



# HYACINTH

FCH JU → SPI-JTI-FCH.2013.5.3

HYdrogen ACceptance IN the Transition pHase

Informe de aceptación Stakeholders

*Informe de aceptación de las tecnologías de hidrógeno  
y pilas de combustible en "Stakeholders"*

*09/05/2017 Madrid, España*

*Gema Alcalde, CNH2*



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**1. INTRODUCTION**

**2. METHOD**

**3. STAKEHOLDER SURVEY-RESULTS**

**4. STAKEHOLDER INTERVIEWS-RESULTS**

**5. CONCLUSIONS**

## HYACINTH: Specific objectives

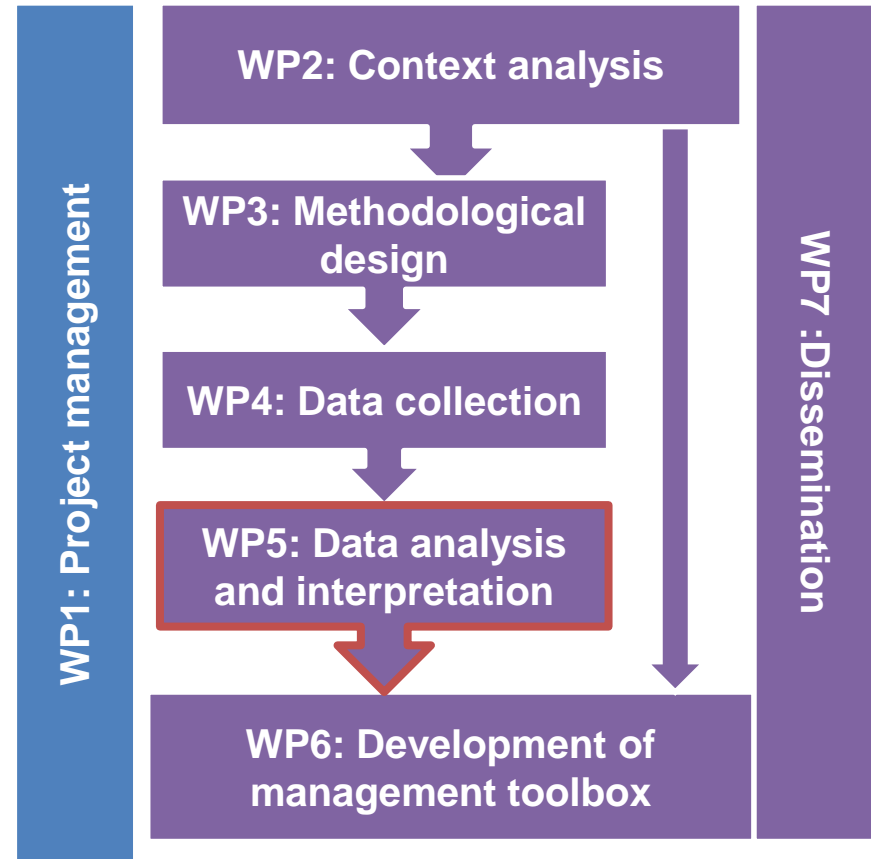
- Identify and understand awareness and **acceptance of FCH technology** and perceive potential benefits in the general public and **at selected stakeholders.**
- **Identify the main drivers of social awareness and acceptance** of FCH technologies in order to provide recommendations.
- **Support stakeholders** by providing a social acceptance research **toolbox.**



## WORK PACKAGES- WP 5: Data analysis and interpretation

– **WP5 “Data analysis and interpretation”**, will analyze the information gathered from WP4 alongside with information from WP2 to obtain **two studies**: one for the **general public awareness and acceptance** of hydrogen and fuel cell technologies and the second one for the **stakeholders acceptance**. The information obtained **will feed the information** treated in the **toolbox** (WP6).

**D.5.1. Report on results of Stakeholder Survey: Report on results of the qualitative and quantitative Stakeholder survey.**



### DESIGN METHODS

	SURVEY	SEMI- STRUCTURED INTERVIEWS
Participating countries	France, Germany, Spain, Slovenia and United Kingdom	
Time period	March and June 2016	November 2015 to June 2016
Total sample	333 participants	145 interviews
Recruitment	Invitations were sent by the project partners in each country.	Interviews were conducted by the partners in each country.
Sampling	Energy stakeholders and hydrogen experts	Stakeholders from hydrogen and fuel cell projects
Procedure	The stakeholder survey was conducted using national versions of an online questionnaire.	Interviews were conducted by phone; (some face-to-face). The interviews were conducted in the local language and lasted around 30 minutes.
Data Analysis	The data was analyzed using SPSS software.	Qualitative data has been coded with MaxQDA.

