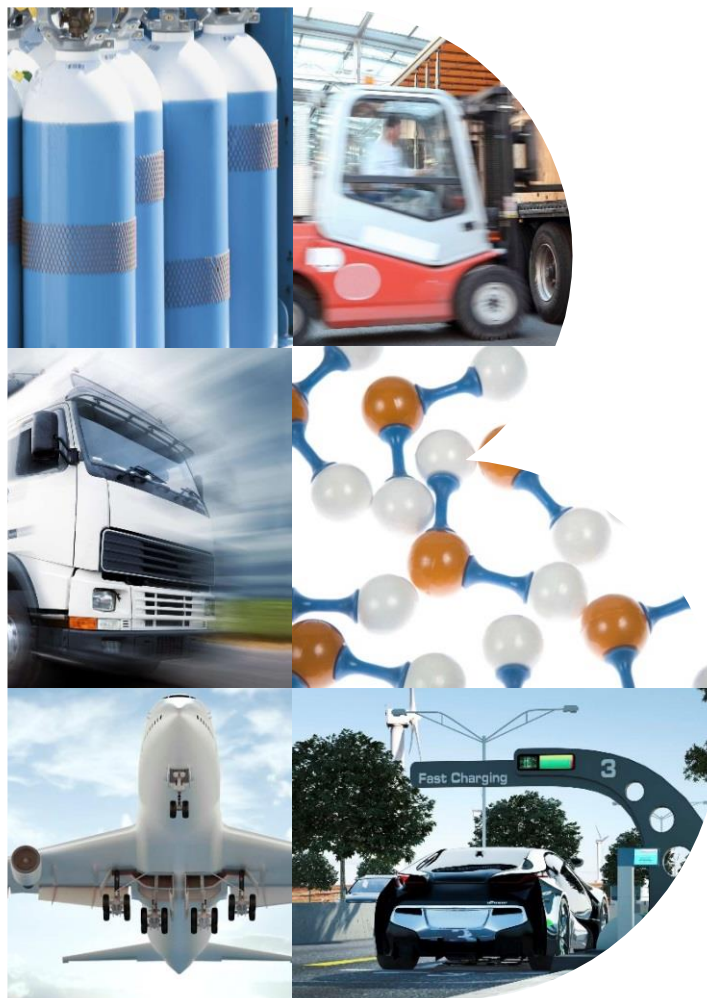


Development of Business Cases for FCH Applications for Regions and Cities

Kickoff Presentation



Agenda for the kickoff meeting

Agenda item	Time
1. Welcome and objectives of the kickoff	10:00 – 10:15
2. Introduction – Getting to know the coalition, interest and prior experience	10:15 – 10:45
3. Overview of project approach and methodology – Main content, methodologies and tools	10:45 – 11:45
Coffee break	11:45 – 12:05
4. FCH applications – First overview and initial discussion	12:05 – 13:05
Lunch	13:05 – 13:50
5. Organization – Project structure, working group formation, working mode	13:50 – 14:50
6. Discussion – Your feedback and input	14:50 – 15:20
7. Closing – Summary of workshop results and next steps	15:20 – 15:50
Networking drinks	starting 15:50

1. Welcome and objectives of the kickoff



Study supports regions/cities in preparing and deploying FCH applications to support their de-carbonization agenda – Kickoff today

Objectives of the **study**

- > **Support regions in assessing various FCH applications** within their specific needs and contexts by producing preliminary and detailed **business cases** for **FCH applications** and evaluating their potential
- > **Identify and maximize the use of regional and/or Europe-wide funding/financing options** for deployment of the applications, based on the funding/financing needs of participating regions/cities
- > **Develop roadmaps and concepts for the months after the study** to prepare and implement deployment projects from 2018 onwards
- > **Support the participating regions/cities to engage their stakeholders** for the promotion and deployment of the technology (e.g. policy makers, public authorities, the public at large, regional associations)

Objectives for **today**

- > Shared understanding of project objectives
- > Joint understanding of project approach and methodology
- > Agreement on project organization and working mode
- > Meeting of involved stakeholders
- > Gathering of your feedback!

2. Introduction – Getting to know the coalition, interest and prior experience



The RB team contributed in-depth expertise on new technologies, fuel infrastructure, public transportation and stakeholder mgmt.

Roland Berger Team



**Heiko
Ammermann**

Partner
Frankfurt



**Yvonne
Ruf**

Principal
Düsseldorf



**Markus
Kaufmann**

Senior
Consultant
Hamburg



**Thomas
Zorn**

Senior
Consultant
Munich

Overall responsibility

- > Head of Global Infrastructure Practice Group at RB
- > Expertise in commercialization and financing of H₂ technologies
- > Co-authored a various FCH JU RB studies, e.g. on Financing of refueling infrastructure, stationary fuel cells and urban buses

Project manager

- > Expert in early stage and high-technology commercialization and financing
- > Vast experience in managing complex public-private stakeholder coalitions
- > Managed FCH JU project on fuel cell bus technology
- > Expertise in market projections for innovative technologies

Deputy project manager

- > Extensive experience in FCH JU coalition management, stationary fuel cells, power-to-gas technologies and energy policy/markets (esp. distributed generation and natural gas)
- > Expert in facilitating public-private dialogue as well as policy formulation
- > Profound expertise in market and business case analysis

FCH expert

- > Over seven years of consulting and industry experience in business development for hydrogen applications, chemicals and energy
- > Sound knowledge of and vast network within the global hydrogen sector
- > Profound understanding of current European hydrogen and fuel cell applications

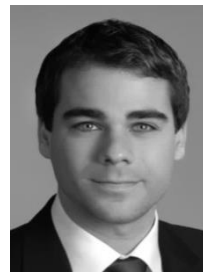
Technology and coalition experts as well as business case modelling experts will support the study

Roland Berger national liaisons and experts



**Prof. Dr.-Ing.
Detlef
Stolten**

Fuel cells and
hydrogen expert



**Dr.-Ing.
Martin
Robinus**

Hydrogen
expert



**Dr.
Simon
Lange**

Senior
Consultant
Düsseldorf



**Felix
Heieck**

Consultant
Frankfurt

Technology expert

- > Director Forschungszentrum Jülich
- > Over 20 years track record in fuel cells and electrolysis development and science
- > Profound knowledge in fuel cells and hydrogen-based applications – including transportation, stationary, grid and maritime applications
- > Extensive global network

Technology expert

- > Fellow at Forschungszentrum Jülich
- > Experience in system analysis – focus on linking power and transport sector with fuel cell vehicles and battery-electric vehicles
- > Extensive knowledge on fuel cells and hydrogen-based applications
- > Expert for both transportation and stationary applications

