
502 green square of DER units and plants, often the types of information that should be modelled stem from the
503 requirements of the other, more “distant” stakeholders and their applications.

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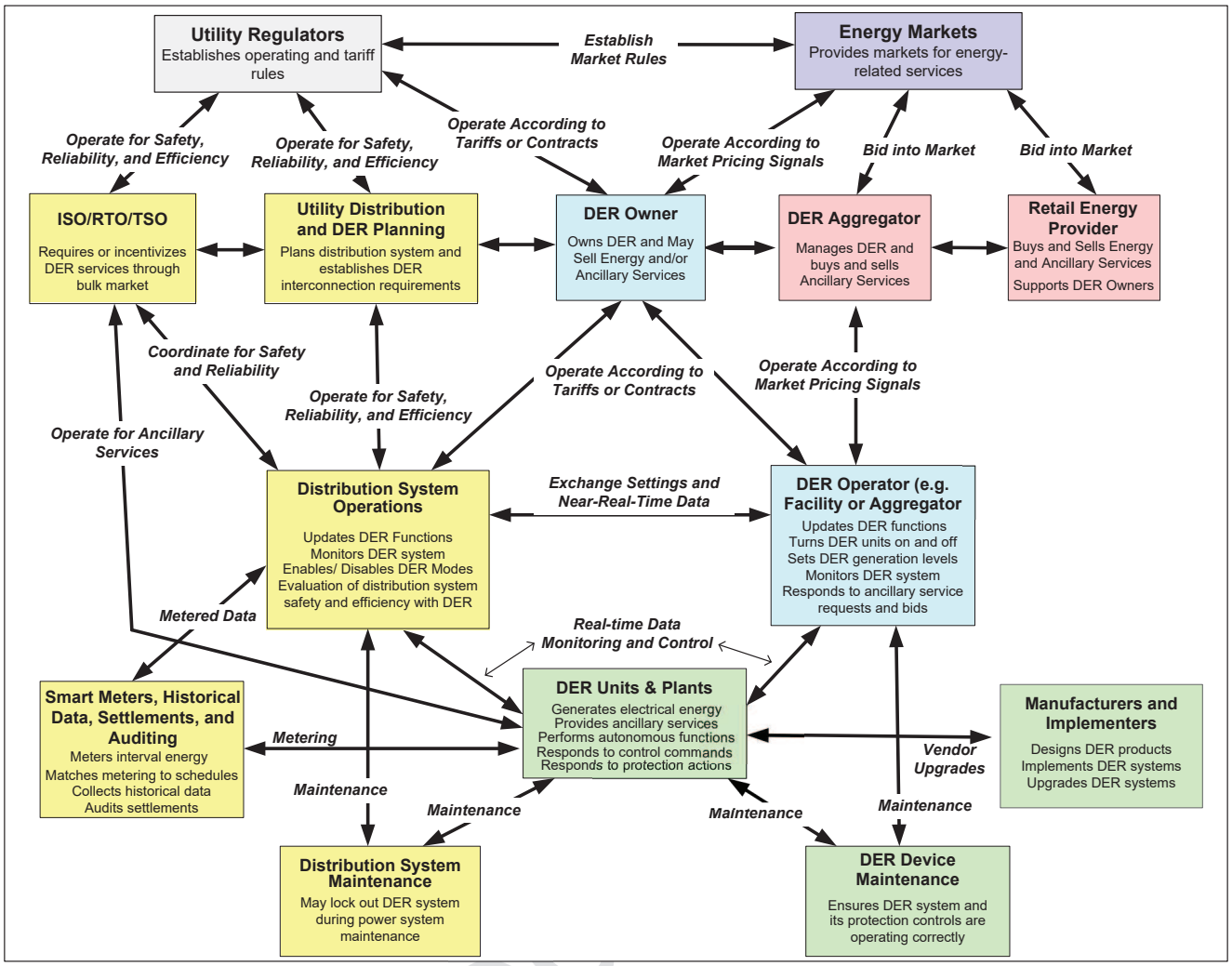

Figure 1: Typical stakeholders in power system operations

4.1.2 DER hierarchical concepts

At the local level, DER systems can generally manage their own generation, storage, and flexible load activities autonomously based on local conditions, pre-established settings, and DER owner preferences. However, DER systems can also be active participants in power system operations and should be coordinated with other DER systems and distribution equipment. In addition, the DSOs must interact with transmission system operators (TSOs), also known as regional transmission organizations (RTOs) and/or independent system operators (ISOs), for reliability and market purposes. In some regions, retail energy providers, aggregators, or other energy service providers are responsible for managing groups of DER systems either through operational actions or market actions.

This hierarchical approach can be described as hybrid combinations of five (5) levels across multiple domains, as illustrated in the five-level hierarchical DER system architecture (using Domains and Zones from the Smart Grid Architecture Model (SGAM), sliced through at the Information Layer) shown in Figure 2 and described below. The circled numbers identify the various logical information exchanges.

