ICS 13.020.40; 27.075 PREDBEŽNÁ SLOVENSKÁ TECHNICKÁ NORMA Apríl 2024

STN P	Vodíkové technológie Metodika určovania emisií skleníkových plynov spojených s výrobou, úpravou a prepravou vodíka do miesta jeho spotreby	STN P ISO/TS 19870 83 9502

Hydrogen technologies
Methodology for determining the greenhouse gas emissions associated with the production, conditioning and transport of hydrogen to consumption gate

Technologies de l'hydrogène
Méthodologie pour déterminer les émissions de gaz à effet de serre associées à la production, au conditionnement et au transport de l'hydrogène jusqu'au point de consommation

Táto predbežná slovenská technická norma obsahuje anglickú verziu ISO/TS 19870: 2023 a má postavenie oficiálnej verzie.

This prestandard includes the English version of ISO/TS 19870: 2023 and has the status of the official version.

Táto predbežná slovenská technická norma je určená na overenie.

Prípadné pripomienky pošlite do novembra 2025 Úradu pre normalizáciu, metrológiu a skúšobníctvo Slovenskej republiky.

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Anotácia

ISO 14044 vyžaduje, aby bol cieľ a rozsah hodnotenia životného cyklu (LCA) jasne definovaný a aby boli v súlade s možnou realizáciou vodíkových technológii. Vzhľadom na iteratívnu povahu LCA je možné, že rozsah LCA bude potrebné v priebehu štúdie (realizácie) znovu upresniť.

Tento dokument špecifikuje metodiky, ktoré možno použiť na určenie uhlíkovej stopy produktu (CFP) alebo čiastočnej CFP vodíkového produktu v súlade s ISO 14067. Ciele a rozsah metodík zodpovedajú prístupu a) alebo b), za predpokladu že ISO 14040: 2006, A.2 uvádza dva možné prístupy k LCA:

a) Prístup, ktorý priraďuje základné toky a potenciálne vplyvy na životné prostredie ku konkrétnemu systému produktov, zvyčajne ako popis technického života (histórie) produktu.

b) Prístup, ktorý študuje environmentálne dôsledky možných (budúcich) zmien medzi alternatívnymi produktovými systémami.

Prístupy a) a b) sú uznávané odbornou verejnosťou. Ďalšie informácie sú dostupné v príručke ILCD[1]. [1]

Existuje mnoho spôsobov výroby vodíka pri využití rôznych primárnych zdrojov energie.

Tento dokument popisuje požiadavky a metódy hodnotenia aplikované na niekoľko možností technológii pri výrobe vodíka: elektrolýza, parné reformovanie metánu (so zachytávaním a skladovaním uhlíka), splyňovanie uhlia (so zachytávaním a skladovaním uhlíka), autotermálne reformovanie (so zachytávaním a ukladaním uhlíka), vodík ako vedľajší produkt v priemyselných aplikáciách a vodík z odpadu z biomasy ako surovina.

Tento dokument sa zaoberá aj emisiami skleníkových plynov v dôsledku úpravy alebo premeny vodíka na rôzne fyzikálne formy a chemické nosiče:

– skvapalňovanie vodíka;

– výroba, preprava a krakovanie amoniaku ako nosiča vodíka;

– hydrogenácia, transport a dehydrogenácia kvapalných organických nosičov vodíka (LOHC).

Dokument zohľadňuje emisie skleníkových plynov spôsobené prepravou vodíka a/alebo vodíkových nosičov až do miesta jeho spotreby. Je možné očakávať, že budúce revízie tohto dokumentu budú brať do úvahy ďalšie metódy výroby vodíka, úpravy, jeho konverzie a dopravy. Vzťahuje sa a zahŕňa každú oblasť dodávateľského reťazca až po konečné využívanie vodíka u spotrebiteľa. Poskytuje dodatočné informácie týkajúce sa princípov hodnotenia, systémových hraníc a očakávaných vykazovaných metrík vo forme príloh A až K, ktoré sú dostupné cez online portál ISO (https://standards.iso.org/iso/ts/19870/ed-1/en).