Regional expert

- > Experience in energy/utilities, renewables, new technologies and infrastructure
- > Expert for the local frameworks in participating regions
- > Extensive knowledge on strategies for commercialization of fuel cell busses in Europe
- > Strong experience in public-private stakeholder management

Business case analysis expert

- > Strong experience in business case development and analysis as well as data mining
- > Expertise in infrastructure, financial services, public sector and grid operators
- > Profound understanding of financing infrastructure investments in Europe

Roland Berger regional experts support the engagement of various coalition members – EU-wide coverage on topics

Roland Berger national liaisons and experts



Per M Nilsson
Partner

Office: Gothenburg, Sweden
Languages: English, Swedish



Friedrich Demmer
Partner

Office: London, UK
Languages: English, German



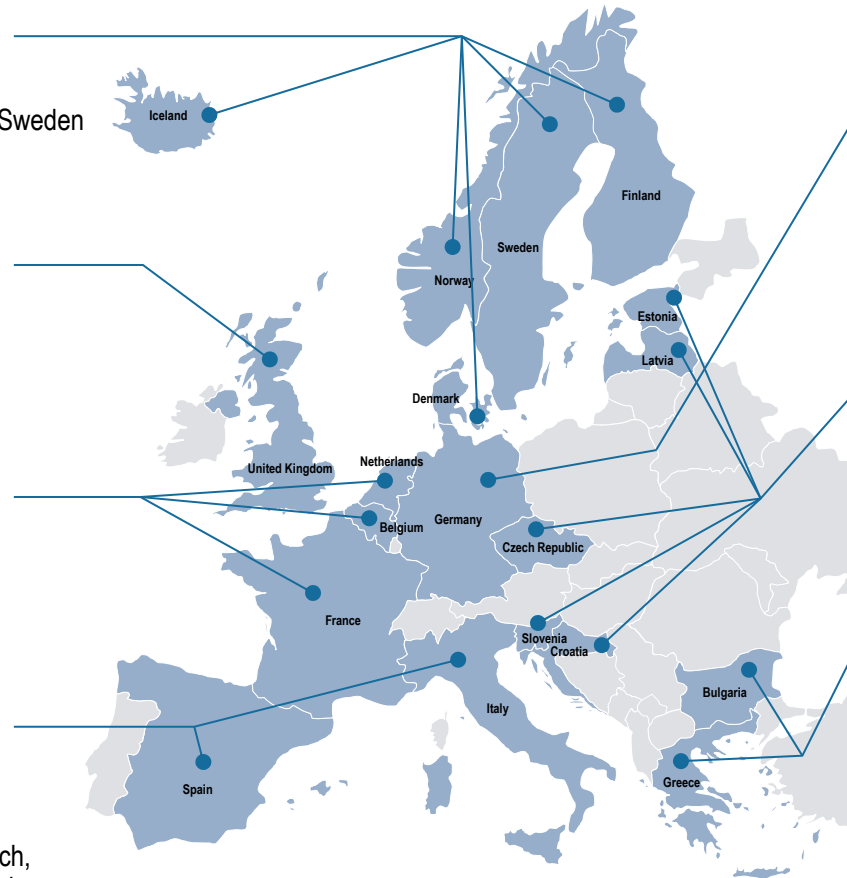
Didier Brechemier
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Friedbert Pflüger
Senior Advisor

Office: Berlin, Germany
Languages: English, German



Codrut Pascu
Partner

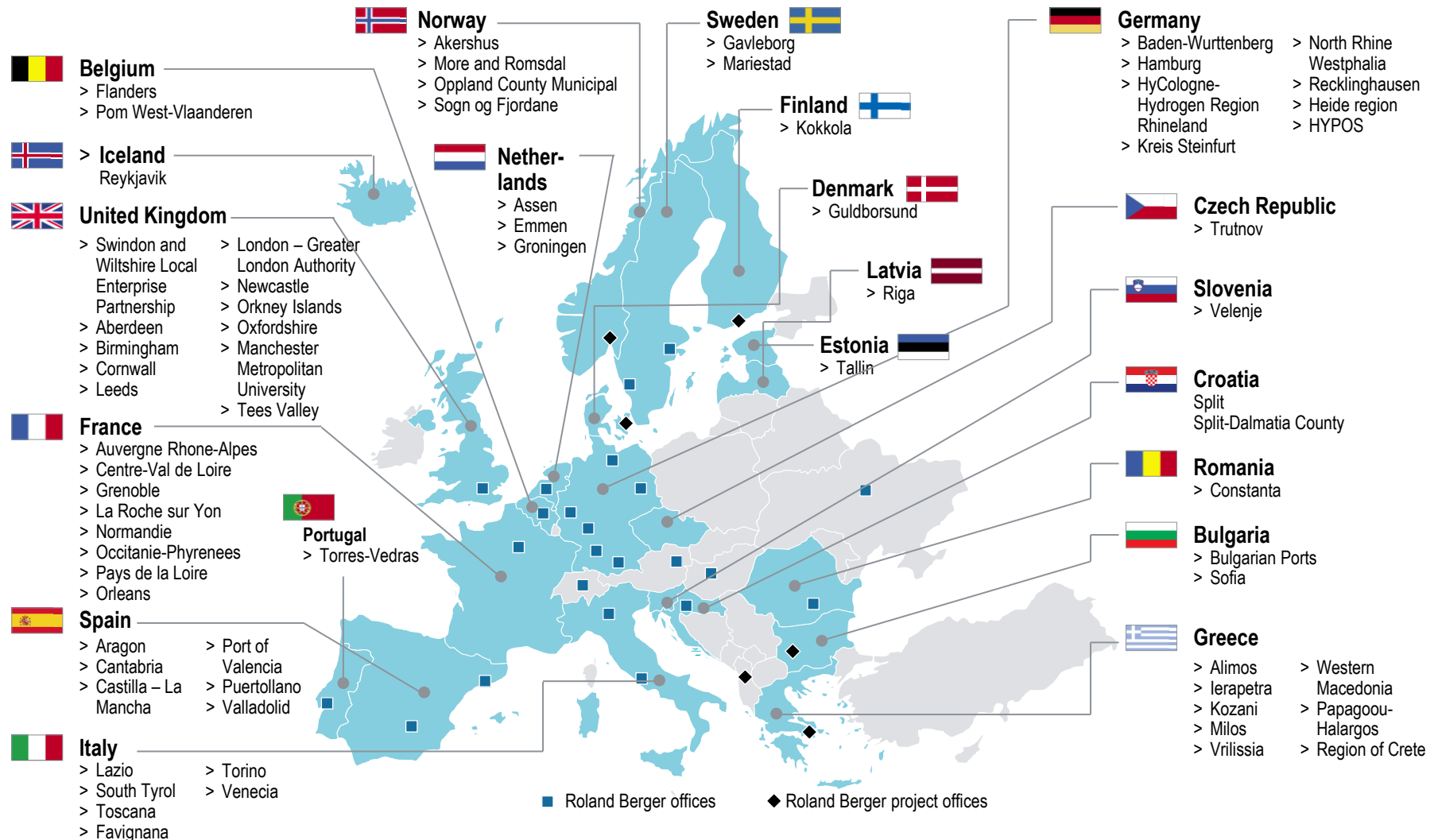
Office: Bucharest, Romania
Languages: English, French, Romanian