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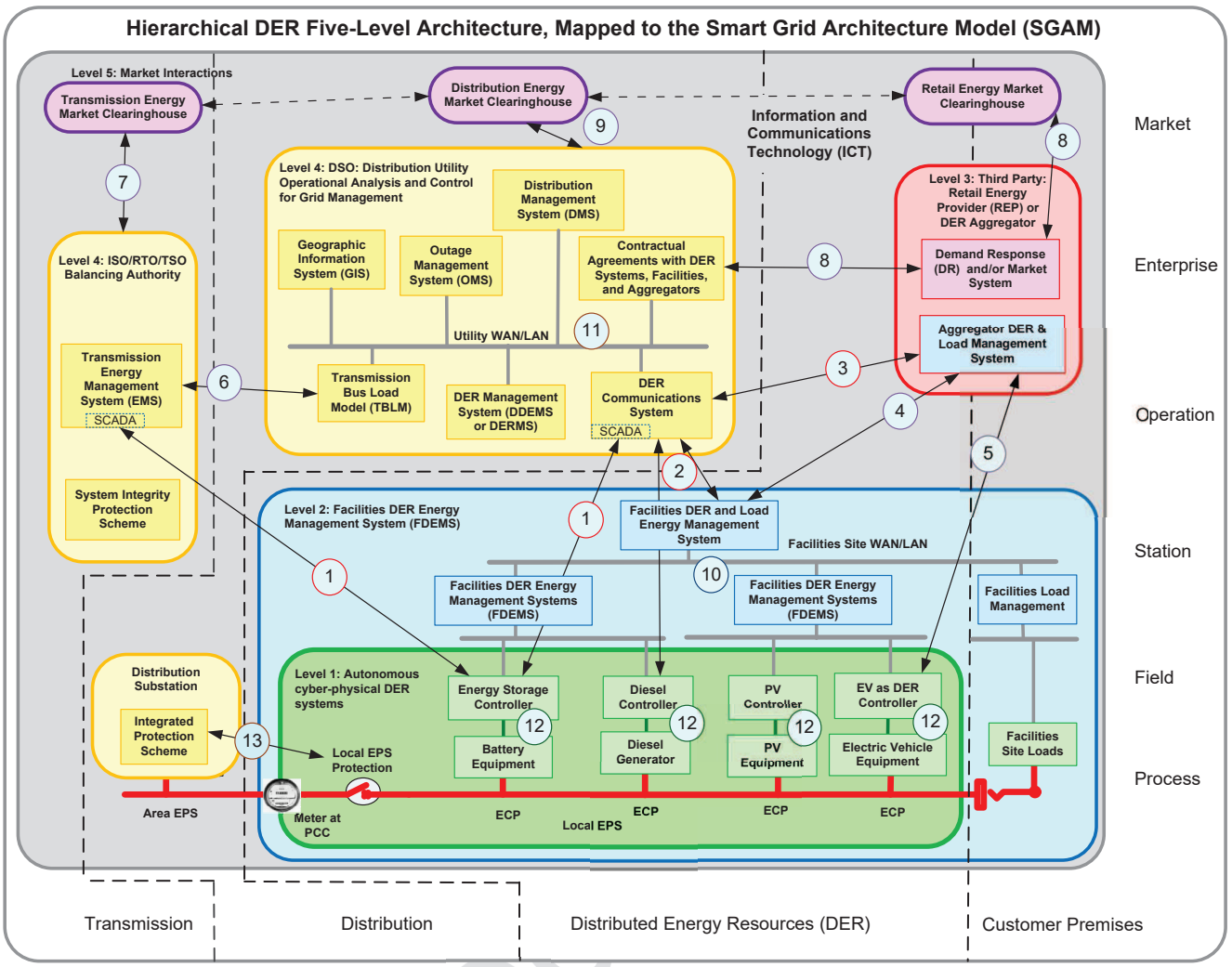

Figure 2: DER hierarchical model including logical communication interactions

1. **Level 1 DER Systems** (green in the Figure) is the lowest level and includes the actual cyber-physical DER systems themselves. These DER systems will be interconnected to local grids at Electrical Connection Points (ECPs) and to the utility grid through the Point of Common Coupling (PCC) (the ECP and the PCC may be the same if the DER is directly grid-connected). These DER systems will usually be operated autonomously. In other words, these DER systems will be running based on local conditions, such as photovoltaic systems operating when the sun is shining, wind turbines operating when the wind is blowing, electric vehicles charging when plugged in by the owner, and diesel generators operating when started up by the customer. This autonomous operation can be modified by DER owner preferences, pre-set parameter, and commands issued by utilities and aggregators.

2. **Level 2 Facility DER Management** (blue in the Figure) is the next higher level in which a facility DER management system (FDEMS) manages the operation of the Level 1 DER systems. This FDEMS may be managing one or two DER systems in a residential home, but more likely will be managing multiple DER systems in commercial and industrial sites, such as university campuses and shopping malls. Utilities may also use a FDEMS to handle DER systems located at utility sites such as substations or power plant sites. For utilities, FDEMS are viewed as field systems and shown at the Station level of the SGAM; however, from a facility's point of view, they may be seen as enterprises in their own right, and they could then be shown at the Enterprise and Operations levels.

3. **Level 3 Third Parties: Retail Energy Provider or Aggregators** (red in the Figure) shows market-based aggregators and retail energy providers (REP) who request or even command DER systems (either through the facility's FDEMS or via aggregator-provided direct communication links) to take specific actions, such as turning on or off, setting or limiting output, providing ancillary services (e.g., volt-VAr control), and other grid management functions. Aggregator DER commands would likely be price-based

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