[1] POZNÁMKA. – European Commission – Joint Research Centre – Institute for Environment and Sustainability, International Reference Life Cycle Data System (ILCD) Handbook – General guide for Life Cycle Assessment – Detailed guidance. First edition March 2010. EUR 24708 EN. Luxembourg. Publications Office of the European Union; 2010.

Národný predhovor

Normatívne referenčné dokumenty

Na nasledujúce dokumenty sa odkazuje v texte takým spôsobom, že časť ich obsahu alebo celý obsah predstavuje požiadavky tohto dokumentu. Pri datovaných odkazoch sa používa len citované vydanie. Pri nedatovaných odkazoch sa používa najnovšie vydanie citovaného dokumentu (vrátane akýchkoľvek zmien).

POZNÁMKA 1. – Ak bola medzinárodná publikácia zmenená spoločnými modifikáciami, čo je indikované označením (mod), použije sa príslušná EN/HD.

POZNÁMKA 2. – Aktuálne informácie o platných a zrušených STN a TNI možno získať na webovom sídle www.unms.sk.

ISO 14040: 2006 prijatá ako STN EN ISO 14040: 2007 Environmentálne manažérstvo. Posudzovanie životného cyklu. Princípy a štruktúra (ISO 14040: 2006) (83 9040)

ISO 14044 prijatá ako STN EN ISO 14044 Environmentálne manažérstvo. Posudzovanie životného cyklu. Požiadavky a pokyny (ISO 14044) (83 9044)

ISO 14067: 2018 prijatá ako STN EN ISO 14067: 2022 Skleníkové plyny. Uhlíková stopa produktov. Požiadavky a pokyny na kvantifikáciu (ISO 14067: 2018) (83 9067)

ISO 14083: 2023 prijatá ako STN EN ISO 14083: 2023 Skleníkové plyny. Kvantifikácia a nahlasovanie emisií skleníkových plynov pochádzajúcich z činností dopravného reťazca (ISO 14083: 2023) (95 2009)

ISO/TS 14071 prijatá ako STN P CEN ISO/TS 14071 Environmentálne manažérstvo. Posudzovanie životného cyklu. Procesy kritického preskúmania a kompetentnosť preskúmavateľov. Dodatočné požiadavky a pokyny k ISO 14044: 2006 (ISO/TS 14071) (83 9071)

Vypracovanie slovenskej technickej normy

Spracovateľ: Úrad pre normalizáciu, metrológiu a skúšobníctvo SR, Bratislava

Technická komisia: –

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Foreword

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

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

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

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

This document was prepared by Technical Committee ISO/TC 197, *Hydrogen technologies*, Subcommittee SC 1, *Hydrogen at scale and horizontal energy systems*.

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

The Paris Agreement was adopted at the UN Climate Change conference (COP21) with the aims of: strengthening the global response to the threat of climate change, restricting global temperature rise to below 2 °C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1,5 °C above pre-industrial levels. To meet these goals, greenhouse gas (GHG) emissions need to be reduced by about 45 % from 2010 levels by 2030, reaching net zero in 2050 (IPCC, 2018; UNFCCC, 2021).

