BUSINESS PLAN

CEN-CENELEC/TC 6
HYDROGEN IN ENERGY SYSTEMS

EXECUTIVE SUMMARY

Business Environment

The European Union is committed to transforming its transport and energy systems into low-carbon systems and to reduce emissions by 80-95% below 1990 levels by 2050[1]. To reach this ambition, the proposed Energy Union strategy is designed to help deliver the 2030 climate and energy targets and make sure that the EU becomes the world leader in renewable energy. Because of its relevance for decarbonising critical European economical sectors, hydrogen can play an important role in the necessary technological transition and subsequently contribute in achieving to Europe's energy sustainability, security and competitiveness targets. Hydrogen is the most commonly occurring element in nature and – unlike fossil fuels such as crude oil or natural gas – will never run out.

Hydrogen (H_2) has already a long history as an industrial gas (over one hundred years) and large volumes are used across the widest range of applications every day. Like electricity, hydrogen is an energy carrier – not a source of energy. It must therefore be produced. Hydrogen offers several key benefits that increase its potential to replace fossil fuels. Stored hydrogen, for example, can be used directly as a fuel or to generate electricity via fuel cells. There are many different types of fuel cells that can be used for a wide range of applications. Small fuel cells have been developed to power laptop computers, cell phones, and military applications. Large fuel cells can provide electricity for emergency power in buildings and in remote areas that do not have power lines. Hydrogen use in vehicles is a major focus of fuel cell research and development.
These relatively new developments bring hydrogen more and more in the public domain which creates the need for new arrangements. Standardization offers the platform to the market, to meet the different market needs (arrangements) for requirements and information.

Table 1 Application areas of hydrogen [2]

Application type	Portable	Stationary	Transport	Industry	Other applications
Definition	Units that are built into, or charge up, products that are designed to be moved, including auxiliary power units (APU)	Units that provide electricity (and sometimes heat) but are not designed to be moved regularly	Units that provide propulsive power or range extension to a vehicle	Units that are used in various chemical processes and conversions of industrial elements	Units that provide hydrogen from RES (Power to Gas) for mixing with the natural gas grid
Examples	• Non-motive APU (campervans, boats, aircraft, lighting)	• Large stationary prime power • Large	•Vehicles for industrial use e.g forklifts • Fuel cell electric	• Chemical compounds (ammonia, methanol etc) produced for	

[1] http://ec.europa.eu/clima/policies/international/paris_protocol/energy/index_en.htm

[2] adapted Table, The Fuel cell industry review, 2014, p.7

	• Military applications (portable soldier-borne power, skid mounted generators) • Portable products (torches, battery chargers), small personal electronics (mp3 player, cameras)	stationary combined heat and power (CHP) • Small stationary micro-CHP • Uninterruptible power supplies (UPS)	vehicles (FCEV) • Trucks and buses • Recreational vehicles • Marine units • Trains • aerospace application	chemical and pharmaceutical industry; • Refined fuels (such as gasoline and diesel) and self-contained fueling stations in petrochemical and refining industry • Oxygen scavengers in metallurgical, steel and food industry • Atmosphere control means in glass and float glass manufacturing industry • Fuel and oxidant for ground-transportation applications in space industry • Renewables energy source	

The focus of the work of the TC will not be on large industrial use of hydrogen as a feedstock which is not produced from a renewable or sustainable source. This market is already established and no need for standardization has been expressed. Though topics related to renewables or a sustainable source e.g. guarantee of origin might be of interest.

Categories of the relevant stakeholders to be involved are:

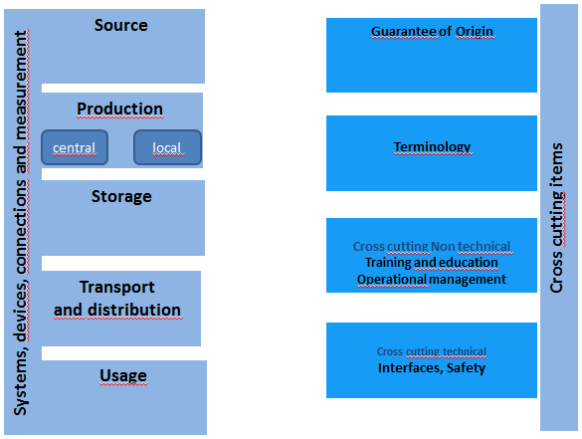
Table 2 Categories of stakeholders to be involved based on the hydrogen economy

