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Vodik v energijskih sistemih - Slovar (ISO/DIS 24078:2023)

Hydrogen in energy systems - Vocabulary (ISO/DIS 24078:2023)

Wasserstoff in Energiesystemen - Vokabular (ISO/DIS 24078:2023)

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Hydrogen in energy systems — Vocabulary

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Foreword

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This document has been prepared by Technical Committee CEN-CENELEC/JTC 6 Hydrogen in Energy Systems, WG1 Terms and Definitions, in Vienna Agreement regulated collaboration with ISO TC 197 Hydrogen Technologies.

This is a first edition of EN/ISO 24078:202X. This document is intended to be used as a guiding document providing basic terms and definitions explaining the role of hydrogen in energy systems, and references the reader to get familiar with standards, technical reports, glossaries, guides etc., covering specific fields for further/more detailed vocabulary.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document was developed under the Vienna Agreement, by CEN/CLC JTC 6 and ISO TC 197, under the CEN lead.

In this document, terms and definitions have been identified, reviewed and proposed in order to cover technical aspects for hydrogen in energy systems, with input from sources such as ISO/IEC Standards, European Standards from CEN and CENELEC, national standards, and existing definitions from the dictionaries relevant to particular industries.

This document only contains terms used to describe hydrogen in energy systems within the scope of CEN/CLC/JTC 6.

The definitive intention of this document is to present the basics of the concepts that are subjected to standardisation in the fields related to hydrogen in energy systems. Therefore, this document consists of high level terms and definitions, and guides the reader to more specific standards/documents, where more technical details can be found.

Terms and definitions are categorized in the following structure:

— energy carriers,

— energy system, energy infrastructure, smart grid and energy systems integration,

— electric power network and electrical energy storage,

— hydrogen production from electricity and other methods for hydrogen production,

— hydrogen production equipment,

— transmission, distribution and storage in dedicated hydrogen infrastructure and gas network, as well as hydrogen admixture into natural gas and separation,

— hydrogen heat and power generation devices,

— power-to-hydrogen, hydrogen-to-X and energy storage,

— cross cutting items such as: hydrogen safety issues, metrology, quality of energy carriers, certification and materials compatibility.

Note It is not an intention of this document to standardise legislator activities of any kind, nor to standardise commercial products

Hydrogen in energy systems — Vocabulary

1 Scope

This document establishes the terms, definitions, symbols and abbreviations used in the fields related to hydrogen in energy systems.

This document excludes the following fields:

— biological methanation,

— reactor for hydrogen production from other sources,

— road, maritime and aviation transport,

— aeronautics and space.

Note These fields are foreseen to be covered in future editions of this document.

This document does not apply to carbon capture storage and utilisation, as well as services.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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

The sources for the following terms and definitions in this document are taken from documents with different scopes and further different application areas. They can therefore be based on premises in the respective sources that are not listed here.

The following terms and definitions are intended to stand on their own or in the context of this document. This document generally excludes any requirements beyond the use of the terms. Any procedures, tests material selection, or other aspects that play a role separately in the sources must be specified separately in the standards that reference this document.

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

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

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

Note 1 *In this International Standard the term 'gas' refers - in its physical sense - to fluids in its gaseous state. If specification of the gaseous fluid is needed, the specific term of the gaseous energy carrier is used, such as biomethane, hydrogen and natural gas.*

3.1 Energy

3.1.1
energy carrier
substance or medium that can transport energy

Note 1 to entry: For example *electricity* (3.1.15), *hydrogen* (3.1.2), *natural gas* (3.1.6), fuels, etc.

[SOURCE: ISO/IEC 13273-1:2015, 3.1.2, modified by adding a note 1 to entry]

3.1.2
hydrogen
chemical element, H with atomic number 1, usually occurring as a diatomic molecule, H2 which is a highly flammable, colourless, odourless and tasteless gas at standard ambient temperature and pressure

Note 1 to entry: Hydrogen in energy systems is usually in gaseous or liquid form.

[SOURCE: JRC Report EUR 30324 EN 326, modified by adding a note 1 to entry]

3.1.3
hydrogen based fuel
gaseous hydrogen or a synthetic fuel which can be used directly (i.e. without external reforming) as a fuel for hydrogen turbine, *fuel cell* (3.8.1) or combustion engine

Note 1 to entry: More specifications in ISO 14687:2019(en).