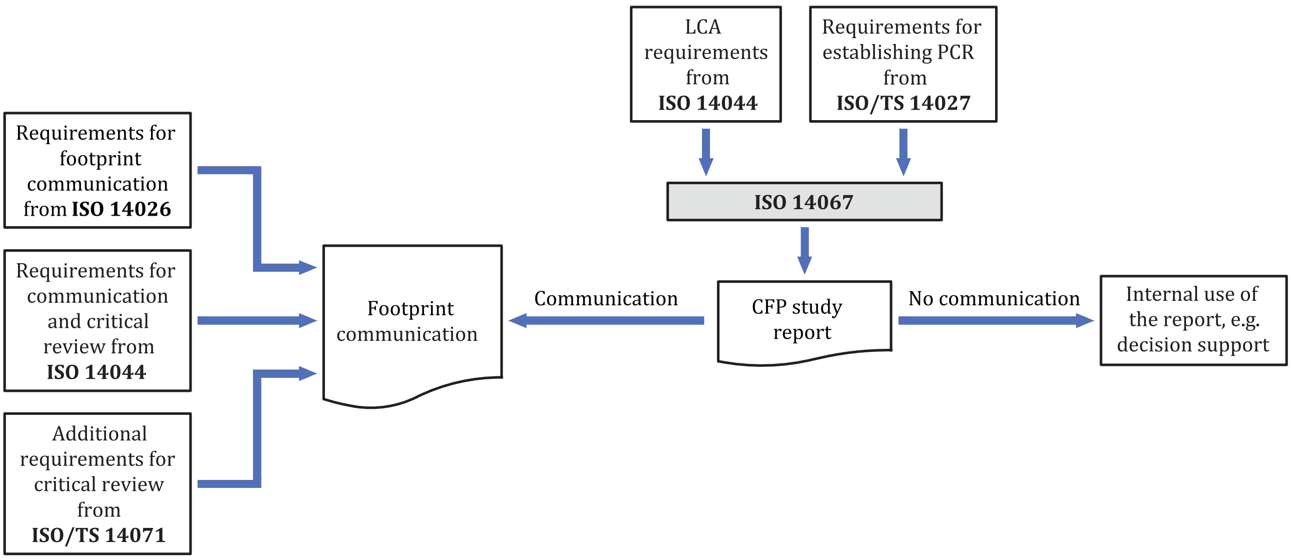
GHG initiatives on mitigation rely on the quantification, monitoring, reporting and verification of GHG emissions and/or removals. International Standards that support the transformation of scientific knowledge into tools can help in reaching the targets of the Paris Agreement to address climate change.

ISO 14040 and ISO 14044 define the principles, requirements and guidelines identified in existing International Standards on life cycle assessment (LCA). The ISO 14060 series provides clarity and consistency for quantifying, monitoring, reporting and validating or verifying GHG emissions and removals to support sustainable development through a low-carbon economy. It also benefits organizations, project proponents and stakeholders worldwide by providing clarity and consistency on quantifying, monitoring, reporting and validating or verifying GHG emissions and removals.

ISO 14067 is based on the principles, requirements and guidelines on LCA identified in ISO 14040 and ISO 14044 and aims to set specific requirements for the quantification of a carbon footprint (CFP) and a partial CFP.

ISO 14067 defines the principles, requirements and guidelines for the quantification of the carbon footprint of products. Its aim is to quantify GHG emissions associated with the lifecycle stages of a product, beginning with resource extraction and raw material sourcing and extending through the production, use and end-of-life stages of the product.

Figure 1 illustrates the relationship between ISO 14067 and other ISO documents on LCA.



PCR Product category rule

Figure 1 — Relationship between standards beyond the GHG management family of standards (source ISO 14067:2018)

Hydrogen can be produced from diverse sources including renewables, nuclear and fossil fuels using carbon capture, utilization and storage (CCUS) to reduce the emissions associated with its production. Hydrogen can be used to decarbonize numerous sectors including transport, industrial manufacturing and power generation.

A particular challenge is that identical hydrogen molecules can be produced and combined from sources that have different GHG intensities. Similarly, hydrogen-based fuels and derivatives will be indistinguishable and can be produced from hydrogen combined with a range of fossil and low-carbon inputs. Indeed, some of the products made from hydrogen (e.g. electricity) can themselves be used in the production of hydrogen. Accounting standards for different sources of hydrogen along the supply chain (see Figure 2) will be fundamental to creating a market for low-carbon hydrogen, and these standards need to be agreed upon internationally. Additionally, there is the possibility that consumption gates are not located in proximity to hydrogen production gates, requiring hydrogen transport. ISO 14083 gives guidelines for the quantification and reporting of GHG emissions arising from transport chain operations.

A mutually recognized international framework that is robust, avoids miscounting or double counting of environmental impacts is needed. Such a framework will provide a mutually agreed approach to “guaranties" or “certificates” of origin, and cover greenhouse gas inputs used for hydrogen production, conditioning, conversion and transport.

This document aims at increasing the methodologies that should be applied, in line with ISO 14067, to the specific case of the hydrogen value chain, covering different production processes and other parts of the value chain, such as conditioning hydrogen in different physical states, conversion of hydrogen into different hydrogen carriers and the subsequent transport up to the consumption gate.