# DESIGN METHOD STAKEHOLDER SURVEY

**1. How do you feel about FCH Technology as a possible solution for energy and environmental challenges?**

**2. What are your expectations regarding the medium-term (5-10 years) market implementation in your country**

**3. Governments and companies in [country] should support the transition to hydrogen technologies**

### 4. Application chosen by participants

**STATIONARY APPLICATION:  
94 participants**

**MOBILE APPLICATION:  
239 participants**

5.1. Respondents' familiarity

5.2. Respondents' familiarity

6.1. Challenges to deployment

6.2. Challenges to deployment

7.1. Aspects regarding stationary Applications. Competing tech.

7.2. Aspects regarding stationary Applications. Competing tech.

8.1. Drivers for stationary applications

8.2. Drivers for stationary applications

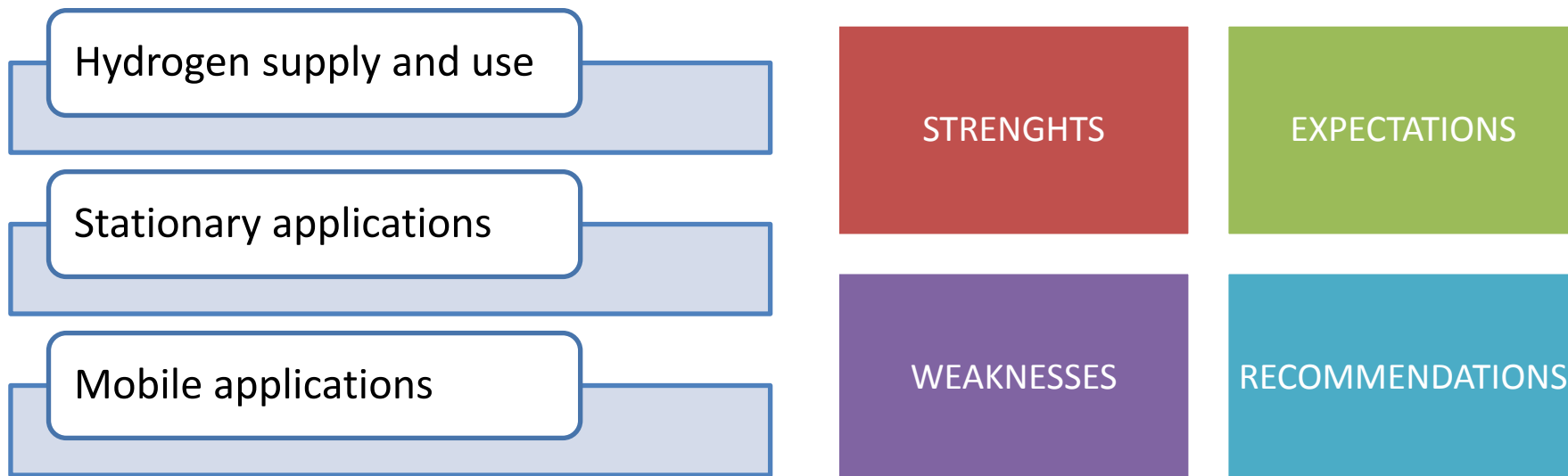
9.1. Public funding should be used to...

9.2. Public funding should be used to...

10 & 11.1. Familiarity and Attitude

10 & 11.2. Familiarity and Attitude

# DESIGN METHOD STAKEHOLDER INTERVIEWS



For the applications **Hydrogen supply and use**, **stationary applications** and **mobile applications**, we asked for perceived strengths and weaknesses, expectations and finally recommendations.

## STAKEHOLDER SURVEY-METHODS

- **Survey content:**
  - Innovation systems rationale: successful technologies require stakeholder alignment
  - Stakeholder perceptions of hydrogen technologies
  - In-depth evaluation of either
    - Small static hydrogen fuel cell applications
    - Hydrogen fuel cell electric vehicles (FCEVs)
  - Perception of other actors in the innovation system
  - Factors influencing future market development



- **Questionnaire survey during spring 2016**
- Population: **selected stakeholders in 5 countries**
- Implementation: **Online questionnaire** (by Norstat)

### 3. STAKEHOLDER SURVEY- METHOD AND RESULTS

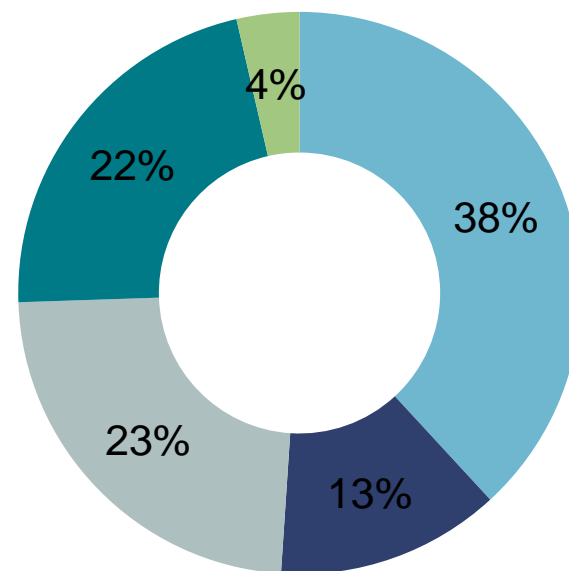
#### STAKEHOLDER SURVEY - SAMPLE

Invitations to take part in the survey were sent to participants by the project partners in each country. In total, 944 stakeholders were contacted by the project team, resulting in a sample of 333 participants

	Completes	<i>in % from Started</i>	<i>in % from Contacted</i>	Started	<i>in % from Contacted</i>	Contacted	Share within sample %
DE	127	63	48	202	76	265	38
UK	43	57	33	76	59	129	13
ES	78	60	38	129	63	204	23
FR	72+1*	61	24	118	40	294	22
SI	12	55	23	22	42	52	4
<b>Sum</b>	<b>332+1</b>	<b>61</b>	<b>35</b>	<b>547</b>	<b>58</b>	<b>944</b>	<b>100</b>

\* In France one additional incomplete questionnaire which was nearly complete was added to the final data set.