3.1.4
liquid hydrogen
hydrogen (3.2.1) that has been liquefied, i.e. brought to a liquid state

[SOURCE: ISO 14687: 2019, 3.15]

3.1.5
slush hydrogen
hydrogen (3.2.1) that is a mixture of solid and liquid at the eutectic (triple-point) temperature

[SOURCE: ISO 14687: 2019, 3.18]

3.1.6
natural gas, NG
complex gaseous mixture of hydrocarbons, primarily methane, but generally includes ethane, propane and higher hydrocarbons, and some non-combustible gases such as nitrogen and carbon dioxide

Note 1 to entry: Natural gas can also contain components or contaminants such as sulphur compounds and/or other chemical species.

[SOURCE: EN ISO 14532:2017]

3.1.7
biomethane
gas comprising principally methane, obtained from either upgrading of *biogas* (3.1.8) or methanation (3.9.3.9) of *biosyngas* (3.1.9)

Note 1 to entry: See EN 16723-1 and EN ISO 14532 for further vocabulary relating to biomethane.

[SOURCE: EN 16723-1:2016, modified by adding Note 1 to entry]

3.1.8
biogas
generic term used to refer to gases produced by anaerobic fermentation or digestion of organic matter, and without further upgrading or purification

Note 1 to entry: this can take place in a landfill site to produce landfill gas or in an anaerobic digester to produce biogas. Sewage gas is biogas produced by the digestion of sewage sludge. Biogases comprise mainly methane and carbon dioxide

[SOURCE: EN ISO 14532:2017]

Note 2 to entry: See EN 16723-1 and EN ISO 14532 for further vocabulary relating to biogas, biomass, biological material from living, or recently living organism, typically this can be plants or plant-derived materials

[SOURCE: EN 16723-1:2016, clause 3.2]

3.1.9
biosyngas
gas, comprising principally carbon monoxide and hydrogen, obtained from gasification of biomass

[SOURCE: EN 16723-1:2016, clause 3.4]

3.1.10
syngas
gas, comprising principally of carbon monoxide and hydrogen, obtained from gasification of fossil fuel

[SOURCE: EN 16723-1:2016, clause 3.13]

3.1.11
synthetically produced methane
synthetic methane, SM
methane, which has been produced by subsequent methanation of hydrogen with carbon oxides

3.1.12
substitute natural gas, SNG
gas from non-fossil origin, which is interchangeable in its properties with *natural gas* (3.1.6)

[SOURCE: ISO 14532:2014]

3.1.13
manufactured gas or synthetic gas
gas, which has been treated and can contain components that are not typical of *natural gas* (3.1.6)

Note 1 to entry: Manufactured (synthetic) gases can contain substantial amounts of chemical species that are not typical of natural gases or common species found in atypical proportions as in the case of wet and sour gases.

Note 2 to entry: Manufactured gases fall into two categories, as follows:

a. those that are intended as synthetic or substitute natural gases, and that closely match true natural gases in both composition and properties;

b. those that, whether or not intended to replace or enhance natural gas in service, do not closely match natural gases in composition.

Case b) includes gases such as town gas, coke oven gas (undiluted), and LPG/air mixtures. None of which is compositionally similar to a true natural gas (even though, in the latter case, it can be operationally interchangeable with natural gas).

[SOURCE: ISO 14532:2014]

3.1.14
interchangeability (of gases)
measure of the degree to which properties of one gas are more compatible with those of another gas

Note 1 to entry: Two gases are said to be interchangeable when one gas can be substituted for the other gas without interfering with the operation of appliances or equipment

[SOURCE: EN ISO 14532:2014, modified to generalise by exchanging “combustion characteristics” with “properties” and removing “gas-burning” in the note 1 to entry]

3.1.15
electricity
set of phenomena associated with electric charges and electric currents

Note 1 to entry: Examples of usage of this concept: static electricity, biological effects of electricity.

[SOURCE: IEV 151-11-01, modified by deleting note 2 to entry]

3.1.16
electric power
rate at which electric energy is transferred in an electric circuit

Note 1 to entry: The coherent SI unit of electric power is watt, W.