Hydrogen economy	Stakeholders involved
Production	Industry and commerce suppliers, E-transmission and E-distribution system operators,
Storage	Transmission and distribution system operators (TSO-g and DSO-g)
Equipment	Manufacturers designing and manufacturing products/systems/services
Transport and distribution	Electricity Transmission (TSO-e) and distribution system operators (DSO-e), Gas Transmission (TSO-g) and distribution system operators (DSO-g) (pipelines) and the transport via tubes.
Use	Public/society/consumers (domestic, commercial and industrial) including those organisations representing interests of specific societal groups, e.g. people with disabilities or those needing other particular consideration
Education	Academic and research bodies
Codes&standards	standards application business (e.g. testing laboratories, certification bodies)
Safety and metrology	Public Authorities responsible for energy, metrology and environment e.g. EC National Regulators, National Ministries, European Organisations/Associations,

	non-governmental organisations (NGO), including organisations representing broad or specific environmental interests
Other parties concerned	European and international Organisations/Associations (e.g. EUROMOT, GERG, IEA, Marcogaz, WEC, NGVA Europe, others), Internal liaisons with CEN/CLC/ISO and IEC technical committees

Scope

Standardization in the field of systems, devices and connections for the production, storage, transport and distribution, measurement and use of hydrogen from renewable energy sources and other sources, in the context of the European strategy for the development and acceptance of the hydrogen market.
The scope includes cross cutting items related to hydrogen such as: terminology, Guarantee of Origin, interfaces, operational management, relevant safety issues, training and education.



Excluded are:

- Storage and transport of liquid hydrogen which is covered in the scope of CEN/TC 268.
- Storage and transport of compressed hydrogen which is covered in the scope of CEN/TC 23.
- Vehicle refueling stations and associated equipment and procedures as related to the standardization Request M/533.
- The injection of hydrogen and the mixture of hydrogen with natural gas (H2NG) in the gas infrastructure, which is covered in the scope of CEN/TC 234.
- The use of mixtures of natural gas with hydrogen (H2NG).

Benefits

A new CEN/CENELEC/TC 6 is established based on a recommendation from the CEN/CENELEC Sector Forum Energy Management Working Group (WG) Hydrogen. The main arguments for establishing the new TC were, that there is no current TC covering the wide range of topics that have been identified and, that the critical issues identified by the WG needed to be addressed by standardisation. The benefits of the new TC are identified as follows:

- Harmonisation of the standardization processes and results in the area of hydrogen in energy systems;

- Contribution to Europe's energy objectives of sustainability, security and competitiveness;

- Removal of the technical barriers to trade and open markets through development of standards on hydrogen;

- Contribution to acceleration and support the development of hydrogen in the energy systems, its implementation and operation, management and safety/security, as well as facilitating the public acceptance;

- To provide the necessary technical standards for Hydrogen in the energy system respecting the desired level of
    - o technical safety of the system and the safety of the public,
    - o technical reliability and
    - o technical interoperability in Europe.

- Avoidance of duplication of work where electrotechnical and non-electrotechnical sectors have some aspects of hydrogen in common;

The more detailed information on benefits is provided in further in this document.

Priorities

To make European standards available that can further enhance:

- Development of hydrogen markets in the energy system;
- implementation of European legislation.

Prioritised standardisation needs are already identified from the SFEM/WG Hydrogen. The input from SFEM/WG Hydrogen and the members of the CEN-CENCENELEC/TC 6 will be the first basis for the work program of the TC.
Identified and prioritised standardisation needs are:

- Terms and definitions for the field of work;
- Guarantee of Origin for hydrogen produced from renewable and/or low carbon primary energy;
- Cross-cutting items (non-technical):
    - o Societal acceptance;
    - o Legal aspect;
    - o Training and education
- Cross-cutting items (technical);
    - o Certification;
    - o Competence of personnel.
    - o Safety related standards. The safety aspects regard general safety, leakage, explosion, gas detection, materials compatibility, global safety issues for hydrogen and systems, etc. safety aspects related to hydrogen and the pure hydrogen related aspects for the mixture of hydrogen with natural gas (the liaison with CEN/TC 234 is of importance).
    - o Technical issues such as monitoring, testing and metering,
- Specification of new electrolyser key performance indicators (KPIs) related with new operating conditions related to the coupling with renewable energy sources;
- The actions at the interfaces with the related connected grids (electricity, natural gas and hydrogen infrastructure), Liaisons with, amongst others, CEN/TC 234, CEN-CENELEC-ETSI Smart Meters Coordination Group (SM-CG) and CEN-CENELEC-ETSI Smart Grid Coordination Group (SG-CG), is of importance in this field;
- multigrid interaction related issues (electricity-gas-heating and cooling);
- aspects related to the use of hydrogen for applications;