#### Participants by country



■ DE ■ UK ■ ES ■ FR ■ SI

### 3. STAKEHOLDER SURVEY- METHOD AND RESULTS

## STAKEHOLDER SURVEY - SAMPLE

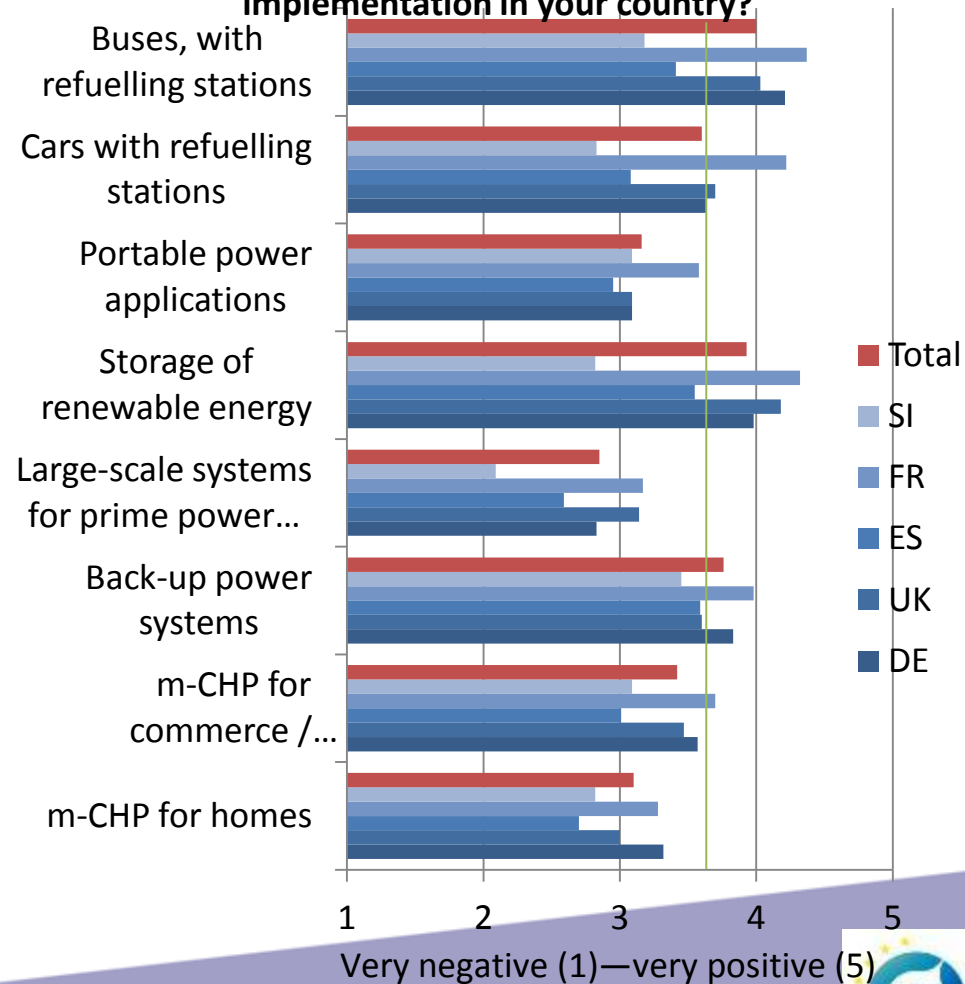
	Frequency	% of sample	DE	UK	ES	FR	SI	
Research on hydrogen and/or Fuel Cells	175	52,6	80	9	48	35	3	
Fuel cell developer or manufacturer	47	14,1	26	4	15	1	1	
Hydrogen production	98	29,4	32	7	37	22		
Professional services provider	60	18,0	29	7	12	12		
Policy development and program administration	61	18,3	28	14	7	10	2	
Car manufacturer / OEM	16	4,8	12	1	1	2		
Systems integrator	84	25,2	42	3	25	11	3	
Education, safety and training	57	17,1	21	6	16	13	1	
Fuel cell user	49	14,7	24	7	13	5		
Hydrogen storage	51	15,3	21	4	16	10		
Service station operator	22	6,6	14	2	2	4		
Supplier to developer or manufacturer	11	3,3	2	2	2	5		
Commercialization support	25	7,5	8	6	7	4		
Fuel cell distributor or agent	8	2,4	3		3		2	
Hydrogen distribution	15	4,5	3	4	4	4		
Other	45	13,5	14	11	9	8	3	

- Heterogeneous affiliations: **Figure: Fields of work / expertise of participants**
  - Around **33% from private companies** (49% FR and 67% SL)
  - Around 15% from public and government organisations, education and other non-profit (DE, SP).
- Plenty of experience:
  - **>25% have 11+ years of work experience**
  - >21% 5-10 years of experience
- Different fields of expertise: multiple answers were allowed:
  - **>50% work in research**
  - 30% on H2 production
  - 25% in systems integration

## STAKEHOLDER SURVEY – GENERAL QUESTIONS

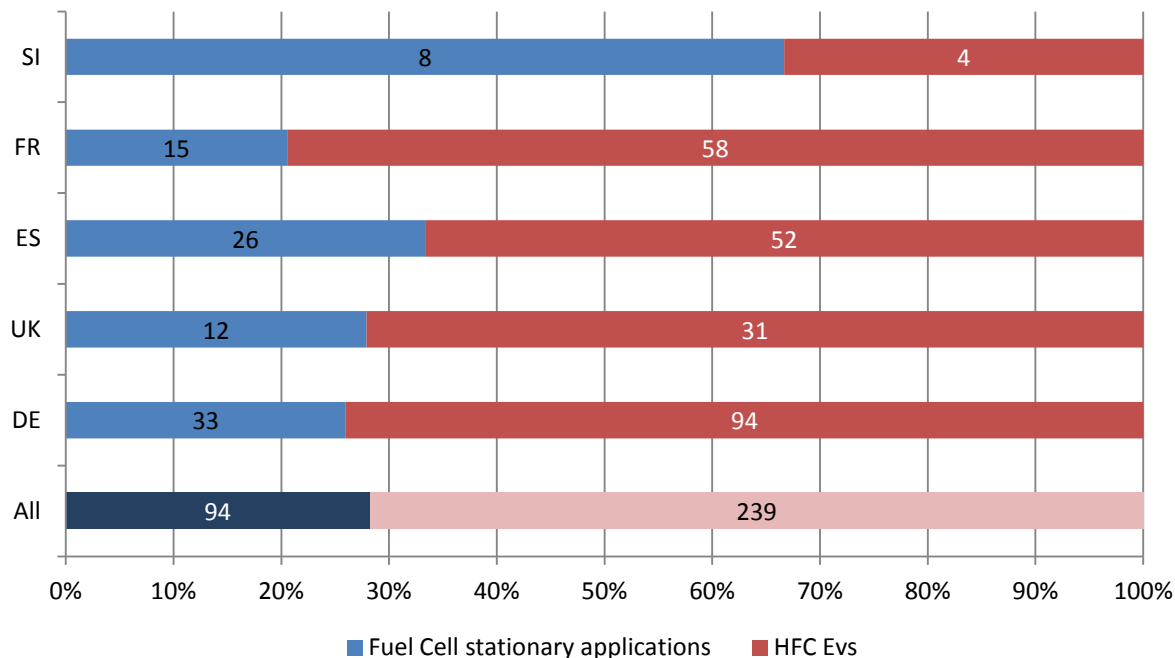
- 88 % think that FCH are a good or a very good solution for energy and environmental challenges (no country differences)
- Most positive future expectations about H2-buses and H2 as a means of storage for renewable energy
- Respondents are in favour to further governmental support for FCH technologies

What are your expectations regarding the medium-term (5-10 years) market implementation in your country?



## STAKEHOLDER SURVEY – APPLICATION CHOSEN BY PARTICIPANTS

If the choice of FCH application is related to the respective evaluation regarding the medium-term market implementation it turns out that participants rated the application they chose significantly more positive than the one not chosen (tested by ANOVA).



This means that on average respondents who answered the questions either about stationary applications or FCEVs hold more positive views on them.

Figure: Application chosen by participants

## ■ Mobile applications



- **Most challenging:** providing refuelling points followed by costs
- **Less challenging:** safety
- They favour FCEVs over other drivetrains / fuels. The highest competition → battery electric vehicles
- Public funding: Support for research and development and providing infrastructure is most important; demonstration project and subsidies for vehicles less relevant.
- Professionals from the same sector and researchers are perceived as most familiar, the public's familiarity lowest.

## ■ Static applications



- **Most challenging:** cost disadvantages
- **Less challenging:** safety issues and technological maturity.
- Public acceptance, regulatory issues
- Support for research and development is favoured over funding for demonstration project and subsidies on purchase prices.
- Professionals from the same sector and researchers are perceived as most familiar, the public's familiarity lowest.

## ■ Factors influencing ratings of future market deployment

- For **stationary applications**:
  - Competition of renewable electricity and heat technologies
  - Implementation of air quality regulations
  - Development of business models for H2 distribution infrastructure
- For **FCEVs**:
  - Competition from alternative technologies
  - Competition from full electric cars as well as CNG / LNG cars
  - Perceived attitudes of professionals from the same sector and from actors from the automotive sector

### 3. STAKEHOLDER SURVEY- METHOD AND RESULTS



## Static applications

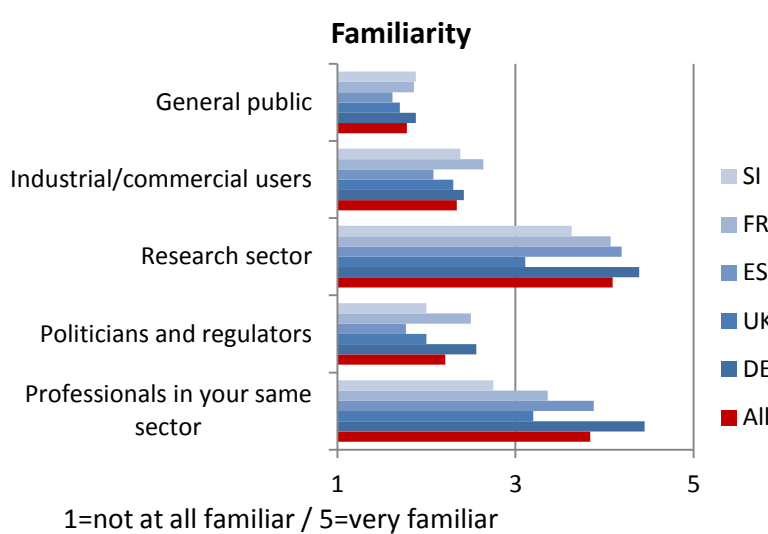


Figure : Familiarity of other societal stakeholders with stationary applications

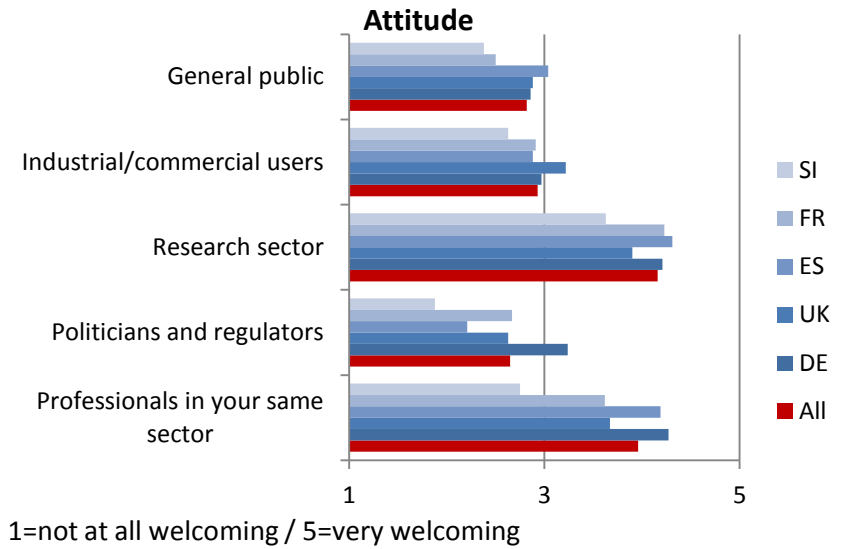


Figure: Attitudes of other societal stakeholders towards stationary applications

## Mobile applications

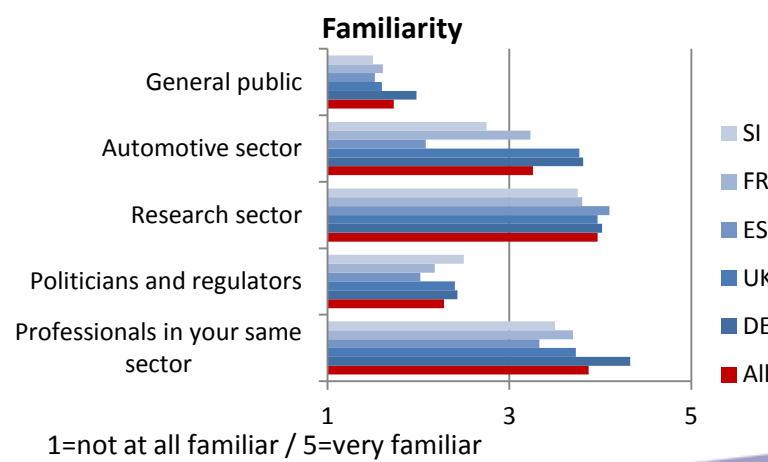


Figure: Familiarity of other societal stakeholders with FCEVs

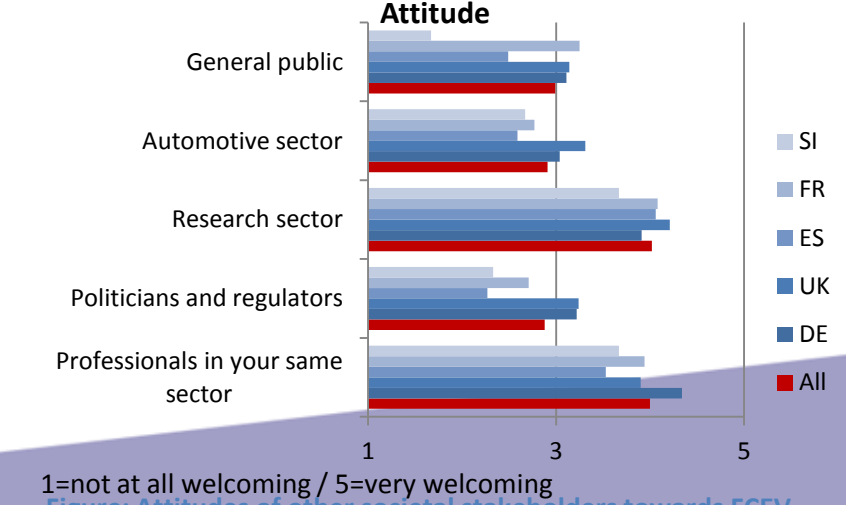


Figure: Attitudes of other societal stakeholders towards FCEV

### STAKEHOLDER ACCEPTANCE STUDY

#### ■ Interviews template

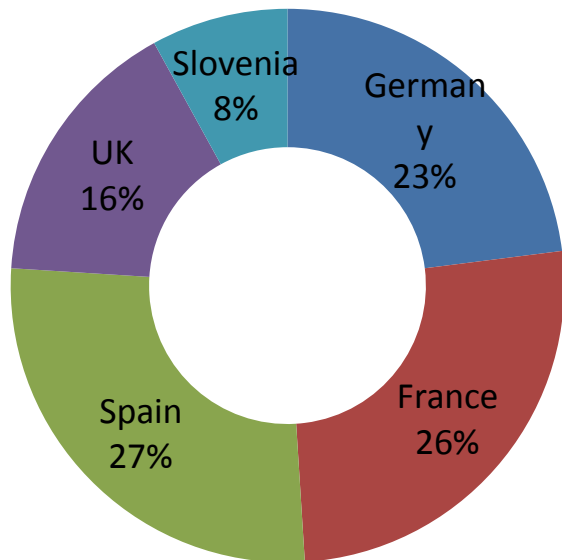
- Project initiation and overview.
- Evaluation of the hydrogen application, acceptance and support.
- Expectations regarding the future adoption of the specific technology/application.
- Recommendations for advancing use of the technology.



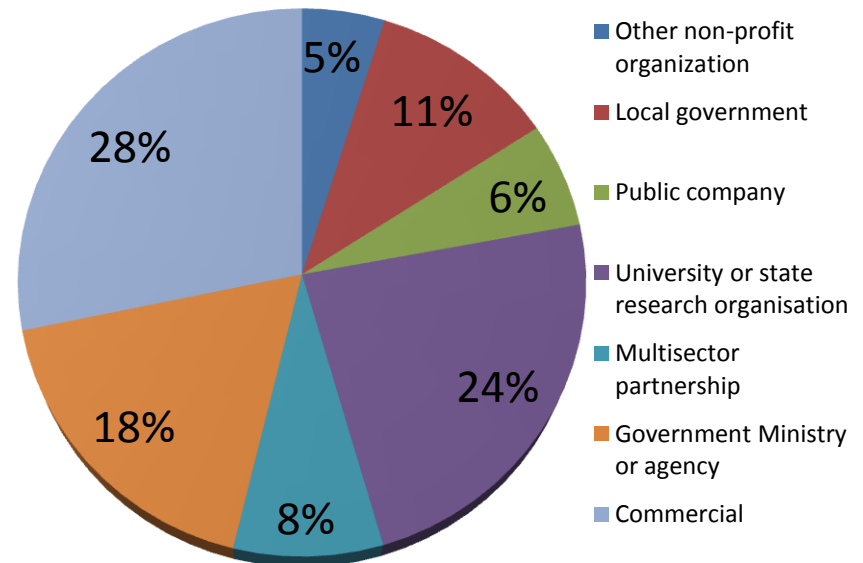
- **Semi-structured interviews** between November 2015 and June 2016
- Population: **selected stakeholders in 5 countries**
- Implementation: **telephone or face-to-face interviews**, recorded and summary transcripts

## 4. STAKEHOLDER INTERVIEW- METHOD AND RESULTS

Interviewee percentage by country



Interviewee percentage by affiliation

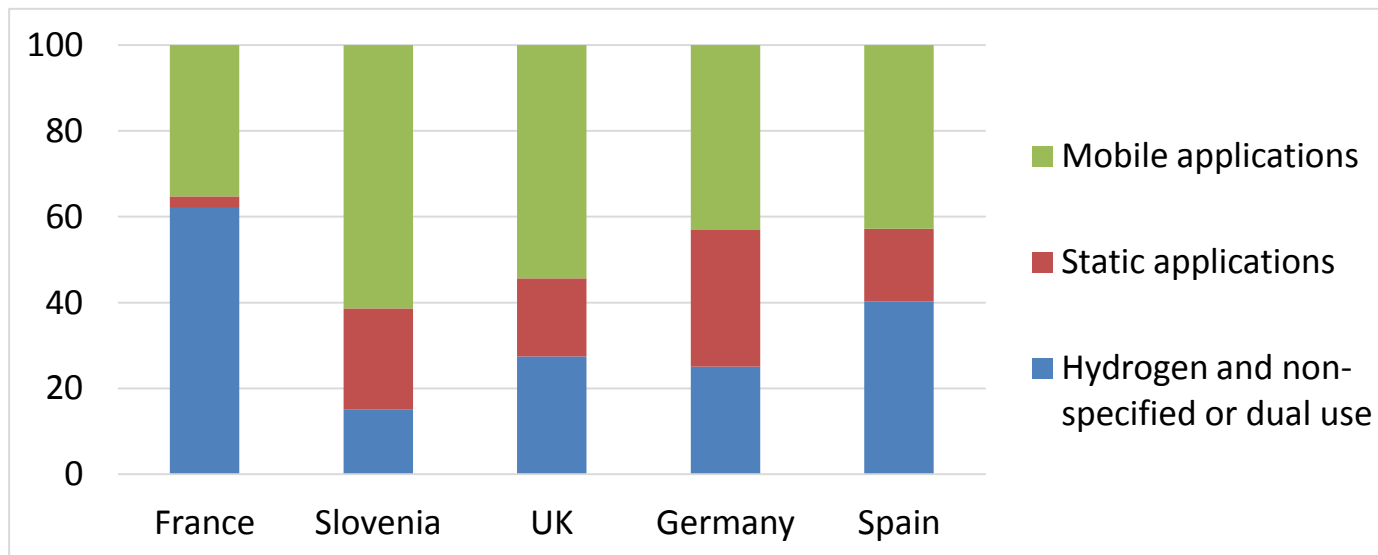


## 4. STAKEHOLDER INTERVIEW- METHOD AND RESULTS

### ■ Applications of HFCs discussed in the interviews

Technology application	Percentage of comments, all interviewees
Static applications	16
Mobile applications	44
Hydrogen and non-specified or dual use	40

### ■ Percentage of comments, by application, by country



### ■ Perceptions of hydrogen supply and use

#### Strengths:

- **Environmental performance of hydrogen** (despite the scepticism of the inefficiency of combining multiple conversion processes)
- **Versatility: energy storage vector for renewable energy supply** (per se and in relation to electrical grid balancing)

#### Weaknesses:

- Cost
- Limited awareness among regulators and government
- Inadequate or excessive regulation
- Competition from alternative technologies
- Lack of commercial support and lack of markets
- Immaturity and durability
- General lack of infrastructure
- Perceived safety issues

#### Key expectations:

- Positive view: market development expected by many in the relatively near term.
- Uncertain future for hydrogen and a high degree of conditionality on government policy support.

#### Recommendations:

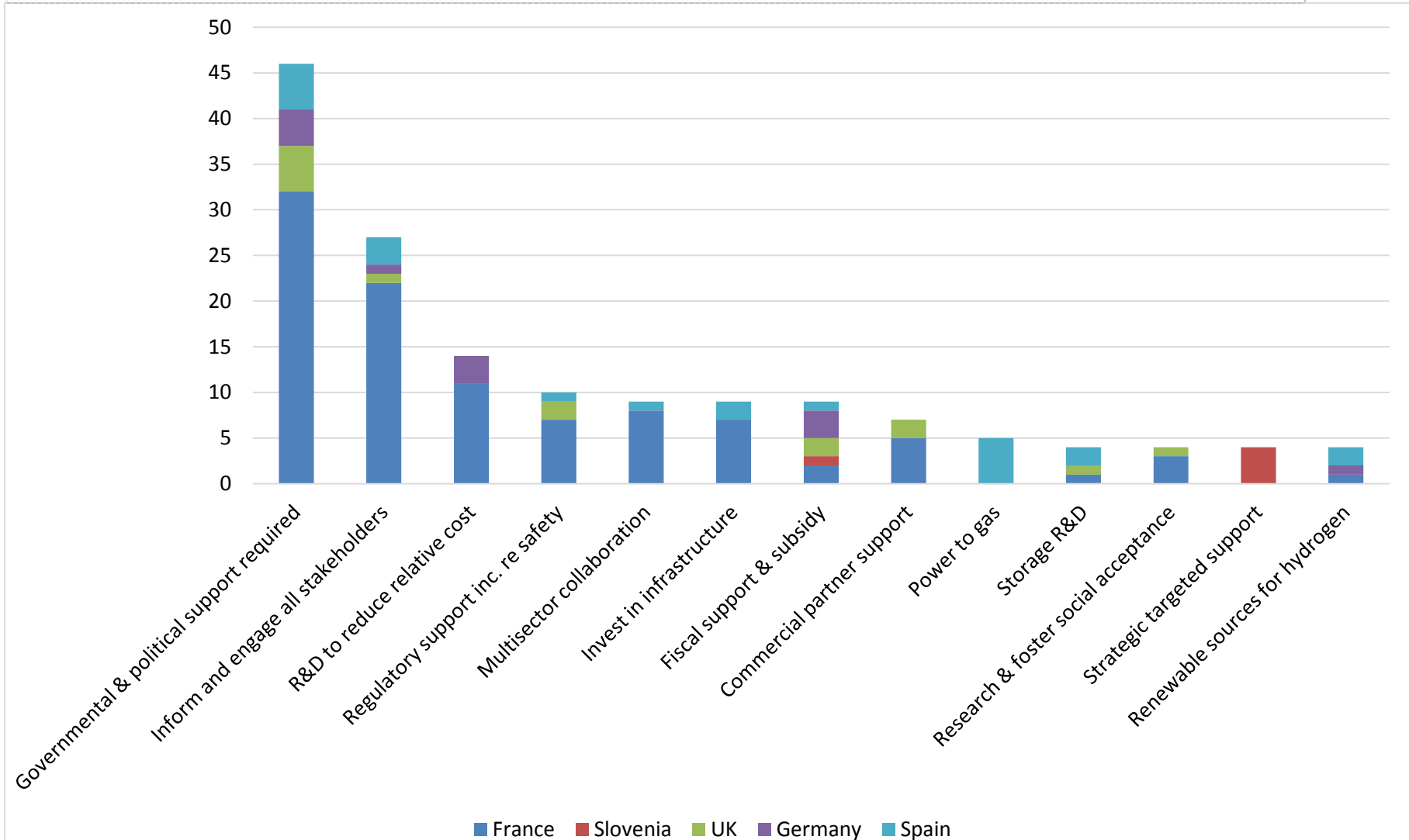
- More government and political support is required
- Need to inform and engage stakeholders
- Additional R&D to reduce costs

