Technical Programme

Material Safety in the Hydrogen Economy

ENERGY IS US

Individual success through exchange of experience
vgbe energy

Essen, April 2024

Inhalt

1 Motivation

The energy supply of the future will be sustainable, environmentally friendly, secure and economical. The expansion of renewable energies is therefore one of the central building blocks of European climate and energy policy. Along with the increasing need for flexibility in the energy system, hydrogen is considered a key technology of the future.

In order for hydrogen to make a significant contribution to decarbonization, the entire value chain - production, storage, transport and usage - must be taken into account.

Materials technology is an important cross-cutting topic, as hydrogen poses specific challenges. Molecular hydrogen accumulates on steel surfaces and dissociates there to atomic hydrogen. This penetrates the microstructure of steels. This accumulation of hydrogen in the metal structure leads to a change in the material properties. This results in hydrogen embrittlement of the material, a reduction in service life and possibly even failure of the component. For this reason, the choice of materials for applications with hydrogen is limited; when retrofitting existing plants, a thorough assessment of the used materials should therefore be carried out regarding type and condition. This also applies to sealing materials, as hydrogen penetrates plastics to an even greater extent as steel.

To ensure that the open questions in materials technology on the subject of hydrogen are dealt with as successfully and solution-oriented as possible, the technical program (TP):

"Material Safety in the Hydrogen Economy"

was set up.

The content of the program is handled by a Steering Committee (SC) at vgbe energy e.V., whose tasks are listed in more detail in Chapter 2.

The administration work of the TP is carried out by the vgbe office, whose tasks are described in Chapter 4.

2 Steering Committe (SC)

At vgbe, topics related to materials in connection with hydrogen are bundled in this technical program. Other vgbe committees will not consider these topics in this level of detail.

All companies participating in the TP can appoint a representative to the SC. The following content is discussed and developed in the SC:

- Further development of the TP roadmap, see Table 1,
- Identification of technical trends and developments,
- Discussion and evaluation of technical issues,
- Creation of priorities for new topics,
- Collection of topics via the existing network,
- Providing technical input and managing the selection of topics with regard to duplication, synergies and synchronization with the market ramp-up,
- Development of technical projects.

Prior to this, a group of experts discussed topics that could be implemented as technical projects over the next few years. The draft roadmap can be found in Table 1:

Table 1: Draft roadmap for possible hydrogen projects

Year End of processing	Topic
2025	• Temperature dependent sensitivity window • Create a gap list from literature review • Lifetime reduction of components due to conversion to hydrogen • …
2026	• HyPower (Development of Cost-Effective Testing Methods for Assessing Material Performance in Hydrogen Containing Environments focusing on Power Plant Applications) • SurfAge (Surface Influence on Hydrogen Embrittlement) • NDT methods for hydrogen induced crack detection • When is material design really important for hydrogen? • Projects on the topic "Gas turbine" • …
2028	• Life cycle concepts (changes due to hydrogen) • Are the same locations at risk of hydrogen cracking as without hydrogen? • Thermodynamic data of hydrogen absorption • …
2030	• Armour-plating, wear protection, ... • Influence of multiaxiality (specimen geometry) under hydrogen loading • Composite materials • Coatings against hydrogen (IFAM) - diffusion barriers or protective coatings • …

3 Benefits for TP members

The Participation in the technical program offers a variety of advantages, such as

- Reduced rates to participate in technical hydrogen projects in the field of materials at vgbe,
- Participation in the Steering Committee,
- Direct and rapid flow of information on new developments and projects,
- Receipt of information on developments in ongoing technical projects,
- Active use of vgbe's national and international network of experts
    - Professional exchange with experts,
    - Easy access to potential project partners,
- Implementation of projects with several partners
    - Cost reduction,
    - Exchange of experts,
    - Direct influence on the projects, such as
        - Project description,
        - Definition of project objectives,
        - Project implementation,
        - Selection of contractors,
- Formation of a strong community of interest,
- Compliance of the "Code of Conduct" by the association vgbe energy e.V..

4 Responsibilities of the vgbe office

The tasks of the vgbe office are defined as follows:

- Contact for topic suggestions and project ideas,
- Project coordination
    - Preparation of offers for technical projects,
    - Checking for possibilities of public funding,
    - Funding organization,
    - Contact for the commissioned research institutes,
    - Monitoring of schedules,
    - Monitoring of cost plans,
    - Coordination of project meetings,
- Organization of the Steering Committee
    - Coordination of SC meetings,
    - Preparation of minutes,
    - Provision and maintenance of the vgbe eNet,
- Monitoring of current technical developments and market trends,
- Organization of interested groups for various topics.

5 General conditions

5.1 Time frame

The technical program starts in 2024 and runs for 3 years.

It is generally possible to join the TP at a later date.

5.2 Conditions of participation

Both vgbe members and non-vgbe members are eligible to participate in the technical program.

vgbe members pay a reduced participation fee.

The language of the TP is English (German optional).

6 Participation fee

The annual costs of the technical programme amount to

5.000,--€, plus 19 % VAT for vgbe members,

or.

7.500,--€, plus 19% VAT for non-vgbe members.

The programme will be realized if at least 5 companies participate.

7 Compliance

vgbe energy, the contractual partners of vgbe energy related to this Technical Programme and participating companies are committed to fair business practices and reject any form of corruption and bribery. On the basis of this understanding, vgbe energy, the contractual partners of vgbe energy and the participating companies undertake to strictly adhere to their respective internal compliance rules and compliance procedures as well as the legal anti-corruption regulations. vgbe energy, the contractual partners of vgbe energy and the companies involved and their employees therefore commit themselves neither to offer, promise or grant unauthorized advantages of any kind nor to demand, promise or accept them in connection with the conclusion and execution of this contract as well as the resulting contractual relationship. vgbe energy, the contractual partners of vgbe energy and the companies involved also expect third parties involved in the execution of this contract to behave accordingly and undertake to inform them of compliance with the law.

8 Contact person

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Registration form for participation in the technical programme of the vgbe energy e.V.

Technical programme	**„Material safety in the hydrogen economy“**
Company:	
Name:	
Function	
Address	
Phone:	
E-Mail:	
Other Remarks:	

With my signature, I declare my binding willingness to participate in the above-mentioned technical program with an annual financial contribution of € 5,000 (for vgbe members) or € 7,500 (for non-vgbe members).

Place, Date

Signature

Place, Date

Signature

Please send the completed form to: **jens.ganswind@vgbe.energy**

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