[SOURCE: IATE 1697301, modified by adding note 1 to entry]

3.1.17
heat
energy transferred from one body or system to another, as well as within one system, due to a difference in temperature

Note 1 to entry: The coherent SI unit of heat is joule, J.

[SOURCE: ISO 14934-1:2010 3.1.2, modified by adding note 1 to entry]

3.1.18
combined heat and power generation, CHP
simultaneous generation of *electricity* (3.1.15) and *heat* (3.1.17) based on the block heat and power plant definition: system consisting of modules for the simultaneous generation of electricity and heat[1]

3.1.19
energy from renewable sources
primary energy the source of which is constantly replenished and will not become depleted

Note 1 to entry: Examples of renewable energy are: wind, solar (solar thermal and solar photovoltaic) and geothermal energy, ambient energy, tide, wave and other ocean energy, hydropower, biomass, landfill gas, and biogas.

[SOURCE: IEV ref 617-04-1, modified by adding wind, solar (solar thermal and solar photovoltaic) and geothermal energy, ambient energy, tide, wave and other ocean energy, hydropower, biomass, landfill gas, and biogas]

3.1.20
variable renewable energy, VRE
energy source characterized by output that is dependent on the natural variability of the source rather than the requirements of consumers[2]

3.1.21
non-renewable energy sources
energy from non-renewable sources, namely oil, *natural gas* (3.1.6), coal, sewage treatment plant gas and nuclear energy[3]

Note 1 to entry: Inverse of renewable energy sources.

3.1.22
renewable hydrogen
hydrogen produced through processes using renewable sources

EXAMPLE Possible examples are water electrolysis using renewable electricity, reforming of biomethane, biogas or biomass.

3.1.23
low carbon hydrogen
hydrogen produced in processes with significantly lower life-cycle GHG emissions than the fossil fuel benchmark, which is compliant with a defined GHG threshold.

EXAMPLE Possible examples are hydrogen from natural gas reforming with CCS, methane pyrolysis and water electrolysis using nuclear power.

Note 1 to entry: Life-cycle emissions are calculated using ISO 14067:2018(119) or ISO 14064-1:2018(120).

Note 2 to entry: The fossil fuel benchmark is steam methane reforming process using natural gas.

Note 3 to entry: The full life cycle (LCIA) is calculated using ISO 14040.

3.1.24
natural hydrogen
hydrogen produced through natural, often geological, processes

EXAMPLE Hydrogen liberated by the reaction of water with subterranean minerals[4].\

3.2 Energy system and market

3.2.1
energy system
system primarily designed to produce, convert, synthetize, transform, process and/or store an energy carrier and transport or distribute it to the end-user

3.2.2
energy infrastructure
collective term for network for energy carriers, including ancillary equipment and facilities for their physical transmission

Note 1 to entry: in the sense of this document energy carriers are listed in 3.1.1.

3.2.3
Gas system
any gas transmission networks, gas distribution networks, liquified gas facilities and/or storage facilities owned and/or operated by a gas undertaking, including line pack and its facilities supplying ancillary services and those of related undertakings necessary for providing access to transmission, distribution and liquified gas

Note 1 to entry: The physical term gas is used here. It refers to fluids in gaseous state, such as hydrogen, natural gas, biogases, synthetic gases, irrespective of their different chemical and/or safety characteristics.

3.2.4
electric power system
composite, comprised of one or more generating sources, and connecting transmission and distribution facilities, operated to supply electric energy

Note 1 to entry: A specific electric power system includes all installations and plant, within defined bounds, provided for the purpose of generating, transmitting and distributing electric energy.

[SOURCE: IEV 601-01-01]

3.2.5
bulk power system, BPS
bulk electricity system, BES
portion of the electric power system comprising the facilities used for the generation and transmission of electric energy

Note 1 to entry: The extent of the bulk power system is usually limited to the means for production and transmission of electric energy to major industrial and distribution centres.

Note 2 to entry: In English, the term "composite system" is also used for this concept.

[SOURCE: IEV 692-01-04]

3.2.6
heating / cooling system
set of devices and circuits ensuring the flow of heating / cooling medium

Note 1 to entry: The heating / cooling medium can be a gas or a liquid.