## 4. STAKEHOLDER INTERVIEW- METHOD AND RESULTS



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### Hydrogen supply and use: Recommendations



### ■ Perceptions of static applications

#### Strengths:

- H2FCs for portable power (could also be bracketed with the potential for uninterruptible power)
- **Integration with existing infrastructure** (UK respondents only)
- Efficiency of fuel cells (reducing the pressure on the electrical network)
- **The capacity to offer domestic and non-domestic CHP, power and heat, including high power.**

#### Weaknesses

- Cost & Investment costs
- Complexity of the system and its components
- Perceived and 'actual' safety
- Competition from alternative technologies
- The challenge of finding commercial partners

#### Key expectations (mixed):

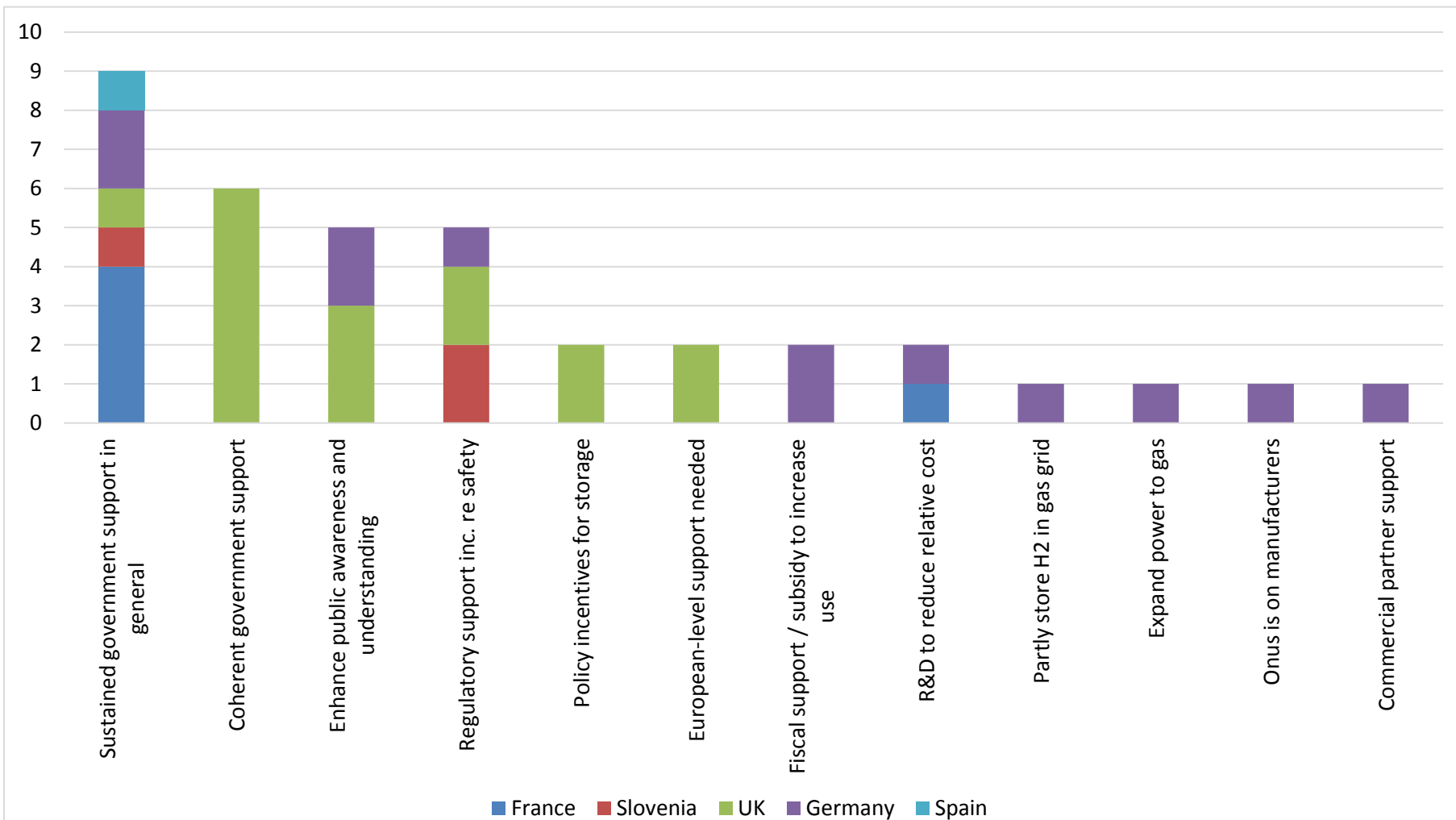
- Expectations expressing a positive inevitability for the technology
- Uninterruptible supply systems as one such niche (German respondents only)
- Stationary uses being more likely than mobile uses (UK respondents only)
- Hydrogen being used as a storage medium as key to the take-up of static applications (UK respondents only)

#### Recommendations:

- Government support
- Regulatory support particularly relating to issues of safety