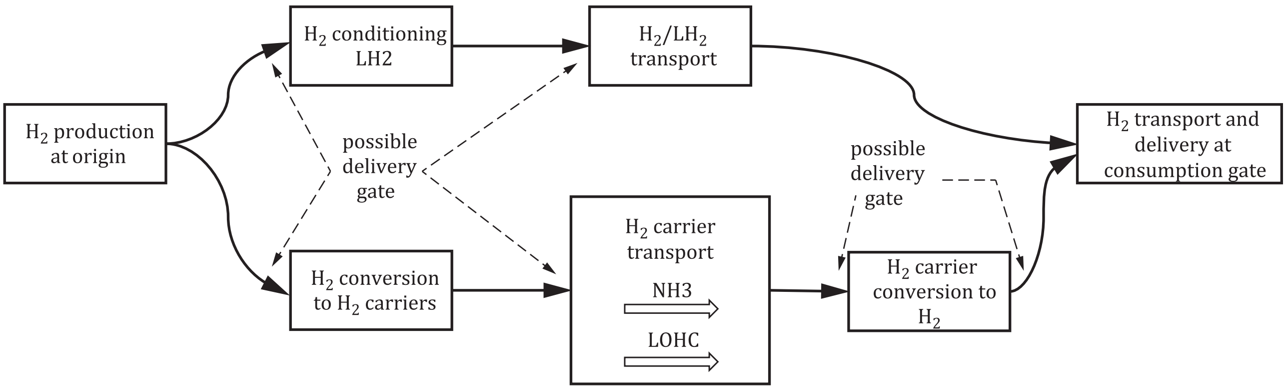


Figure 2 — Examples of hydrogen supply chain

Hydrogen technologies — Methodology for determining the greenhouse gas emissions associated with the production, conditioning and transport of hydrogen to consumption gate

1 Scope

ISO 14044 requires the goal and scope of an LCA to be clearly defined and be consistent with the intended application. Due to the iterative nature of LCA, it is possible that the LCA scope needs to be refined during the study.

This document specifies methodologies that can be applied to determine the carbon footprint of a product (CFP) or partial CFP of a hydrogen product in line with ISO 14067. The goals and scopes of the methodologies correspond to either approach a) or b), given below, that ISO 14040:2006, A.2 gives as two possible approaches to LCA.

a) An approach that assigns elementary flows and potential environmental impacts to a specific product system, typically as an account of the history of the product.

b) An approach that studies the environmental consequences of possible (future) changes between alternative product systems.

Approaches a) and b) have become known as attributional and consequential, respectively, with complementary information accessible in the ILCD handbook.[1]

There are numerous pathways to produce hydrogen from various primary energy sources. This document describes the requirements and evaluation methods applied to several hydrogen production pathways of interest: electrolysis, steam methane reforming (with carbon capture and storage), co-production and coal gasification (with carbon capture and storage), auto-thermal reforming (with carbon capture and storage), hydrogen as a co-product in industrial applications and hydrogen from biomass waste as feedstock.

This document also considers the GHG emissions due to the conditioning or conversion of hydrogen into different physical forms and chemical carriers:

— hydrogen liquefaction;

— production, transport and cracking of ammonia as a hydrogen carrier;

— hydrogenation, transport and dehydrogenation of liquid organic hydrogen carriers (LOHCs).

This document considers the GHG emissions due to hydrogen and/or hydrogen carriers' transport up to the consumption gate.

It is possible that future revisions of this document will consider additional hydrogen production, conditioning, conversion and transport methods.

This document applies to and includes every delivery along the supply chain up to the final delivery to the consumption gate (see Figure 2 in the Introduction).

This document also provides additional information related to evaluation principles, system boundaries and expected reported metrics in the form of Annexes A to K, that are accessible via the online ISO portal (https://standards. iso. org/iso/ts/19870/ed-1/en).

2 Normative references

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

ISO 14040:2006, *Environmental management — Life cycle assessment — Principles and framework*

ISO 14044, *Environmental management — Life cycle assessment — Requirements and guidelines*

ISO 14067:2018, *Greenhouse gases — Carbon footprint of products — Requirements and guidelines for quantification*

ISO 14083:2023, *Greenhouse gases — Quantification and reporting of greenhouse gas emissions arising from transport chain operations*

ISO/TS 14071, *Environmental management — Life cycle assessment — Critical review processes and reviewer competencies: Additional requirements and guidelines to ISO 14044:2006*