- The adoption of relevant ISO and IEC standards as European standards. The TC will discuss and decide for what Standards under ISO/TC 197 or IEC/TC 105 and falling under the scope of the CEN-CENELEC/TC 6 this applies (this excludes the standards related to the Standardisation Request M/533).

Sources for the input of identified and priorities standardization needs are:

- SFEM/WG Hydrogen report
- Workshop “Power to Hydrogen: key challenges and next steps“ JRC; CEN/CENELEC, Brussels, 03-04 May 2016

1 BUSINESS ENVIRONMENT OF THE CEN-CENELEC/TC 6

1.1 Description of the Business Environment

The European Parliament in its response to the EU2020 Strategy underlined that "sustainable production processes, coupled with resource efficiency and an integrated energy policy, and the further development of renewable energy sources will enable the EU not only to meet its climate and energy targets but also to maintain a strong manufacturing base in Europe and to boost competitiveness, growth and employment" Making energy more sustainable, secure and affordable is the objective of the EU.
The European Commission is looking at cost-efficient ways to make the European economy more climate-friendly and less energy-consuming.
Its low-carbon economy roadmap suggests that:
• By 2050, the EU should cut emissions to 80% below 1990 levels
• Milestones to achieve this are 40% emissions cuts by 2030 and 60% by 2040
• All sectors need to contribute
• The low-carbon transition is feasible & affordable. To reach the ambition of a carbon-neutral energy supply, the proposed Energy Union strategy is designed to help deliver the 2030 climate and energy targets and make sure that the EU becomes the world leader in renewable energy.

Hydrogen has a strong potential to become a key component of a renewable and sustainable energy system of the future. It is ready to play a major role in decarbonising the European energy landscape in coming decades. Hydrogen provides a clean alternative energy. It can be produced using a variety of sources such as primary energy sources (sunlight, wind power, hydroelectric power), water or hydrocarbons (like biomass and fossil fuels), natural gas or as a by-product of industry. Hydrogen may enable the storage of energy from renewable sources that are intermittent, and may be added to natural gas and injected into the gas grid, for use as fuel for transports, heating, gas power stations or as (energy carrier) fuel for several applications e.g. FCEVs (fuel cell electric vehicles). .
It has the advantage that it can be transported, stored and used in a number of energy applications (power generation, distributed as residential CHP, transportation etc.). Power to Hydrogen and Power to Power related technologies present a huge potential for Europe in light of decarbonisation and lower import dependency scenarios. Hydrogen is relevant to all of the energy sectors - transportation, buildings, utilities, and industry. In combination with fuel cells, power can be generated in large and small quantities at point of use without emitting greenhouse gases.

Because of its relevance for decarbonising critical European economical sectors, hydrogen can play an important role in the necessary technological transition and subsequently contribute in achieving to Europe's energy sustainability, security and competitiveness objectives in the following way[3]:

Sustainability
A radical reduction in harmful emissions can be achieved through the deployment of zero emission applications due to the use of hydrogen as replacement of a less sustainable source. Examples are minimum carbon emissions and the use of fuel cells for decentralised power production e.g CHP. In this way CO2 could be cut by between 64 per cent and 97 per cent in 2050.

[3] Fuel cell and hydrogen benefits for Europe: http://www.intelligent-energy.com/uploads/accompanying_files/2_-_150611_NEW-IG_Factsheet_Benefits_for_Europe.pdf, accessed on 27.09.2016

Security and affordability
As hydrogen can be produced from a range of primary energy sources, its availability is almost limitless, thus allowing Europe to provide energy security and independence. In this way the need for fuel consumption would be minimised and would deliver between €58 and €83 billion a year in fuel savings for the EU economy by 2030.

Competitiveness, growth and employment
Hydrogen is an extremely flexible energy carrier that can be used in all fields of the industry, with markets worth billions of euros across numerous applications. Using hydrogen Europe could improve its growth prospects and create 500,000 to 1.1 million net additional jobs in 2030 through auto sector innovation.

1.2 Quantitative Indicators of the Business Environment

The following list of quantitative indicators describes the business environment in order to provide adequate information to support actions of the CEN-CENELEC/TC 6:

- COP21 UN Climate Change Conference, Paris
  Europe is leading the fight against climate change. It is working hard to persuade all the big emitters to get on board and make the UN Climate Change Conference in Paris (COP 21) a success.
  The EU wants ambitious emissions reduction targets for COP 21:
  - limit global warming to a global average increase of 2°C
  - get a commitment to reduce Greenhouse gases by at least 60% by 2050 compared to 2010
  - decarbonisation of the world economy by the end of the century
- 2050 - The European Union is committed to transforming its transport and energy systems into low-carbon systems and to reduce emissions by 80-95% below 1990 levels by 2050;
  - Power sector: the largest emission cuts will come from the power sector, where renewable electricity could penetrate between 60% and 95%, depending on the scenarios from the European Commission[4];
  - Transport sector: with respect to 1990 is required from the transport sector, with an estimated electrification of road transport of about 65%. By 2030, the goal for transport will be to reduce Greenhouse Gas (GHG) emissions to around 20% below their 2008 level, in order to be in line with the long-term projections;[5]
  - Other sectors: the deeper cuts can be achieved in other sectors of the economy, a reduction of at least 60% of GHGs by 2050 (EC analysis)[6];
- 2030 - The 2030 Climate and Energy framework agreed in October 2014 by the European Union
  includes a proposal for a 2030 Renewable energy target of 27% of final energy demand. The renewables target would be reached primarily in the power sector (with an approximate penetration of 45% renewable share), through the deployment of wind power, solar power and biomass combustion;
- 2020 - By 2020, based on a 2010 baseline, the Fuel Quality Directive (FQD) requires: a 6% reduction in the GHG intensity of fuels traded in the EU by 2020 compared to 2010 baseline (4% indicative reduction by 2017).

[4] Generic estimation scenarios of market penetration and demand forecast for “premium” green hydrogen in short, mid and long term”, deliverable D1.3, Certifhy, June 2015

[5] Generic estimation scenarios of market penetration and demand forecast for “premium” green hydrogen in short, mid and long term”, deliverable D1.3, Certifhy, June 2015

[6] Generic estimation scenarios of market penetration and demand forecast for “premium” green hydrogen in short, mid and long term”, deliverable D1.3, Certifhy, June 2015

2 BENEFITS EXPECTED FROM THE WORK OF THE CEN-CENELEC/TC 6

Key benefits are:

- Harmonisation of the standardisation processes and results in the area of hydrogen in energy systems:
    - Despite of the performed standardisation work related to hydrogen, the field of systems, devices and connections for the production, storage, transport and distribution, measurement and use of hydrogen from renewable energy sources and other sources, are not covered yet. Additionally the cross cutting items related to hydrogen such as: terminology, Guarantee of Origin, interfaces, operational management, relevant safety issues, training and education are not standardised.
- Provision of a set of coherent functional and technical requirements supporting stakeholders in the *'Hydrogen in the energy system'* in their operational practices and fulfilling their responsibilities.
- Contribution in achieving to Europe's energy objectives:
  Through the planned programme of work, the new CEN-CENELEC/TC 6 will contribute to Europe's energy objectives in the following way:
  a) sustainability objectives by development and promotion of the standards on hydrogen to reduce harmful emissions,
  b) security objectives by development and promotion of the standards on hydrogen production from wide variety of unlimited but standardised sources, and
  c) competitiveness objectives by development and promotion of the standards on hydrogen for the purposes of use by different industries across numerous applications.
- Removal of the technical barriers to trade and open hydrogen markets through alignment of requirement on hydrogen in the energy system .
- Support of the EC requirement of non-discrimination and objectivity by technical harmonization of requirements as described in the scope.
- Cost savings and the removal of technical barriers to trade and open cross-border hydrogen markets by the application of common technical requirements.
- Contribute to acceleration and support the development of hydrogen in the energy system, its implementation and operation, management and safety/security, as well as accelerating the public acceptance.
- Technically safeguard and strengthening of the European-wide:
    - o technical safety of hydrogen in the energy system;
    - o technical reliability of hydrogen in the energy system
    - o technical interoperability of hydrogen in the energy system
- Strengthening the self-responsibility approach of standardisation taking advantages of knowledge and experiences of the hydrogen sector, also supporting the implementation of requirements resulting from EC policies and directives