Pavlos Klonaris
Principal

Office: Berlin, Germany
Languages: English, German, Greek

70 regions from 21 countries in Europe have signed up until today – Origin of FCH JU signatories and RB offices



We would like to know your background and prior experience with FCH technologies – Please tick relevant stage/box on the board

Technology experience

Initial interest in zero emission applications	Commitment to promoting zero emission applications	One FCH application planned/ in planning for deployment	One FCH application already deployed or demo project ongoing	One application in deployment AND deployment of further applications planned	Numerous applications currently deployed	Establishment of an H2-Valley envisaged
		<div>Trans-port</div> <div>Stati-onary</div>	<div>Trans-port</div> <div>Stati-onary</div>	<div>Trans-port</div> <div>Stati-onary</div>	<div>Trans-port</div> <div>Stati-onary</div>	

Increasing experience

Funding experience

Experience with European/national/regional funding applications for high technologies (beyond H2)	Experience with European/national/regional/FCHJU funding applications for H2
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3. Overview of project approach and methodology – Main content, methodologies and tools

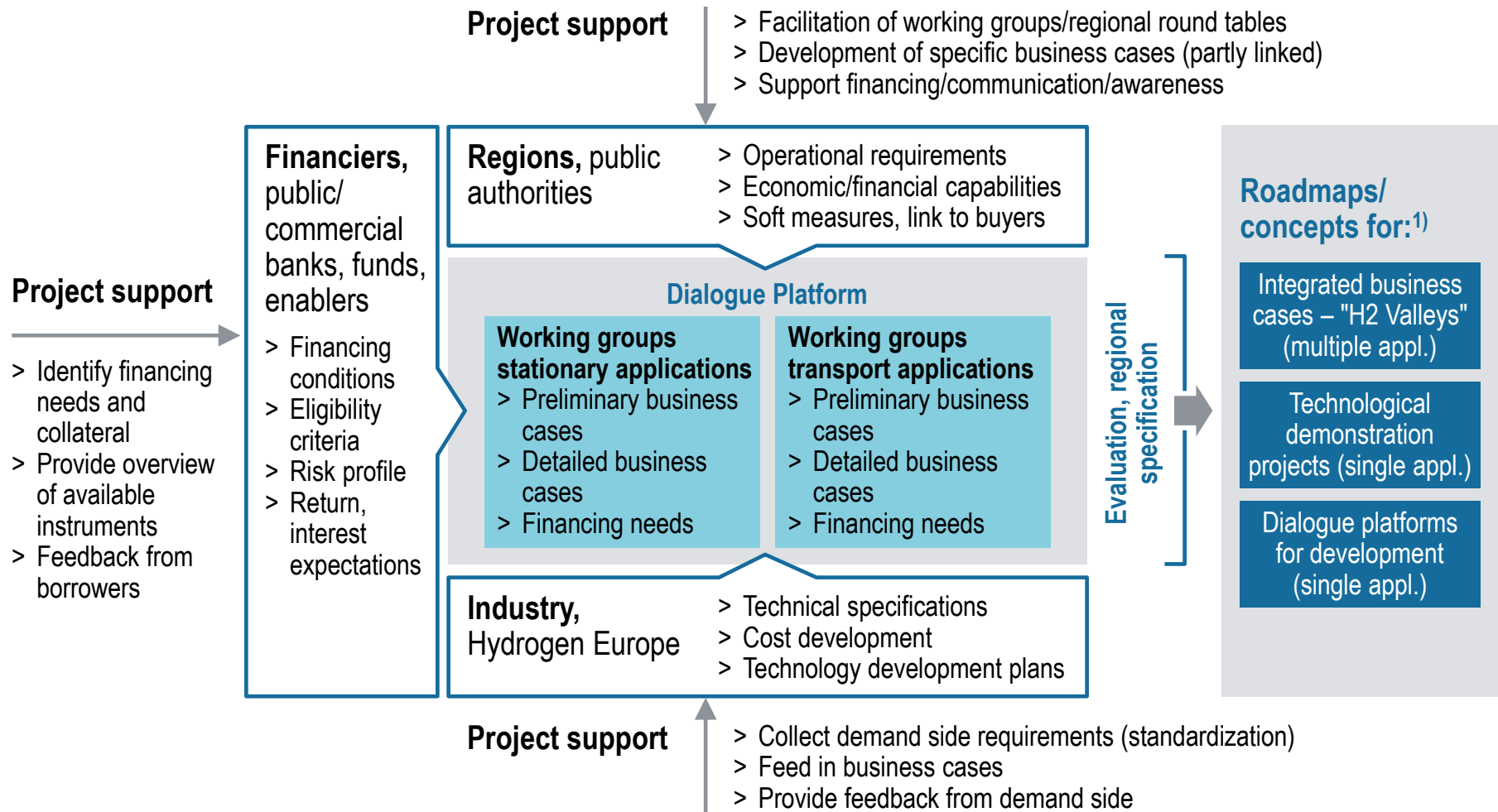


With this study, the FCH JU is pursuing a bold vision for the development of fuel cell and hydrogen applications in Europe

Overarching objectives of study by stakeholder group – Schematic illustration

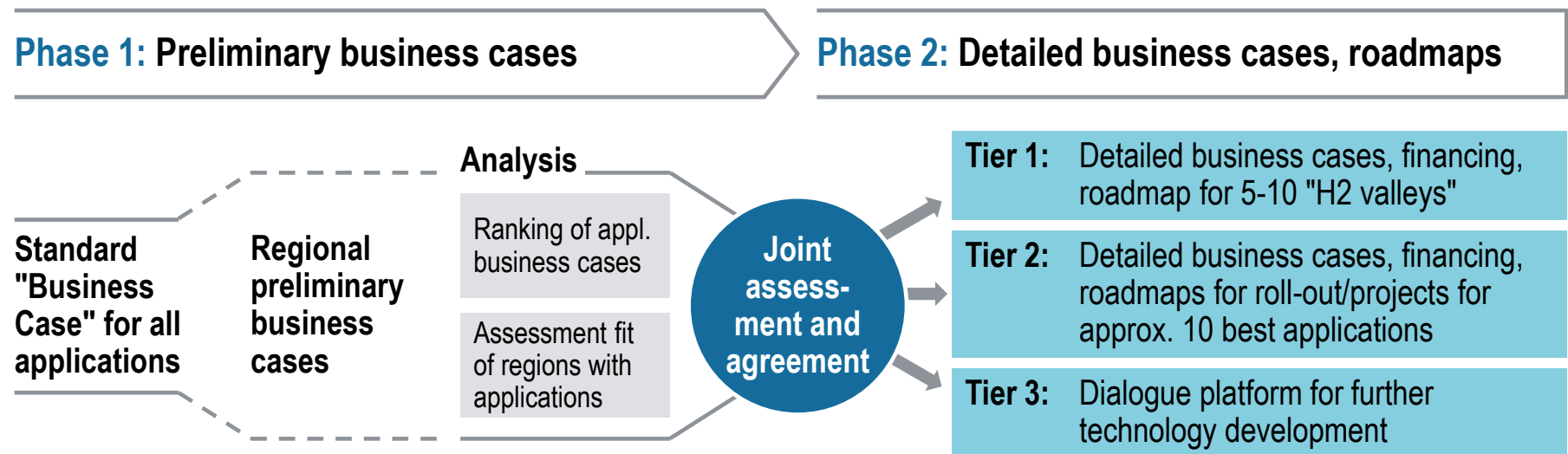


Our general project approach is built on a number of core elements which have proven viable in past assignments for the FCH JU



1) Depending on technological readiness, commercial viability and interest from regions

We suggest a two dimensional project approach – Starting with an application- and followed by a region-based cooperation mode



Collaboration in application – based working groups

- > Standard business cases (techn. specifications/cost)
- > Coaching all regions in specification of business cases
- > Evaluation of business cases and regional fit

Focus

Collaboration in regional round tables

- > Constant engagement of all regional stakeholders
- > Deep dives into specification of business cases
- > H2 valley and Tier-based cooperation
- > Communication concepts

Focus

In the first phase we develop and evaluate preliminary business cases – Most viable applications to be focused on in second phase

Detailed project approach

Phase 1: Preliminary business cases

- 1 Regional self-assessment and technology introduction
- 2 Assessment of preliminary business cases
- 3 Assessment fit/capabilities of regions and applications
- 4 Ranking of applications
- 5 Mapping funding/financing mechanisms
- 6 Communication outreach/impact

Phase 2: Detailed business cases, roadmaps

- 7 Detailed business cases
 - 8 Concept for maximizing use of funding
 - 9 Roadmap and implementation plan
 - 10 Engagement of local stakeholders
- For H2 valleys (Tier 1)
- For demonstration projects (Tier 2)
- 11 Dialog platform for technology development (Tier 3)

Each region shall participate in a self-assessment – We provide technology introductions for the applications under consideration

Module 1: Regional self-assessment and technology introduction

Objectives

- > **Create basis** and a shared starting point for the **analysis** and coalition building during the project
- > Two activities to be carried out
 - **Conduct self-assessment of all regions/cities** to gain understanding of prior knowledge, level of engagement, specific needs, ...
 - **Provide technology introduction** dossier for all **relevant applications**, e.g. available solutions/products, ongoing projects, use cases, required framework conditions, costs)



Approach & methodology



Carry out **both activities in parallel**

- > **Activity 1** (self-assessment):
 1. Preparation of self-assessment questionnaire
 2. Collection of feedback from participants
 3. Evaluation and communication of results
- > **Activity 2** (technology introduction):
 1. Preparation of a technology dossier for each hydrogen application
 2. Preparation of dossier presentations in technology introduction sessions
 3. Preparation of a technology briefing pack



Expected results and deliverables

- > Presentation summarizing results of self-assessment and level of experience
- > Technology dossier presentation as a briefing pack for all coalition members and "newcomers"

The development of the preliminary business cases is the most crucial module in phase 1

Module 2: Assessment of preliminary business cases

Objectives

- > Provide a **preliminary business case** analysis of all hydrogen application under consideration
- > **Evaluate applications according to key criteria** e.g., **high level cost, availability of technological solutions and readiness, markets, environmental impact**, etc. in order to evaluate their future potential
- > **Basis for ranking and decision making** regarding potential further focus in phase 2 (detailed business cases)



Approach & methodology



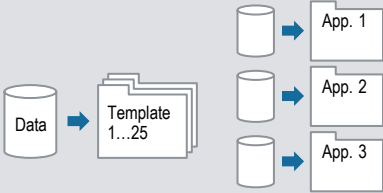
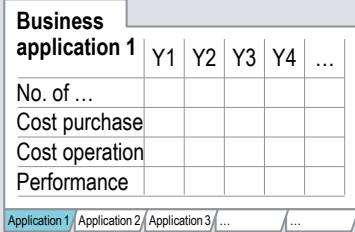
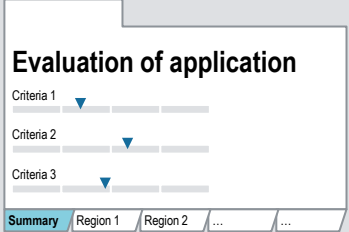
- > Steps to be carried out
 1. Definition/agreement on **analytical framework**
 2. **Analysis of requirements** of participating public authorities (operational, use cases, environmental)
 3. **Preliminary analysis of costs** (high-level CAPEX, OPEX) without regional specification and readiness for commercialization
 4. **Establishment of a joint view on analysis results** (incl. willingness to pay, requirements)
- > Work in **separate working groups**, which **present intermediary results** to General Assembly



Expected results and deliverables

- > Evaluation of all applications on all key analysis factors based on joint evaluation framework
- > Documentation of evaluation results in a standardized evaluation summary for all applications

With the support of the coalition members we develop preliminary business cases

	Compile data	Preliminary analysis	Evaluate and discuss
			
RB	<ul style="list-style-type: none"> > Provide templates > Consolidate feedback > Consolidate/anonymize data > Expand with own data if required 	<ul style="list-style-type: none"> > Conduct analyses > Prepare presentation of preliminary business cases 	<ul style="list-style-type: none"> > Present findings and facilitate discussion in preparation for ranking
Working groups (Regions, Industry)	<ul style="list-style-type: none"> > Provide regional/city-level data (high-level local operational, use case, environmental requirements) > Provide data on technology (availability, main cost and performance information) 	<ul style="list-style-type: none"> > Agreement on analytical framework (e.g. requirements, high-level cost data, performance criteria etc.) 	<ul style="list-style-type: none"> > Discuss positions on technological and operational viability, fit with requirements, commercial availability, cost premium, feasibility of envisaged roll-out etc.

Update the self-assessment from module 1 – prepare the assessment and ranking of applications in module 4

Module 3: Assessment fit regions and applications

Objectives

- > **Assist regions/cities to evaluate the results** from module 2 **against** their **local framework** conditions
- > **Prepare the ranking of applications** to be pursued for further analysis in module 4
- > **Asses from a regional perspective the most viable applications**
- > Gauge interest in concrete deployment and technology development



Approach & methodology



- > Steps to be carried out
 1. **Update of self-assessment** based on the increased level of knowledge, e.g.
 - Ambition to engage in early-stage techn. development projects (prototype testing) or in roll-out of established solution?
 - Viable use cases and concrete plans?
 - Potential scope of deployment projects?
 - Financing and organization strength?
 - Potential show-stoppers?
 2. **Reflection on self-assessment results** with cities and regions



Expected results and deliverables

- > Validated joint understanding of potential of applications and interest of regions
- > Preparation of the assessment and ranking of applications in module 4

In module 4, the coalition shall agree upon the applications which will be further investigated in phase 2

Module 4: Ranking of applications

Objectives

- > **Create a ranking of hydrogen application** based on a agreed up on set of criteria
- > **Provide the assessment form a strategic and commercial perspective** to provide guidance for the regions on which applications to pursue further
- > **Define and select up to 10 applications for detailed consideration in phase 2**



Approach & methodology



- > Steps to be carried out
 1. **Define assessment framework** and agree on ranking criteria
 2. Execute **two-phased ranking process**
 - a. Fill out of assessment templates per application by each participating party
 - b. Analyze the results and weight assessment
 3. **Agree on final results** via a discussion within the coalition on the basis of the results from the ranking process

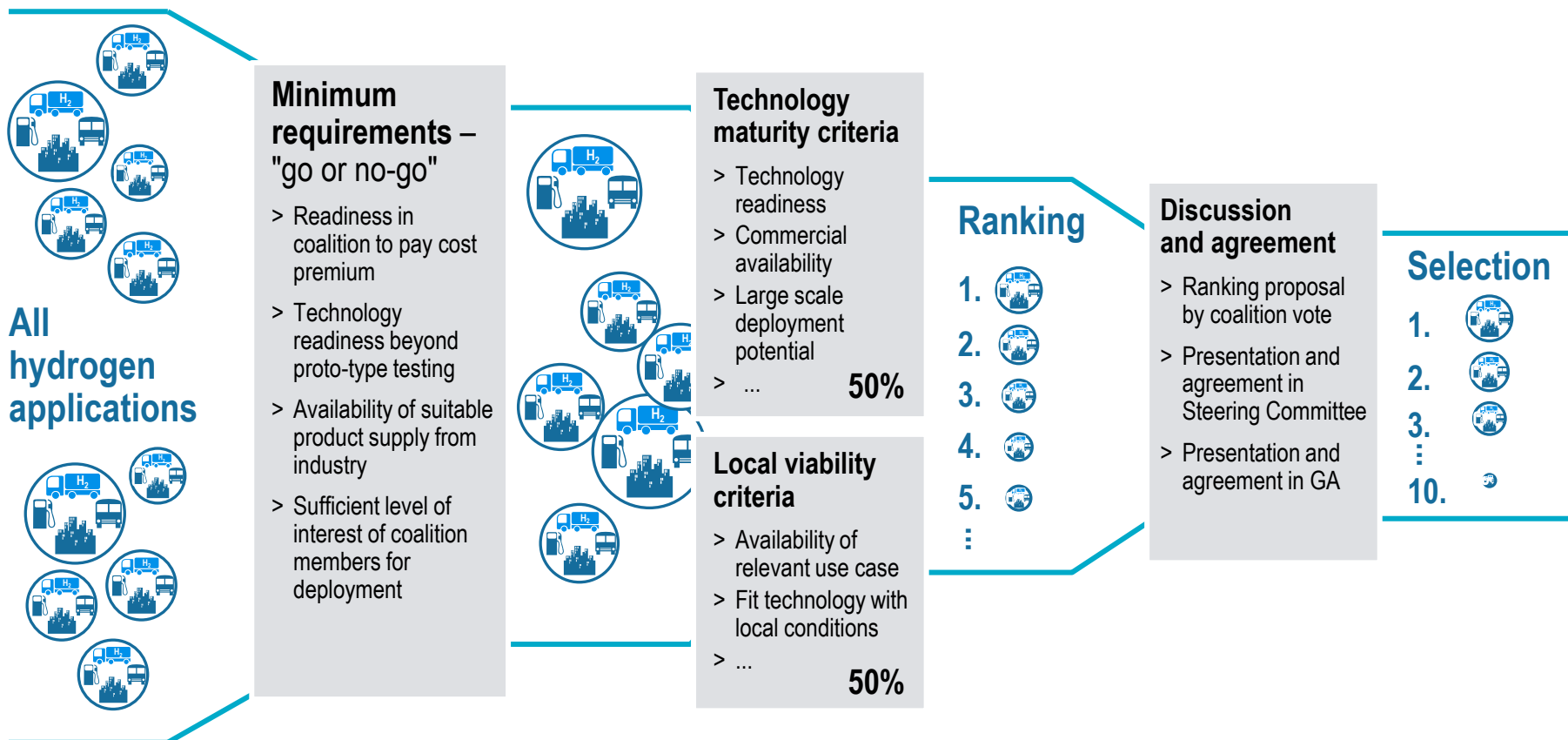


Expected results and deliverables

- > Final ranking of all applications for further investigation in phase 2 (10 applications)
- > Comprehensive documentation of ranking results (all applications and overall)

Selection process is a crucial element of the project – will determine applications for detailed business case development in phase 2

General assessment framework and ranking criteria for discussion



In module 5 we identify and map available funding/financing requirements

Module 5: Mapping funding/financing mechanisms

Objectives

- > **Map** and **assess** currently **available grant funding sources** for hydrogen and fuel cells on EU, national and regional level
- > **Create comprehensive listing** and dossier of available and relevant public funding sources and vehicles
- > **Analyze** and present **potential private funding** options for nearly commercially ready projects



Approach & methodology



- > Steps to be carried out
 1. Research and collect **financing/funding instruments** and vehicles, by reaching out to a broad group of stakeholders (incl. banks)
 2. Consolidate and systematically describe **funding programs** in a **dossier** (e.g. geographical coverage, eligibility, funding volume, form of grant/funding, application process, timelines, overlaps etc.)
 3. Highlight programs suitable for large scale demonstration or with potential to act as "game changers" – Produce **recommendations on specific programs** for regions for phase 2



Expected results and deliverables

- > Comprehensive excel database on available funding tools, incl. guidebook for easier selection/use
- > Presentation of results regarding the suitability of identified funding tools

Module 6 ensures engagement of additional stakeholders and cooperation with existing initiatives to create further synergies

Module 6: Communication outreach/impact

Objectives

- > **Engagement of additional stakeholders** will be an important success factor, e.g. regional/national associations etc.
- > **Preparation and implementation of dedicated external communication** throughout the entire duration of the project
 - Raise awareness for the project
 - Attract additional support
 - Build on efforts done by other stakeholders



Approach & methodology



- > Steps to be carried out
 1. **Preparation** of a **communication package** to engage the relevant parties
 2. **Engagement** of **additional participants** by raising awareness for project and its opportunities among other stakeholders
 3. **Collaboration** with other **existing projects/initiatives** to create synergies
- > **Activities** planned and implemented so they **can be terminated at end of phase 1**

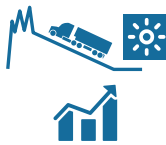


Expected results and deliverables

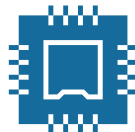
- > External communication package comprised of different tools for regions/industry/FCHJU to use
- > Cooperation with external stakeholders and existing projects/initiatives to leverage synergies

Key activities

- > Regional data on: operational requirements and projected deployment plans



- > Market scenarios for next ten years that influence projected technology costs



- > Analysis of all costs associated with development of applications based on Total Cost of Ownership



- > Validate TCO analysis via different sensitivities



- > A comprehensive assessment **tool** (Excel) will be provided for the applications
- > Computes **an individual assessment of hydrogen application deployment** based on local conditions and deployment plans
- > **Provides information on total cost of ownership** of application

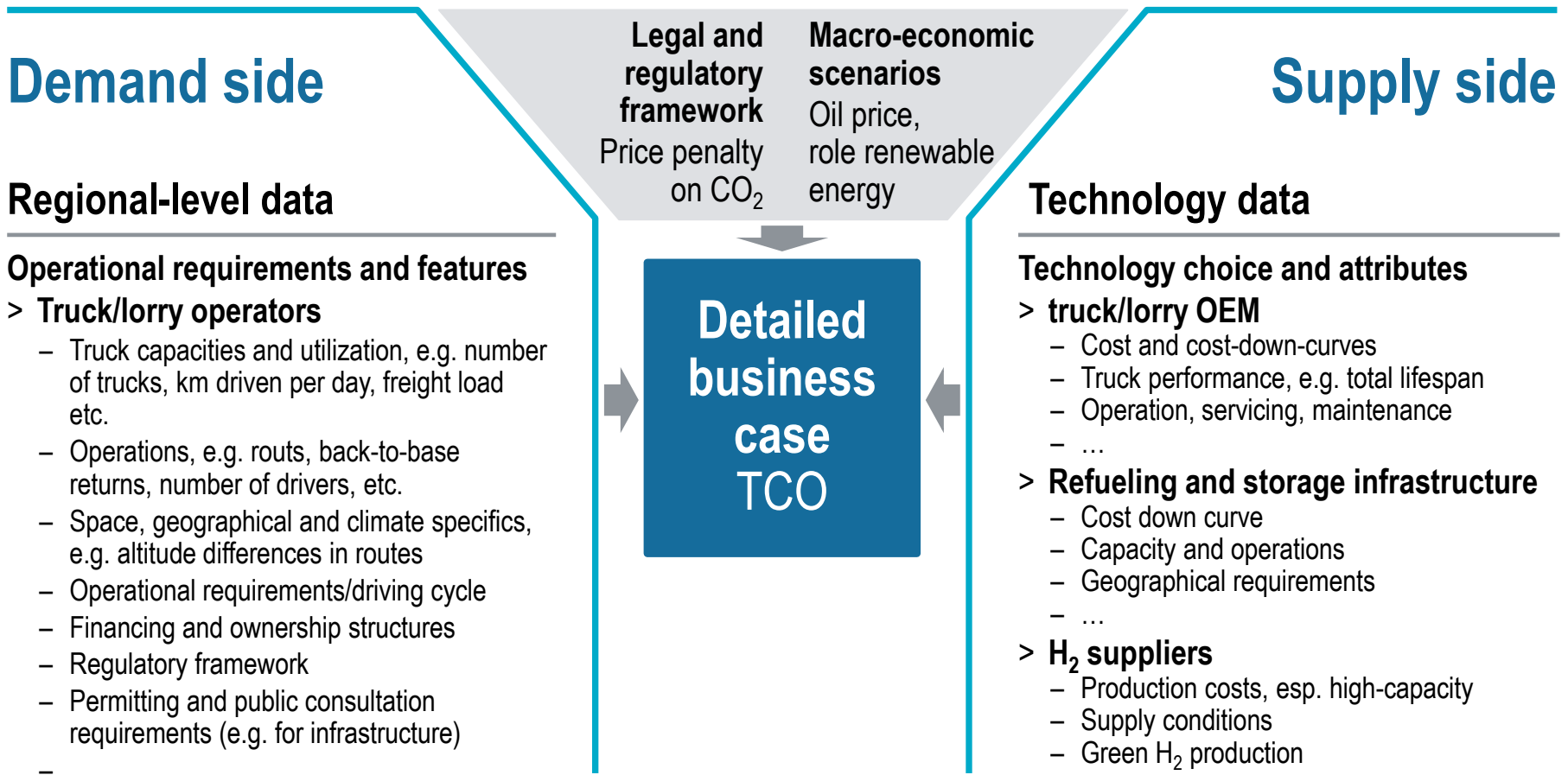
The diagram illustrates three overlapping tables representing data for Region 1, Region 2, and Region 3. Each table has columns for variables Y1, Y2, Y3, Y4, and an ellipsis (...). The rows are labeled 'No. of ...', 'TCO', 'Environment', and 'NPV'. A green 'X' icon is in the top right corner.

Region 1	Y1	Y2	Y3	Y4	...
No. of ...					
TCO					
Environment					
NPV					

Application 1 / Application 2 / Application 3 / ...

The business case is based on demand and supply side data – Overview of parameter for detailed business cases

Example business case parameters for trucks/lorries

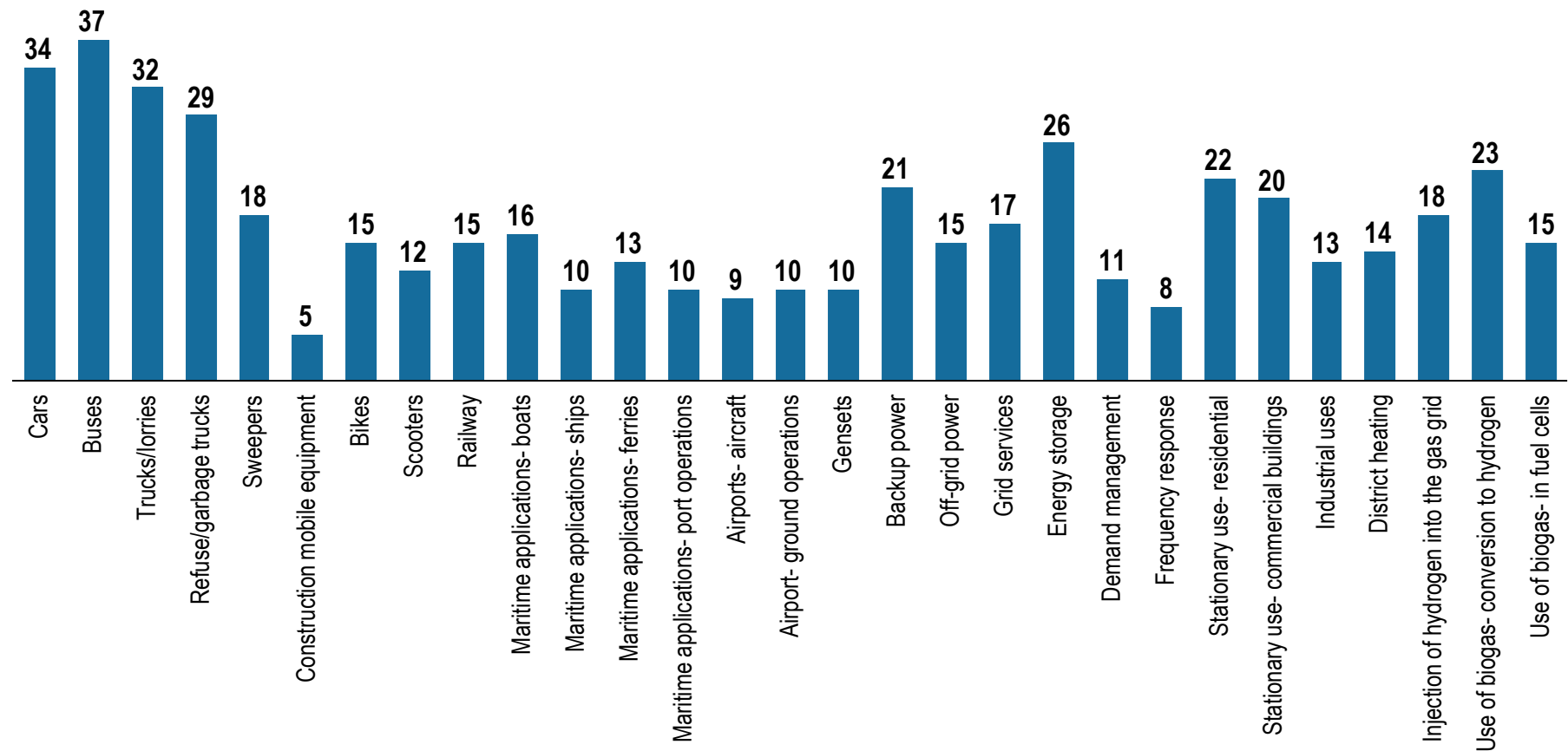


4. FCH applications – First overview and initial discussion



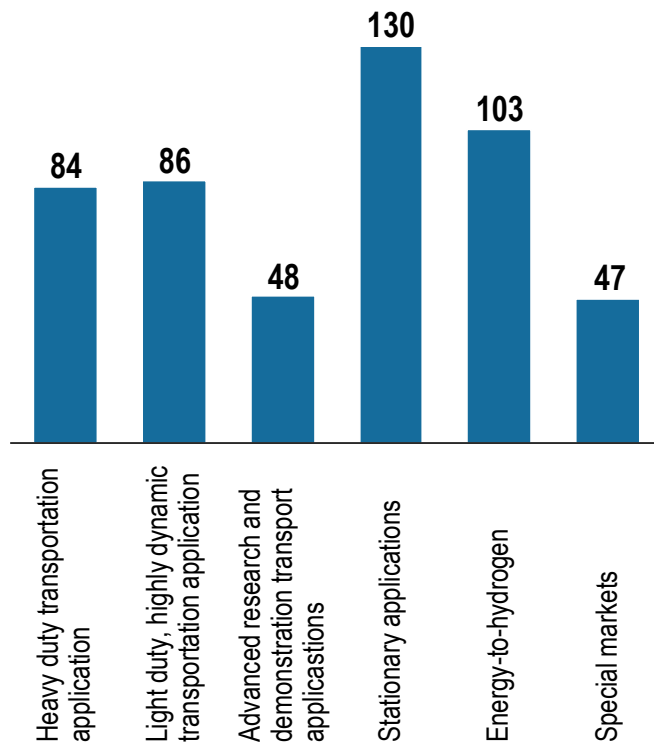
Large interest in most transport and stationary use applications – Construction equipment and frequency response with low response

Interested regions per application (Status May 5th)



We suggest clustering applications to form 5 working groups

Preliminary to be validated



Suggested working groups

1. Heavy duty transportation app.

- > Heavy-duty trucks, lorries
- > Buses (coaches)
- > Railway

2. Light duty transportation app.

- > Cars
- > Delivery vans
- > Refuse garbage trucks (the dynamic characteristics dominate the high power requirement)
- > Sweepers
- > Construction mobile equipment
- > Bikes
- > Scooters

3. Demo transport app.

- > Boats
- > Ships
- > Ferries
- > Aircrafts
- > Port operations
- > Airport ground operations

4. Stationary applications

- > Gen-sets
- > Back-up power
- > Off-grid power
- > Residential use
- > Commercial buildings
- > Industrial use cases
- > District heating
- > Biogas in fuel cells

5. Energy-to-hydrogen

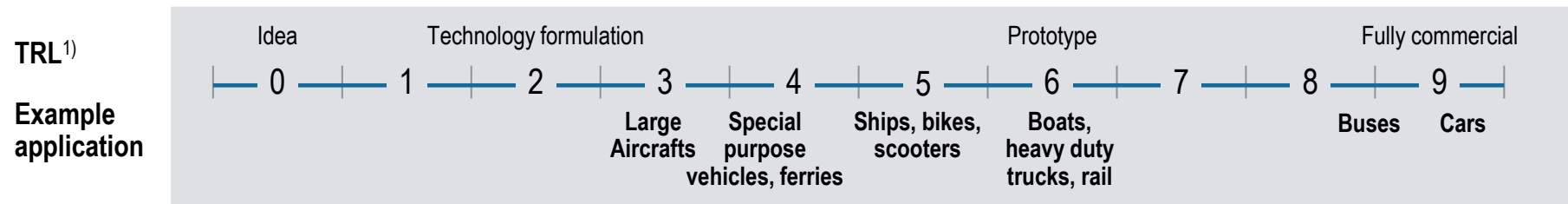
- > Grid services
- > Energy storage
- > Demand management
- > Frequency response
- > Injection of H₂ into the gas grid
- > Biogas conversion to hydrogen

Transport applications diverse in terms of readiness for deployment

– Coalition will address different topics for different applications

Transport applications

*Preliminary
to be validated*



Status of technology

- > Passenger cars and urban buses closest to commercialization, but price premium remains (50-200%)
- > Other heavy-duty transport (trucks) and light duty applications (scooters, bikes) some demo ongoing
- > Aircrafts in very early prototype phase

Challenges

- > Achieving scale/market volume and reducing TCO premium for commercially available applications
- > Further specifying technological requirements from regions/users for prototype developments
- > Fairly restricted/limited market and environmental potential for some applications



Objectives and issues to address jointly in coalition

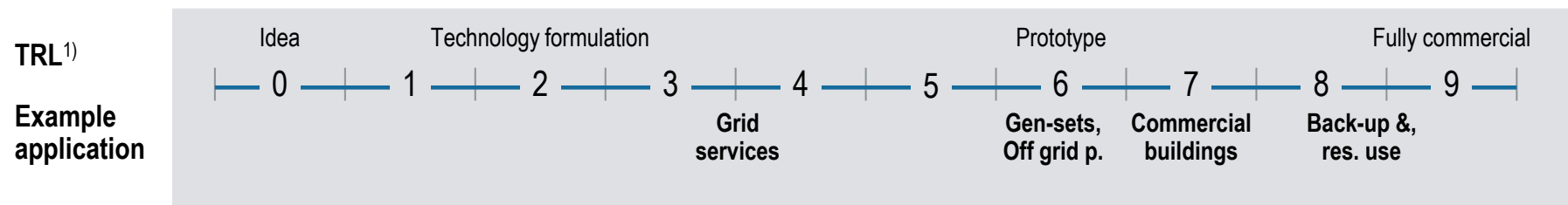
- > **Assess costs and prepare deployment for (close-to-)commercial applications (e.g. cars, buses)**
- > **Facilitate dialogue on technology and operational specification for prototype applications (e.g. boats, bikes)**
- > **Validate market potential for some applications (e.g. mobile construction equipment, operations appl.)**

¹⁾ Technology readiness level

Technology maturity of stationary applications differs – Coalition should seek specific use cases with high local benefit potential

Stationary applications

*Preliminary
to be validated*



Status of technology

- > Technology maturity and commercialization progress differ across applications; economic, environmental and other benefit potential has been proven
- > Residential fuel cell mCHP (both PEM and SFOC, EU and East Asian technology) and to a lesser extent large-scale fuel cell CHP systems lead the market

Challenges

- > Achieving comm. competitiveness (esp. CAPEX, but also in terms of LCOE and TCO) in specific use cases, with volume uptake and small-series production
- > Sustaining and further increasing tech. performance
- > Countering political trends: push for power-to-heat, phase-out of CHP premiums in key markets



Objectives and issues to address jointly in coalition

Identify specific use cases in the local context – i.e. economics (e.g. fuel cost), environmental benefits, sector integration potential and cross-technology symbioses (e.g. fuel cell CHP and heat pumps) – then derive application requirements, then design demonstration projects or target roll-out of (pre-)commercial products

1) Technology readiness level

Heavy duty transport applications provide potential for CO2 reduction in freight and passenger transportation

Suggested Working Group 1 – Heavy duty transportation applications

Preliminary
to be validated

Applications

- > Heavy-duty trucks, lorries (prototypes)
- > Buses (coaches) (pre commercial, mature prototype)
- > Railway (prototypes)

Joint characteristics/ rationale for bundling

- > Relatively constant load
- > Very high longevity required
- > Limited operating dynamics
- > High power and high energy on-board storage
- > Providing a wide-spread intl. market

Involved OEMs and prototypes (examples)



Critical issues to address jointly

- > Commercial viability depends on performance characteristics, operating flexibility, access to refueling
- > Significance for CO2 reduction in freight transport in long-term, but other competing technologies (e.g. LNG-trucks)
- > Technology availability for short-term use cases
- > Location/size of refueling infra in relation to fleet size
- > Regulatory issues, authorities for transport applications
- > Availability of material handling equipment with right specs

Light duty applications at various maturity stages – Cars bear large potential for CO2 reduction but cost and infra to be addressed

Suggested Working Group 2 – Light duty, highly dynamic transportation applications

Applications

- > Cars (commercial availability)
- > Delivery vans (mature prototypes)
- > Refuse garbage trucks (the dynamic characteristics dominate the high power requirement)
- > Sweepers
- > Construction mobile equipment
- > Bikes
- > Scooters

Rationale for bundling

*Preliminary
to be validated*

- > High system dynamics
- > Medium to high on-board energy storage
- > High longevity
- > Medium power
- > Medium to high energy on-board storage
- > Providing a wide-spread intl. market

Involved OEMs and prototypes (examples)



Critical issues to address jointly

- > Potential for commercial viable use case in fleet operation with high utilization in emission constraint environments
- > Currently limited flexibility for vehicle selection (except cars - 3 OEMs provide in Europe on commercial basis)
- > Location/coverage/size of refueling infrastructure
- > Use case for vehicle fleets of public authorities
- > Funding sources mitigate premium price
- > Availability of technologies for short-term demonstration
- > Cars: large potential for cost reduction with scale, R&D

We suggest bundling transport applications in demonstration stage and with high CAPEX requirements in Working Group 3

Suggested Working Group 3 – Advanced research and demo transport applications

Applications

- > Boats (prototype)
- > Ships (advanced prototype)
- > Ferries (early-prototype)
- > Aircraft (early-prototype)
- > Port operations ("ecosystems")
- > Airport ground operations ("ecosystems")

Rationale for bundling

- > Very high CAPEX requirement
- > High longevity requirements
- > High capacity applications
- > High environmental impact
- > Potentially wide-spread intl. market
- > Some with lower TRL (e.g. aircraft)

*Preliminary
to be validated*

Involved OEMs and prototypes (examples)



Critical issues to address joints

- > Technology availability and reliability for short-term use cases (esp. for aircrafts less clear)
- > Use cases for public authorities (e.g. military)
- > Optimization of H2 storage
- > Potential to become commercially viable with more stringent environmental legislation (esp. for emission-free harbor areas)
- > High CAPEX requirements and funding/financing

Working Group 4 bundles all stationary applications for (combined) power and heat generation with fuel cells

Suggested Working Group 4 – Stationary applications

Preliminary
to be validated

Applications

- > Gen-sets
- > Back-up power
- > Off-grid power
- > Residential use
- > Commercial buildings
- > Industrial use cases
- > District heating
- > Biogas in fuel cells

Rationale for bundling

- > Common challenges: fuel supply (and cost), competition from incumbents, CHP business case, lack of component standardization
- > Common benefits for users: CO₂ and primary energy reduction, elimination of pollutants, stability of supply, etc.
- > Technology synergies (e.g. SOFC stack development): modularization, scaling to different levels
- > