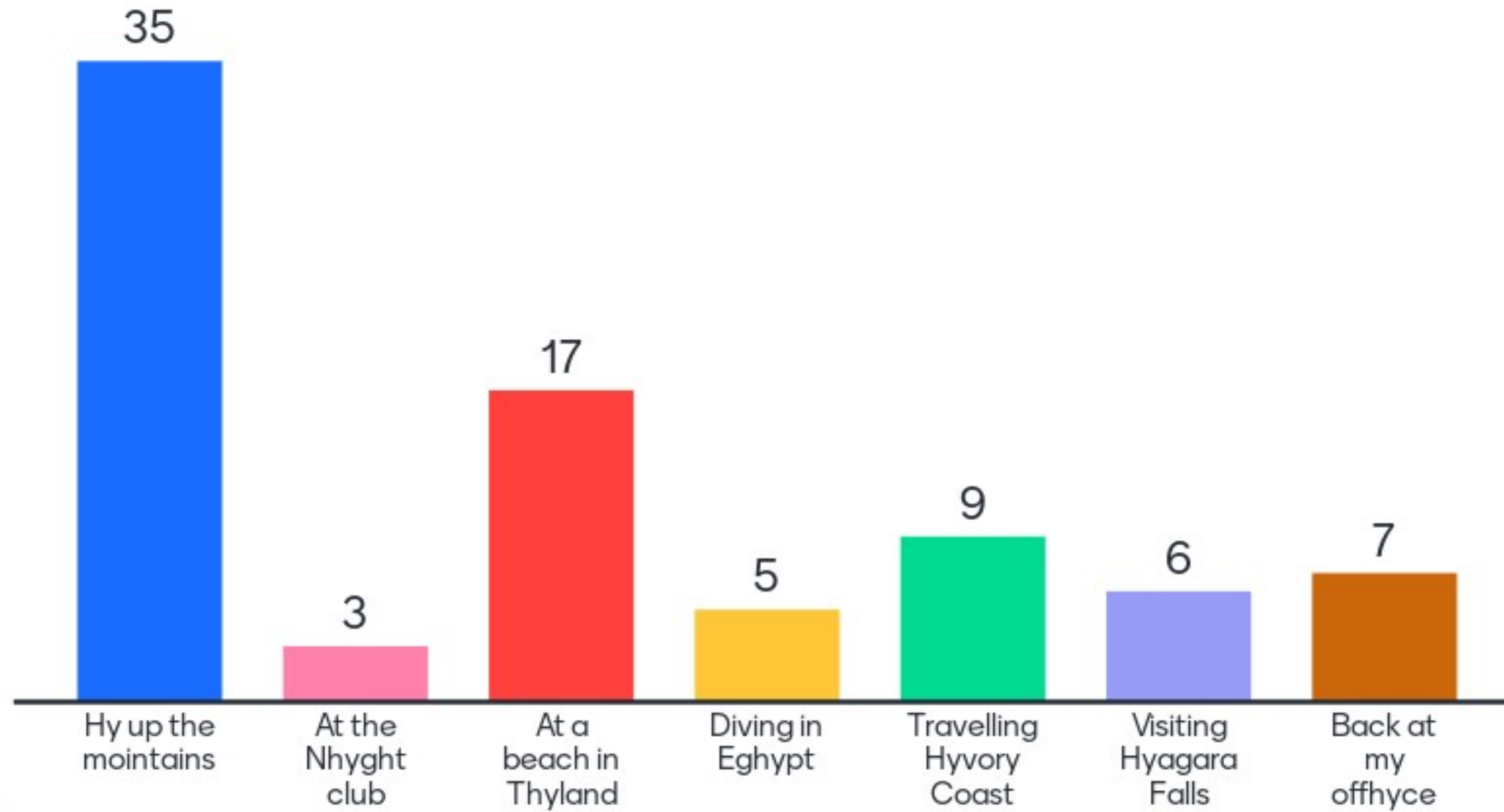


Warm-Up Question: In times of travel restrictions – where would you love to be right now?



What type of organization do you represent?



Appliance
Manufacturer



Gas industry



Association

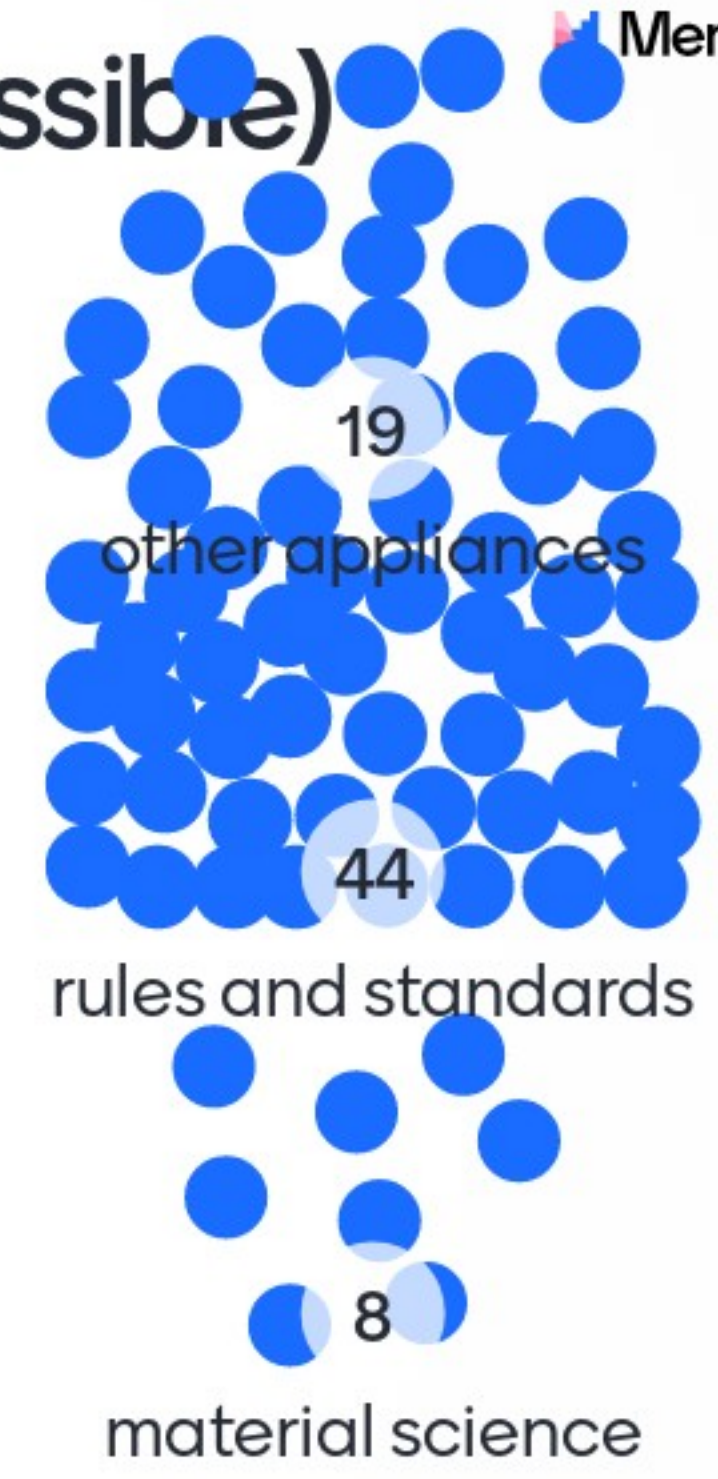
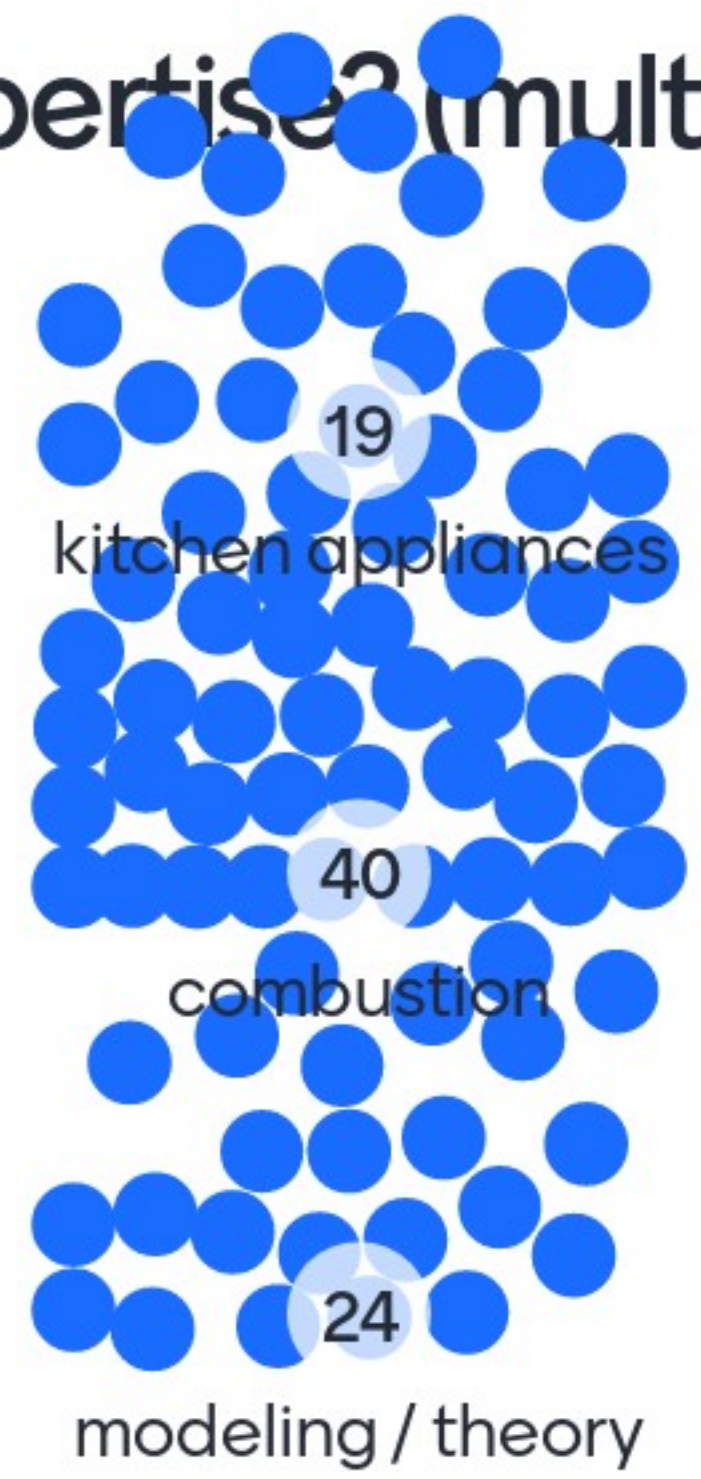


Academical

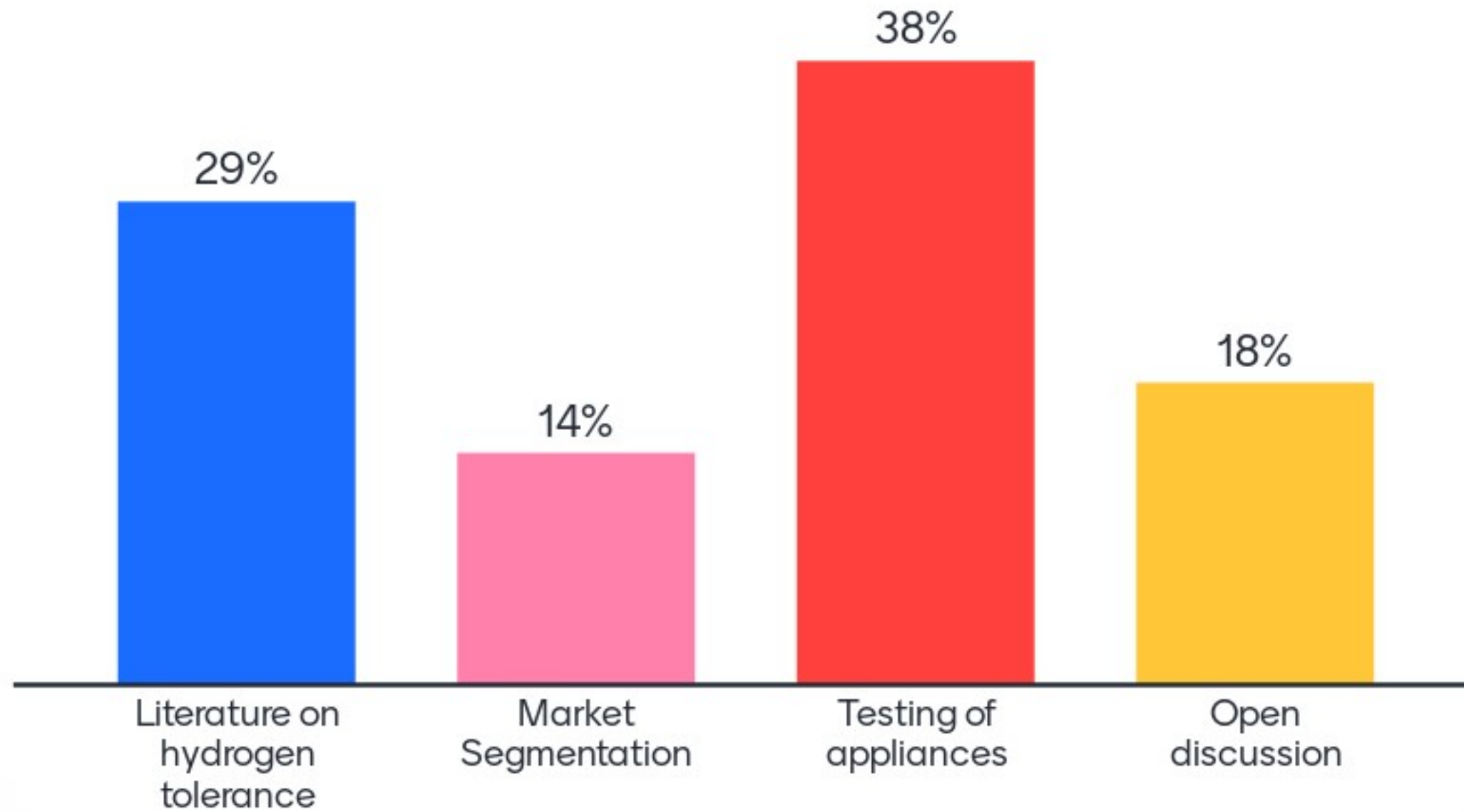


Other

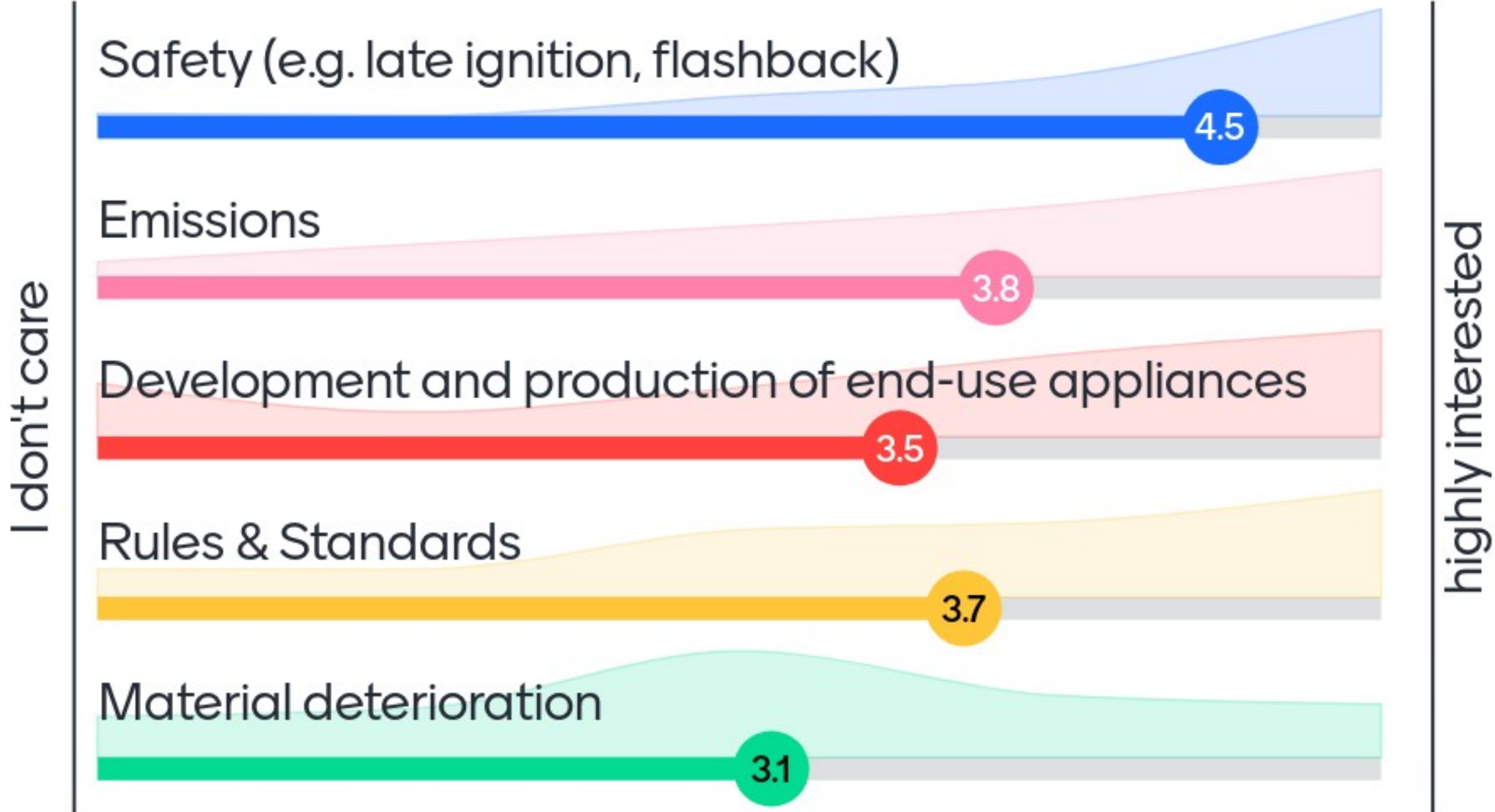
What is your field of expertise? (multiple possible)



Which part of the Workshop are you most interested in?



Which of the following aspects interest you the most?



What excites you most about the potential of hydrogen use in domestic or commercial appliances? (multiple answers possible)

Make the gas green

Emission reduction

Development and application of new technologies

Broad decarbonization of the building sector

Flexibility for renewables

REDUCTION OF THE CARBON FOOT PRINT

decarbonisation of heat

Reliability of products

Ensuring the flame in cooktop appliances is visible



What excites you most about the potential of hydrogen use in domestic or commercial appliances? (multiple answers possible)

The green future for gas industry and the local production of fuels in our countries

More hydrogen in grid

integration of variable renewables

Developing new combustion systems to accommodate a wide variation in gas quality

emission reductions

Lowering emissions

accelerate the energy transition for non-electric sector

gas cooking appliances gaining market towards electric cooking appliances

The reduction in emissions - net zero capability



What excites you most about the potential of hydrogen use in domestic or commercial appliances? (multiple answers possible)

Go green! Possibility to explore new market.

brings changes to the energy system

Market application

Good for environment - Exciting new project.

as an individual the impact on reducing our impact on climate change

reduction of CO2

To secure the future of the gas industry by decarbonising gas

Meeting the decarbonization goals

Reduce CO2



What excites you most about the potential of hydrogen use in domestic or commercial appliances? (multiple answers possible)

energy systems integration

decarbonisation

It gives a chance to these appliances also in the future with green energy

Greening the gas grid

Emissions/ renewable gas

The potential of a 100% green gas in the future with biomethane + H₂

clean energy, CO₂ reduction

Decarbonisation

Make the gas green

What excites you most about the potential of hydrogen use in domestic or commercial appliances? (multiple answers possible)

Alternative energy

The Potential to leverage the existing gas grid

Reduce emissions

Supporting lower GHG emission reduction

Hydrogen is a future solution to ensure sustainability and future for uses.

What will be the requirements for components, e.g. gas valves?

Greening the gas

That H₂ for heating can offer a genuine alternative means of decarbonising heat to electric heat pumps (where it makes sense)

Is it the answer to the decarbonisation and long term use of secure energy supply



What excites you most about the potential of hydrogen use in domestic or commercial appliances? (multiple answers possible)

Decreasing of CO2

That this enables green power and heat all year long and full decarbonization

as a company the chance to get more opportunities

Cost-efficiency of hydrogen/methane blends for transmission pathway to carbon-neutrality

Development of new technologies and design approaches

Having no CO2 emissions at home

About the potential of green H2, the reduction of CO2 emissions and less dependance on fossil fuels

A carbon neutral energy system

Power-to-Gas/Sector Coupling, Long Term Storage, Future of Gas Grid



What excites you most about the potential of hydrogen use in domestic or commercial appliances? (multiple answers possible)

Decarbonization and emissions reduction

Hydrogen % limit in the grid

The possibility to reduce the CO2 emissions using the current gas infrastructure

Decarbonisation of heat

Decarbonisation of gas

Store electricity

Developing low NOx systems

Carbon-free energy at the point of use for a large number of users!

Retain gas appliances in a low carbon future



What excites you most about the potential of hydrogen use in domestic or commercial appliances? (multiple answers possible)

keep usage of gas in the field
maintain safety improve
combustion quality

Reduction of CO₂-emission compared to fossil fuel and money savings because of avoidance of CO₂-tax payments.

The potential to decarbonize the natural gas use and make it a sustainable energy option for our future society

Using a hydrogen blend can introduce a lower carbon gas without changing the appliances that are already in the field

Giving gas a green future.

Energy storage capability

If once for ex. 20 Vol.% of hydrogen in natural gas is accepted for installed appliances, there is an easy way to reduce CO₂ and contribute to climate protection.

How to prepare the existing market and new appliances for more and more green gas

the possibilities to keep current infrastructure of gas network with few modifications



What excites you most about the potential of hydrogen use in domestic or commercial appliances? (multiple answers possible)

Clean energy carrier

extension of using existing gas grids for 20 more years

optimal design of future energy system

As an alternative for NG

Decarbonisation

Getting gas a key partner of the energy transition

Hydrogen is a future solution to ensure sustainability and future for uses.

Continuation of Gas Appliance Market

Supports balancing the supply of electricity



What excites you most about the potential of hydrogen use in domestic or commercial appliances? (multiple answers possible)

decarbonization of heating and industrial heat

New market opportunities

Green Gas Possible replacement gas

A reduction in dependency on natural gas

For natural gas substitution, I would prefer to push bio-gas instead of H₂, because reduction of use is not that big for the probable % will be finally introduced.

Foster multi-technology and multi-energy approach

Insight into indirect cost of technology change in future decarbonisation

New market opportunity

The way away from natural gas



What excites you most about the potential of hydrogen use in domestic or commercial appliances? (multiple answers possible)

A interesting job for the years to come !!

Green gases

peak shaving for electricity

Power to gas - the potential and cost of technology implementation

Power to Gas

H2 is a good answer vs the "all electric" tendency

Where does the hydrogen come from?

Safety

knowledge of the dangerous/safety level



What excites you most about the potential of hydrogen use in domestic or commercial appliances? (multiple answers possible)

Availability of carbon-neutral hydrogen

Safety concerns in the domestic sector

Material resistance, leakage, storage. Last but not least, public opinion

Variability in H₂ concentration over time

It provides an attractive alternative to electrify everything

Network availability and public awareness of these solutions

under estimation of the risk that the end users may face using existing appliances

Condensation and NO_x

Local legislation



What excites you most about the potential of hydrogen use in domestic or commercial appliances? (multiple answers possible)

Hydrogen Production

Preferably hydrogen use in industry and mobility, heating of households comes last because most expensive option

Risk assesment for H2 dedicated appliances and longlasting political support on H2 projects

The acceptance of a certain rate of hydrogen admixture to installed appliances.

Regulation of Hydrogen Mixtures

Missing project and business development skills /resources of DSO/TSOs and innovativeness

Leakage and brittleness

Safety-related risks that only occur in long-term tests or only at the end of the service life of the applications

Methane/hydrogen admixture gas quality fluctuations



What excites you most about the potential of hydrogen use in domestic or commercial appliances? (multiple answers possible)

20%

25-30%

In contrast, what do you consider to be the foremost challenges or knowledge gaps on hydrogen use in gas appliances? (multiple answers possible)

Safety

Public perception

Hydrogen concentrations in the range 50 - 80%

Appliance Safety and reliability over time

safety issues

Flame supervision

Safety unknown with existing appliances

Developping a dedicated H2 net.

standardization of the test methods



In contrast, what do you consider to be the foremost challenges or knowledge gaps on hydrogen use in gas appliances? (multiple answers possible)

Possible obstacles coming from the huge number of obsolete gas appliances in the stock

Safety to end user. Cost

Dealing with variable H₂%-ages.

Testing of older appliances - establishing how many older appliances are in the field

supply of sufficient green/blue H₂

leakage detection.