[SOURCE: IEV 841-27-63, modified to include heating and cooling, as well as other media besides air and water]

3.2.7
hybrid energy system
builds on infrastructure synergies and efficiencies between the electricity and gases' sectors – including energy transport, short and long-term energy storage, security of supply and resilience of having two or more energy carriers[5]

Note 1 to entry: The physical term gas is used here. It refers to fluids in gaseous state, such as hydrogen, natural gas, biogases, synthetic gases, irrespective of their different chemical and/or safety characteristics, which, however, need to be considered in the hybrid system.

3.2.8
smart grid
intelligent grid
system that utilizes information exchange and control technologies, distributed computing and associated sensors and actuators, for purposes such as:

— to integrate the behaviour and actions of the network users and other stakeholders,

— to efficiently deliver sustainable, economic and secure electricity supplies

[SOURCE: IEV 617-04-13, modified to generalize by deleting "electric power" (system)]

3.2.9
energy systems integration
process of coordinating the operation and planning of energy systems across multiple pathways and/or geographical scales to deliver reliable, cost-effective energy services with minimal impact on environment[6]

Note 1 to entry: Coordinated planning and operation of the energy system 'as a whole', across multiple energy carriers, infrastructures, and consumption sectors[6].

Note 2 to entry: Energy system integration is connected with the concept of sector coupling, which envision creating a link between the power and gas sectors[6].

Note 3 to entry: In Note 2 to entry the physical term gas is used. It refers to fluids in gaseous state, such as hydrogen, natural gas, biogases, synthetic gases, irrespective of their different chemical and/or safety characteristics, which, however, need to be considered in the energy systems integration[6].

3.2.10
interoperability
property permitting diverse systems or components to work together for a specified purpose

Note 1 to entry: There are three main types of interoperability[7,8]:

— Syntactic Interoperability: Where two or more systems are able to communicate and exchange data. It allows different software components to cooperate, even if the interface and the programming language are different.

— Semantic Interoperability: Where the data exchanged between two or more systems is understandable to each system. The information exchanged should be meaningful, since semantic interoperability requires useful results defined by the users of the systems involved in the exchange.

— Cross-domain or cross-organization interoperability: This refers to the standardization of practices, policies, foundations and requirements of disparate systems. Rather than relating to the mechanisms behind data exchange, this type only focuses on the non-technical aspects of an interoperable organization.

[SOURCE: IEC 80001-1:2010, 2.11; IEV 871-05-06]

3.2.11
synergy
solutions that connect energy systems between energy domains and across spatial scales to take advantage of benefits in efficiency and performance, e.g. coupling of heat and electricity sectors for fuel-saving purposes[6]

3.2.12
energy markets
commodity markets that deal specifically with the trade and supply of energy, generally electricity, *natural gas* (3.1.6), *hydrogen* (3.1.2) and liquid fuels[9]

Note 1 to entry: Energy systems – includes energy markets and energy supply networks.

3.2.13
demand response
action resulting from management of the electricity demand in response to supply conditions

[SOURCE: IEV 617-04-16]

3.2.14
flexibility of energy systems
the ability to adjust supply and demand by integrating various energy systems[6]:

— by physically linking energy vectors, namely electricity, thermal and fuels;

— by coordinating these vectors across other infrastructures, namely water, data and transport;

— by institutionally coordinating energy markets; and

— spatially, by increasing market footprint with granularity all the way down to customer level

3.2.15
demand management
actions, such as education and financial incentives, to reduce customer demand for a particular form of energy and/or to shift demand from peak to off-peak times or to other energy systems[10]

3.2.16
energy management system, EMS
system operating and controlling energy resources and loads of the grid

[SOURCE: IEV 617-04-25, modified to refer to “grid”, instead of “microgrid”]

3.2.17
security of energy supply
uninterrupted ability of an energy system to provide energy to end-users with evaluation of existing standards and contractual agreements at the point of supply

[SOURCE: IEV 617-01-06, modified by replacing “electricity” with “energy”]

3.2.18
seasonal storage
technologies that store energy during one seasonal condition and discharging the stored energy in another seasonal condition, to meet demand

EXAMPLE Hydrogen, natural gas.