Other aspects of importance:

- **Avoidance of duplication of work where electrotechnical and non-electrotechnical sectors have some aspects of hydrogen in common:**
  CEN and CENELEC have published technical standards partly including the topic of hydrogen. To avoid the duplication of work, the new TC will control that the common standardisation activities related to hydrogen complement each other.
- **The new CEN-CENELEC/TC 6 will be the mirror committee to ISO/TC 197 'Hydrogen technologies'** for those topics not yet covered by another CEN/TC. This refers in particular to the work covered by Standardisation Request M/533 on hydrogen vehicle refueling stations and associated equipment and procedures. These topics from ISO/TC 197 are being dealt with by CEN/TC 268/WG 5.

- The new TC should also **operate as mirror committee for IEC/TC 105 'Fuel Cells'** on those subjects related to hydrogen. The yet to be developed standards need to reflect the interest of the European industry.
- The new TC will **apply the Vienna Agreement by optimising** the use of available resources and expertise for the benefit of the stakeholders of CEN and ISO, results in identical international and European standards in the area of hydrogen in the energy systems.

At this moment it was identified that the work of:
ISO/TC 197 'Hydrogen Technologies'
ISO/TC 158 'Analysis of Gas'
ISO/TC 58 'Gas Cylinders'
ISO/TC 193 'Natural Gas'
ISO/TC 22 'Road vehicles'
CEN/TC 19 'Gaseous and liquid fuels, lubricants and related products of petroleum, synthetic and biological origin'
CEN/TC 23 "Transportable gas cylinders"
CEN/TC 234 'Gas Infrastructure'
CEN/TC 268 'Cryogenic vessels and specific hydrogen technologies applications'
CEN/TC 301 'Road vehicles'
CEN/TC 326 'Natural Gas Vehicles - Fuelling and Operation'
CEN/TC 305 'Potentially explosive atmospheres - Explosion prevention and protection'
CEN/TC 408 'Project Committee - Natural gas and biomethane for use in transport and biomethane for injection in the natural gas grid'
IEC/TC 105 'Fuel Cell Technologies' and CLC/SR 105
IEC/TC 31 " Equipment for explosive atmospheres'
CG Smart Metering
CG Smart Grids
might be related to the scope of the proposed TC and every New Work Item Proposal (NWIP) will be assessed whether or not it is within the scope of other standardisation committees.

Cooperation between CEN and ISO, and IEC and CENELEC facilitates the worldwide information exchange on hydrogen. This will contribute to the elimination of trade barriers, not only in Europe but also on the international level.

3 PARTICIPATION IN THE CEN-CENELEC/TC 6

All the CEN and CENELEC national members are entitled to nominate delegates to CEN-CENELEC Technical Committees and experts to Working Groups, ensuring a balance of all interested parties.

In the TC, it is allowed to send only one delegation per country with representatives appointed by the members of CEN and CENELEC in that country. The participation of national organisations/entities in the activities of CEN-CENELEC/TC 6 should be channelled through the National Standardisation Bodies (NSB).

CEN-CENELEC/TC 6 will also ask for and will promote the participation of multi-national entities and organizations who can significantly contribute to the development of the standards, in particular of those recommended in the sectorial dossiers of the SFEM/WG Hydrogen final report. The nomination of representatives/experts of organisations that do not fall under a NSB's responsibility will be endorsed at TC 6 level and formalised by the CEN-CENELEC Management Centre (CCMC).

Participation as observers of recognised European or international organizations is also possible under certain conditions. To participate in the activities of this CEN/TC, the national standards organisation in the relevant country should be contacted.

Additional information about participation can be found at
http://www.cen.eu/you/participate/Pages/default.aspx and
https://www.cenelec.eu/aboutcenelec/whatwedo/index.html

4 OBJECTIVES OF THE CEN-CENELEC/TC 6 AND STRATEGIES FOR THEIR ACHIEVEMENT

4.1 Defined objectives of the CEN-CENELEC/TC 6

CEN-CLC/TC 6 aims at providing hydrogen in the energy system with the necessary standards, i.e. in the field of systems, devices and connections for the production, storage, transport and distribution, measurement and use of hydrogen from renewable energy sources and other sources, in the context of the European strategy for the development and acceptance of the hydrogen market.
The scope includes cross cutting items related to hydrogen such as: terminology, Guarantee of Origin, interfaces, operational management, relevant safety issues, training and education.

CEN-CLC/TC 6 aims at an utmost of technical safety and technical reliability and availability of the hydrogen in energy systems.

CEN-CLC/TC 6 aims at elaborating and maintaining the complete and coherent suite of functional and technical standards for hydrogen in the energy system.

CEN-CLC/TC 6 aims to extend the details contained in the standards as they are revised over the years respecting the objective of CEN and CENELEC to harmonise technical standards on a European and international level.

CEN-CLC/TC 6 aims at providing a technical committee to bring together the knowledge and experience of experts in the hydrogen in energy systems market value chain to develop the standards with the aim to create added value for organisations.

CEN-CLC/TC 6 aims at providing a technical committee with a scope that enables new technologies and applications for hydrogen in energy systems as they will be developed in the years to come.

CEN-CLC/TC 6 aims at contribution to adaptation to climate change issues when relevant to its work

CEN-CLC/TC 6 aims at making experts available for participation in committees and working groups.
To achieve this objective, CEN-CLC/TC 6 aims at efficient liaisons with:

- the relevant CEN, CENELEC Committees to cover the issues in the field of hydrogen in the energy system;
  Therefore, liaisons are used to avoid overlaps and to bring the requirements in line with each other in an early phase of standardisation.
- with all technical oriented European organisations and associations and those where interfaces with the CEN-CLC/TC 6;
- with the relevant ISO and IEC Committees

  - o to monitor the standardisation work,
  - o to ensure the integration of European requirements related to technology, safety philosophies and technical approaches in EN ISO and EN IEC standards,
  - o to use the liaison rights of the CEN/CENELEC/ISO and IEC co-operation,
  - o to exchange technical know-how, to avoid overlaps,
  - o to implement the Vienna Agreement.
- The relevant external liaisons e.g. energy and hydrogen related associations for alignment and consistency with these associations with regard to projections and strategies.

With respect to limited availability of resources (also as a consequence of EU regulation of the European energy market), good liaison management and planning is necessary.

4.2 Identified strategies to achieve the CEN-CENELEC/TC 6's defined objectives

There is a significant potential to build a European 'lead technology' in the field of hydrogen in energy systems, with relevant European standards providing the basis for future international standards. The European context includes European energy policy and goals including those on renewables, research programmes, and existing pilot trials run by industry, current European standardization work and EC/EFTA mandates including M/533.

The strategies to reach the objectives of new CEN-CENELEC/TC 6 are as follows:

Programme of work:
- Create unified understanding of hydrogen as a key component of a renewable and sustainable energy system of the future;
- Provide a clear framework for production, storage, transportation and use of hydrogen for various purposes;
- Share the same principles with other Technical Committees in all sectors of hydrogen in energy systems in Europe;
- Support and where necessary develop standards and guidance for, adoption of hydrogen as very promising alternative fuel for future energy applications that will effectively fulfil the essential requirements of European regulatory framework, and the needs of regulatory authorities and manufacturers;
- Organise and support strong cooperation with the relevant external European and international organisations or internal parties to align and strengthen the work on the overlapping topics;
- Utilise the Vienna Agreement by optimising the use of available resources and expertise for the benefit of the stakeholders of CEN and ISO, results in identical international and European standards in the area of hydrogen in the energy systems;
- Support the elimination of the trade barriers in producing, storage, transportation and use of hydrogen.

Liaisons

The new CEN-CENELEC/TC 6 has defined a list of internal liaisons (with CEN-CENELEC TCs and ISO/IEC TCs) and external liaisons (organisations which don't have direct relation to the standardisation activities but represent important industries) where a close cooperation is required e.g. with regard to standardisation issues concerning interconnection points. The complete list of intended liaisons with CEN-CENELEC TCs is shown in Table 5. In several countries a National H_2 platform exists. Their input via the National Standardization Institutes if very important.