Assessing the risks properly

Safety and Performance

Standards Safety



In contrast, what do you consider to be the foremost challenges or knowledge gaps on hydrogen use in gas appliances? (multiple answers possible)

Long-term reliability impacts

Enough production for all the consumption in 2050?

variation of H2

hydrogen has an invisible flame:
safety

Political level focus on H2 priority
for industry & transport

Safety and reliability

Safety on Higher concentrations

Safety

Cost of conversion to run on high
admixtures



In contrast, what do you consider to be the foremost challenges or knowledge gaps on hydrogen use in gas appliances? (multiple answers possible)

Cost

Provide enough H₂.

Safety

How appliances/applications will cope with important H₂ concentration variations

Life time of the appliances

safety impact, knowledge gap

safety and performance

What is more useful for the future? Old lines with only a small amount of hydrogen or costly hydrogen lines?

how to detect leak and ensure safety



In contrast, what do you consider to be the foremost challenges or knowledge gaps on hydrogen use in gas appliances? (multiple answers possible)

The more H2 content is high the more technical issues are to be solved (leakages, compatibility of Equipment...)

Transition Roadmap considering the variety of (household) appliances

Safety and performance

Switching or introduce end appliances in every household

How to deal with current appliances - especially the certification for the use of hydrogen admixtures of the existing population

Support base of consumers

Safety: flame stability, the lack of color of the flame, detection by odor...

apart from tech issues, a key challenge will be about public acceptance

variable concentrations



In contrast, what do you consider to be the foremost challenges or knowledge gaps on hydrogen use in gas appliances? (multiple answers possible)

safety for the end user

Tipping point : switching from x% of H2 to 100% of H2

Long Term Reliability / Wear and Tear Impacts

Ensuring Safety

To be able to harmonize on European level the needs and limitation of different existing appliances and to convince member states to adopt same legal decisions

Ensuring that the hydrogen / methane mix is consistent in the supply pipes. A pocket of high percentage of hydrogen could cause problems with safety or lockout

to supply hydrogen to the heating market due to ist wide range of designs and age of Installation how to provide it to the heating market on a constant level and quality

Brittleness over the long run of pipelines

Most people don't realize the necessity of seasonal storage and therefore the need for hydrogen. This 'believe' in only PV and Wind currently stalls development



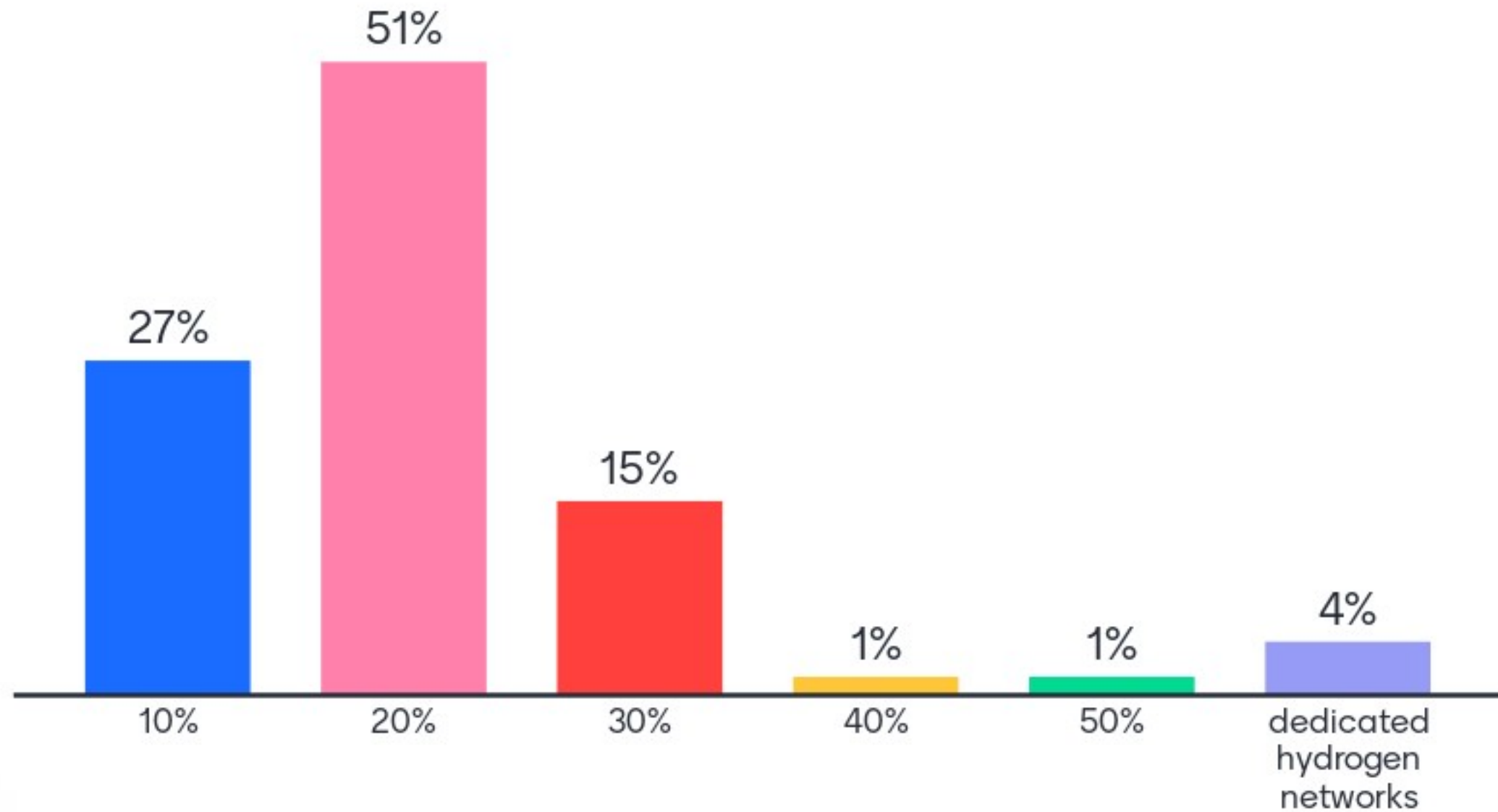
In contrast, what do you consider to be the foremost challenges or knowledge gaps on hydrogen use in gas appliances? (multiple answers possible)