## 4. STAKEHOLDER INTERVIEW- METHOD AND RESULTS

### Static applications: Recommendations



### ■ Perceptions of mobile applications

#### Strengths:

- Operational performance: long range, **short refill times**, high torque, strong performance generally and relative to alternatives
- **Ease integration with existing infrastructure**
- **Suitability for specific fleets**

#### Expectations:

- **Specific vehicle fleets being the first to use FCH technology**
- Niche uses first or only
- **Tighter emissions standards driving FCH use**
- Battery electric vehicle (BEV) with FCH being the most likely option
- **Transport corridors being first to support FCHs**

#### Weaknesses:

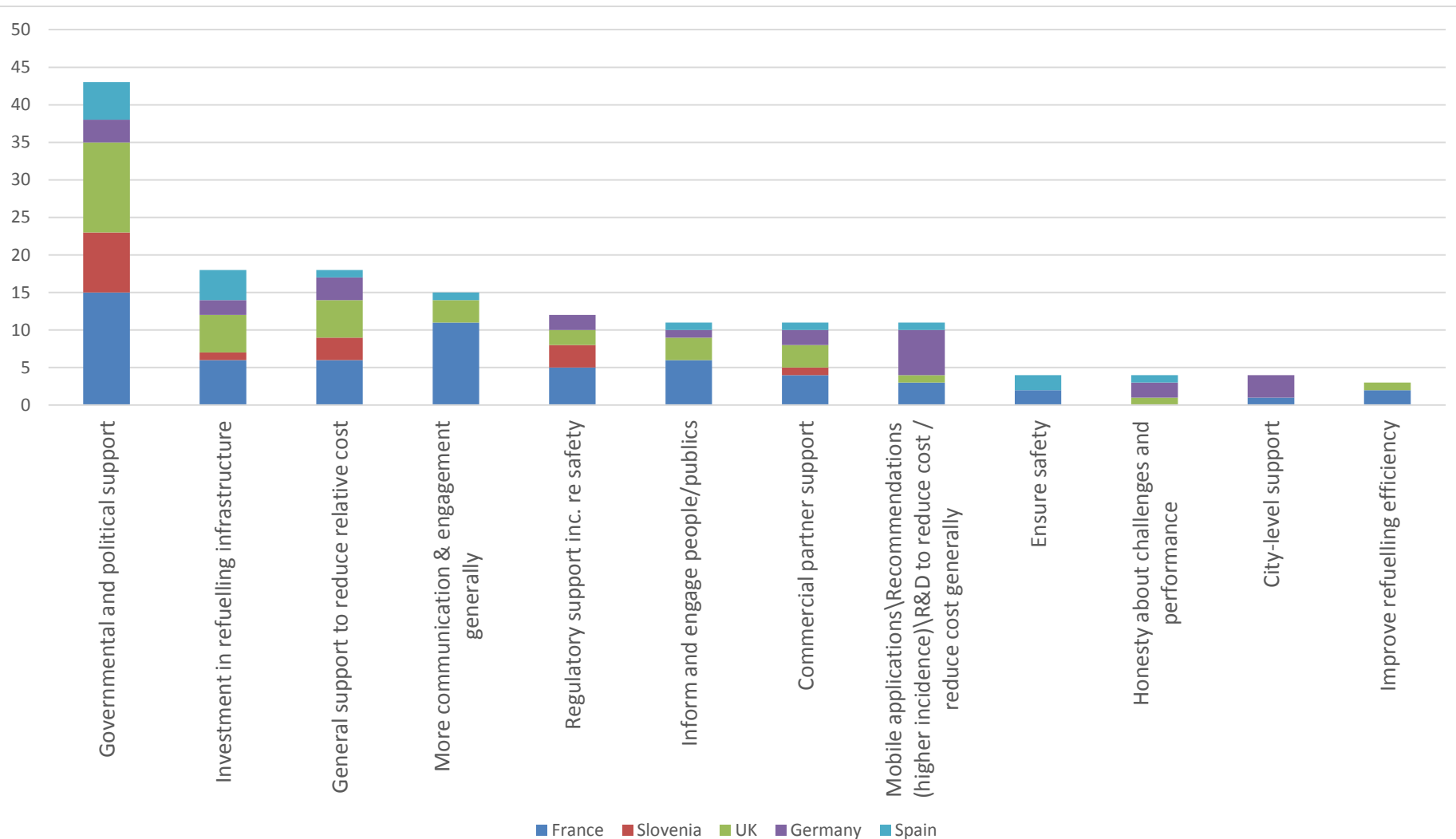
- **Financial cost**
- Perceived competition with other technologies
- Lack of infrastructure
- Limited awareness and support by regulators and government
- Inadequate or excessive regulations, codes or standards
- **Safety**

#### Recommendations:

- **Governmental, political and regulatory support**
- **R&D to support cost reductions**
- **Commercial partner support**
- **More communication and engagement generally, including of publics**
- **Investment in refuelling infrastructure**

## 4. STAKEHOLDER INTERVIEW- METHOD AND RESULTS

### Mobile applications: Recommendations



## 5. CONCLUSIONS



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- Variation across countries: associated with differing levels of government investment in R&D programmes (Germany and Spain being apparently at opposite poles).
- R&D stakeholders have a strong positive appraisal of FCH technologies, but with limitations:
  - cost and limited regulatory, political and commercial support;
  - competition from other technologies and inter-related obstacles.
- Stakeholders view: medium to long term rather than near term.
- FCH technologies view: realistic niche potential in the shorter term
  - uninterruptible power, auxiliary power and high power demand such as fork lifts and heavy goods vehicles.
- Lack of public support is not to be expected to become a major challenge if the framework conditions for the technologies develop in a supportive way.



# Thank you for your attention!

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# Thank you to Hyacinth Team!!

## Extensive report on study

Dütschke, E., Upham, P., Schneider, U. (2017): Report on results of the stakeholder survey. Deliverable 5.1. . <http://hyacinthproject.eu/>