Table 5 Overview of defined internal and external liaisons

Internal	**CEN/CENELEC TCs and SFora:** •CEN/TC 19 'Gaseous and liquid fuels, lubricants and related products of petroleum, synthetic and biological origin' • CEN/TC 23 'Transportable gas cylinders' •CEN/TC 234 'Gas Infrastructure' •CEN/TC 237 'Gas meters' •CEN/TC 268 'Cryogenic vessels and specific hydrogen technologies applications' •CEN/TC 301 'Road vehicles' •CEN/TC 326 'Natural Gas Vehicles - Fuelling and Operation' •CEN/TC 305 'Potentially explosive atmospheres - Explosion prevention and protection' •CEN/TC 408 'Project Committee - Natural gas and biomethane for use in transport and biomethane for injection in the natural gas grid' •CLC/SR 105 'Fuel cell technologies' •CEN/CENELEC 'Smart Metering' •SFEM/WG 'Hydrogen'
	ISO/IEC TCs: •ISO/TC 22 'Road vehicles' •ISO/TC 58 'Gas Cylinders' (and) •IEC/TC 105 'Fuel Cell Technologies' •ISO/TC 158 'Analysis of Gas' •ISO/TC 193 'Natural Gas' •ISO/TC 197 'Hydrogen Technologies'
External	•AIB •EASE (European Association for Storage of Energy) •EASEE gas •ECMA European Cylinder Makers Association •EDSO European Distribution System Operators' Association for Smart Grids •EHA European Hydrogen and fuel cell Association •EIGA •ESMIG European voice of smart energy solution providers •Eurelectric •EUROMOT •ENTSO-E European Network of Transmission System Operators for Electricity •ENTSO-G •ETSO •EURAMET •EUROGAS •FCH-JU Fuel Cells and Hydrogen Joint Undertaking •GERG •GIE Gas Infrastructure Europe •Hydrogen Europe •HySafe International Association for Hydrogen Safety •HyER Hydrogen Fuel Cells and Electro mobility in European Regions •H2ME Hydrogen Mobility Europe •IEA International Energy Agency •IPHE International Platform for Hydrogen and fuel cells in the Economy •JRC •MARCOGAZ •NGVA Europe

	OIML •SHHP Scandinavian Hydrogen Highway Partnership •The New European Research Grouping on Fuel Cells and Hydrogen – N.ERGHY •UNECE •WELMEC Project for interest to exchange •WEC (World Energy Council) •CertifHy •KnowHy

4.3 Environmental aspects

Hydrogen has the potential to become a key component of a renewable and sustainable energy system of the future. As a versatile energy carrier and a fuel that could be extensively used in the near future. Hydrogen can be produced using a variety of primary energy sources, from water or directly from hydrocarbons (like biomass and fossil fuels). It has the advantage that it can be transported, stored and used in a number of energy applications (power generation, distributed as residential CHP, transportation etc.). Power to Hydrogen and Power to Power related technologies present a huge potential for Europe in light of decarbonisation and lower import dependency scenarios.

CEN-CENELEC/TC 6 supports the efforts of CEN Environmental Help Desk. CEN-CENELEC/TC 6 will make use of all relevant and known information on environmental aspects, including CEN Guide 4 „*Guide for addressing environmental issues in product standards*“.

The new standards developed with the work of CEN-CENELEC/TC 6 can have an important role in the decarbonisation path for Europe. Hydrogen may enable the storage of energy from renewable sources that are intermittent, and may be added to natural gas and injected into the gas grid, for use as fuel for transports, heating, gas power stations or used as (energy carrier) fuel in several applications e.g. FCEVs (fuel cell electric vehicles). Hydrogen burns clean in internal combustion engines. Hydrogen emitted in the atmosphere causes no environmental damage and applications become free of local emissions. The energy can phase out fossil (polluting)sources of energy.

5 FACTORS AFFECTING COMPLETION AND IMPLEMENTATION OF THE CEN-CENELEC/TC 6 WORK PROGRAMME

The following factors could negatively impact the completion and use of the CEN-CENELEC/TC 6 committee's standards:

- expert resources are not sufficiently available for certain projects;
- expert resources are lacking due to participation in other TC’s;
- specific expertise for a project is lacking, which could affect the project’s development;
- late delivery of results of pre-normative research for certain projects;
- overlap with the interest or the work of other bodies;
- impossibility of reaching consensus on the subject due to conflict of interest by various stakeholders;
- lack of involvement /interest by the wide user community;
- legal/regulatory issues such as uncertainties regarding a possible EC Directive, which in turn may necessitate modifications of the content and target dates for projects in the work program.

Resources and motivation of all interested stakeholders are crucial factors for the implementation and the completion of the standardisation program. Due to the growing interest to and importance of hydrogen, it is expected that the necessary resources and expertise will be available in the coming years. Work is also greatly dependent on the EU legislation, which can be considered to define certain limits and requires cooperation with the European Commission.