The absence of control systems

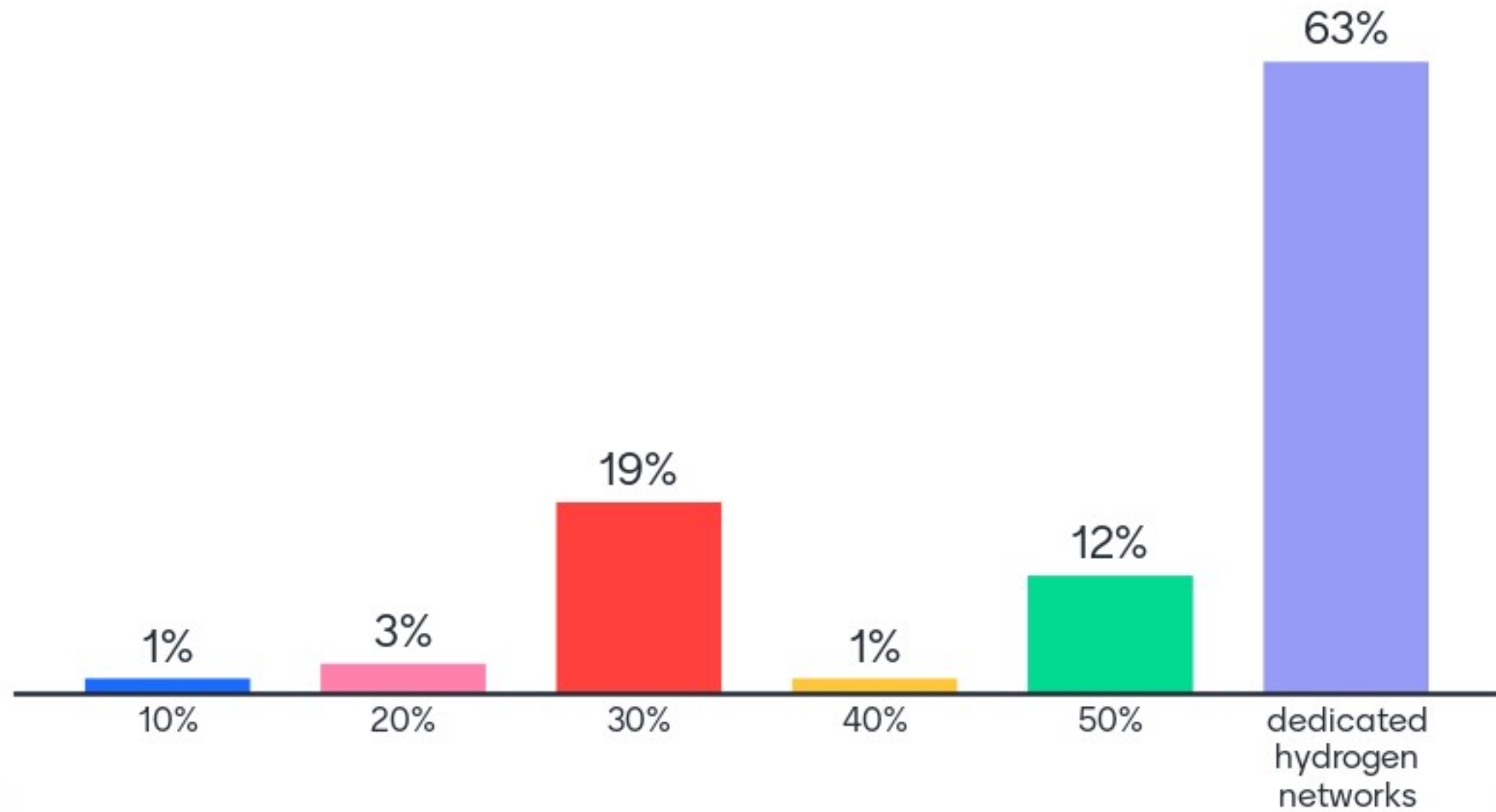
Where does the hydrogen come from?



Which level of hydrogen admixture do you consider realistic for 2030 in the distribution grids?



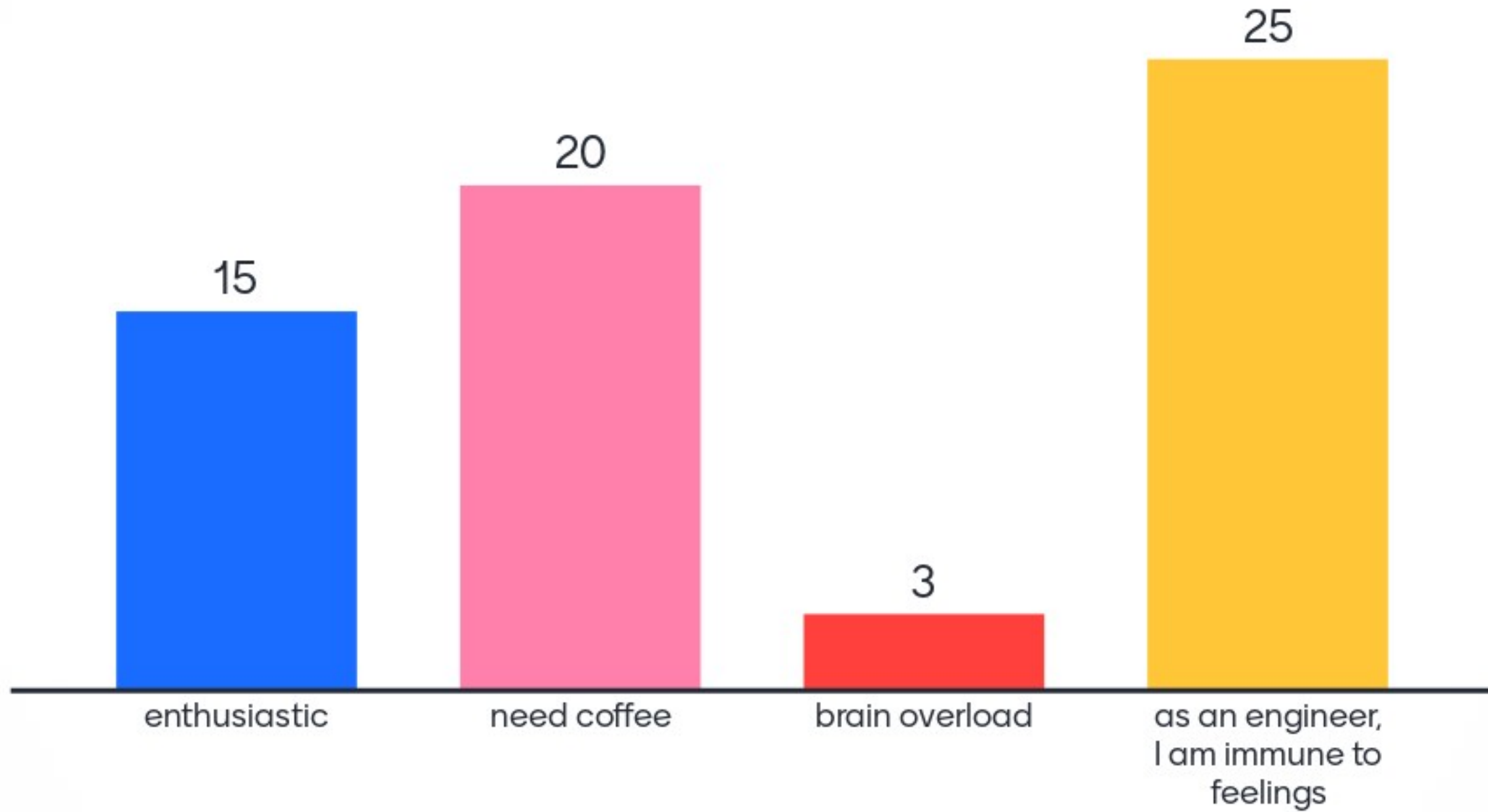
Which level of hydrogen admixture do you consider realistic for 2050 in the distribution grids?



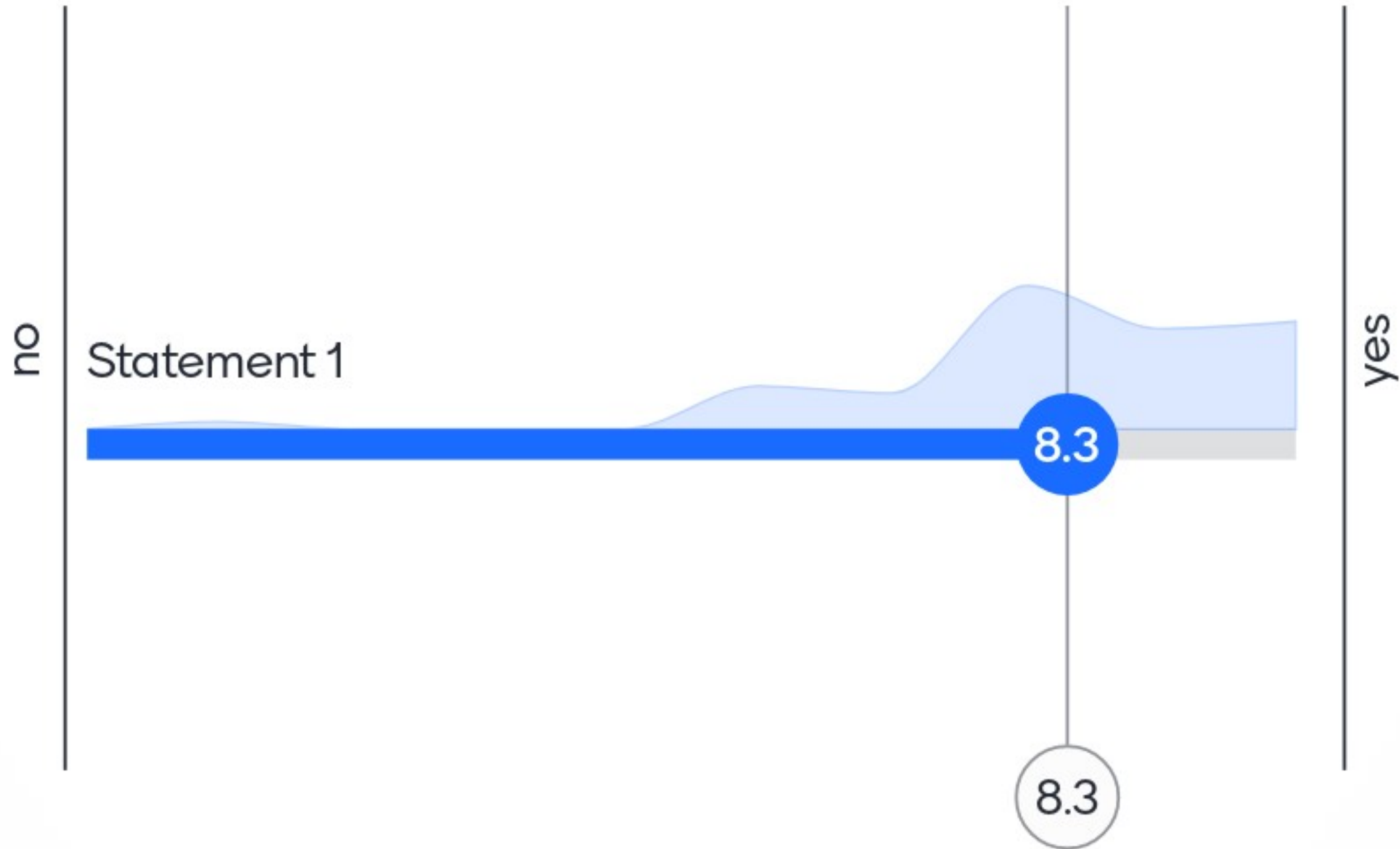
Project Feedback



Afternoon feedback session - How do you feel?



Does the THyGA consortium work in a promising direction?



Can you give specific examples of projects or research areas where collaboration with the THyGA labs could be beneficial to you?

Appliance project and development

New technology for cooking

Grhyd project

Hy4Heat

Product reliability

new standards

Component testings

Testing of combustion controls

Define official rule for H₂ injection in the gas network



Can you give specific examples of projects or research areas where collaboration with the THyGA labs could be beneficial to you?

Forthcoming CEN / GERG PNR project

equipment testing and developments for H2 mix

Investigation on flame signal variation according to the H2%

Hy4Heat

Check appliances behaviour with different ng/h2 blends

Injection project in Germany (DVGW - Avacon)

HyDeploy in the UK is doing a lot of testing and could support information on longer term tests

long term tests

Cooking technology



Can you give specific examples of projects or research areas where collaboration with the THyGA labs could be beneficial to you?

International cooperation

drafting standards

The results of the literature review and testing programme will be useful for demonstrating safety during the testing of hydrogen admixtures

setting up automatic testing equipment

Analysis of risks and impacts / others appliances like professional (many kind of product) / others kind of heating like radiants ..

Hy4heat, BlueHY project UK, and PACE, but already saw them in your sheets.

HIGGS project

New Appliance control development

Develop test procedure for future appliances



Can you give specific examples of projects or research areas where collaboration with the THyGA labs could be beneficial to you?

Development of cooking appliances suitable to work with Hydrogen mixtures, still satisfying consumer need

HyDeploy

Tests and literature for H2 blending 10-30% in natural gas pipelines and industrial facilities

HYREADY

H100

Anticipate trends with feasibility activity

Support standardisation in a horizontal way

DVGW 2050 roadmaps

H2 injection controls into Transmission and distribution networks

Can you give specific examples of projects or research areas where collaboration with the THyGA labs could be beneficial to you?

Radiant tube heaters

test on catering equipments

ErP Directive

Develop standards suitable to demonstrate safety of appliances working with Hydrogen mixtures

I am a member of the HyDeploy project and it is more advanced than this but THyGA would help to support this work and HyDeploy has a lot of evidence if we can make it available

A push for innovation

Defining the most appropriate requirements for new appliances

Impact of h2 on different boiler technologies

Future Fuels CRC appliance work (Australia)



Can you give specific examples of projects or research areas where collaboration with the THyGA labs could be beneficial to you?

Power2Gas project Rozenburg
(Netherlands)

Train the designers of products in the smaller companies,
learn the testing and handling with the right equipment

Warm Air Heaters

Transition plan proposal

appliance certification

Raise up the interest towards H2
appliances development

Today for a complete Literature
review and tomorrow for risk
assessment of a H2 appliance

Component suppliers can help
support the project

Impact on industry - p.e.
food/beverage production,
chemicals or medicals



Can you give specific examples of projects or research areas where collaboration with the THyGA labs could be beneficial to you?

Promote long term survival of gas products

knowledge of tests results done and for new testings

Many questions regarding analysis of risk / kind of appliances with different technologies / impact of H2 in the net : deadline for manufacturers?

Burner manufacturers are missing



Which aspects do you appreciate the most about the THyGA project?

collaboration

Sharing methods, data, results out of the consortium

Practical approach to the project goal.

Global project

Educational benefit and awareness of wider industry concerns and solutions

The effort to test a large number of different appliances

Innovation

Excellent coordination and information sharing

open communication



Which aspects do you appreciate the most about the THyGA project?

Collaboration

The opening to several stakeholders

Collaboration

professionalism and comprehensive approach

Long term tests

Green spirit

State of the art knowledge

Learning process for a hydrogen economy

Knowledge development and industry interaction



Which aspects do you appreciate the most about the THyGA project?

Open Communication

Actual testing of a large number of appliances

Number of appliances

Results helping standardization

Sharing results with the gas community/manufacturer

It is good that manufacturers of the appliances are involved

Complete and practical approach.

Getting aligned

Sharing results



Which aspects do you appreciate the most about the THyGA project?

Combined industry experience working together

Collaboration

Sharing results

Real tests

Knowledge and sustainability

show impact on appliances

Great coordination

wide perimeter of study

Representativity



Which aspects do you appreciate the most about the THyGA project?

Joint work among different stakeholders

Sharing data, EU level project, systematical approach on literature review

liaisons; information exchange

Excellent Project Management!

Commercial appliances included

Integrating existing appliances

Practical approach will provide state of the art position regarding H2 intro

Obtain working limits of appliances

stress testing to the foreseeable limits



Which aspects do you appreciate the most about the THyGA project?

Transparent communication

Good approach

Good structured analysis approach

The European collaboration with integration of manufacturers.

Clarity and openness

Cooperation with stakeholders

a specific point on how to make the way to microCHP and Fuel Cells

a clear view on the safety margin between the operating range and the test range

More discussion on the H2 limits in steel pipe lines



Which aspects do you appreciate the most about the THyGA project?

How the results of the project will be actually taken up for the certification

gas metering and calculations
billing ?



Which aspects do you miss in the THyGA project so far? What is your advice for us? (Multiple answers allowed)

Study how to get an approach to retrofit existing appliances

Radiant and warm air heaters

Clear direction of H2 evolution among many different scenarios

Knowing which existing Appliance will be effectively tested

hybrid HPs

Be strong. We love you !

Continue to share the project status and results.

You should downbreak on components level as well.

More collaboration with component suppliers especially on historical designs



Which aspects do you miss in the THyGA project so far? What is your advice for us? (Multiple answers allowed)

provide slides of today, so we can talk to our contacts

Remember these are volume percentages in the fuel - the CV difference means that most of the energy is still in the NG. We need to go to higher percentages, and sooner.

Large commercial/Industrial appliances

The gathered feedback (which had to be send in prior to 17th of April) on the proposed test procedure.

Involve more different gas users outside residential appliances. They will also be impacted by H2 blends

Summary of national approach regarding H2 intro for the medium and long term

Advice: Concentration on the most realistic szenarios, eg. about 20 Vol.% H2 well adjusted, installed appliances in the field

No cakes at the meetings

Number of appliance tested per segment

Which aspects do you miss in the THyGA project so far? What is your advice for us? (Multiple answers allowed)

Further tests with higher H2 blending %, and with high pressure pipelines, underground H2 storage and industrial applications

At the end, please think about which will be the best compromise between injecting H2 in grids and adapting products ?

H2 beyond 60%

Not to measure with the same gas (e.g. 100% methane)

Check possible interaction of hydrogen with NG impurities during combustion

Research on public perception (but that's something for a different project, not necessarily THyGA)

I miss testing of fuel cell mCHP, or budget to do this. Big OEM's can easily give a boiler for testing, which costs them some hundreds of euro's. We however as a startup can't give a 25k unit for testing although it would certainly add to the project

My son (on my knees right now) loves Hydrogen thanks to you

Translation of the results into 'legislation' for Member States to allow for a certain percentage hydrogen in the current population of appliances



Which aspects do you miss in the THyGA project so far? What is your advice for us? (Multiple answers allowed)

At the end give an overview of the need for replacing old appliances

A summary of product type - table and then the product selected to cover the type of products in that category - this could be by burner type

Will Covid19 have an impact on our activities?

If you need new engineers after the booom, let me know

A specific point on how to make way to microCHP and fuel cells

Distribute the slides of today



Before leaving: Would you recommend the THyGA Project to your colleagues (the ones you like)?

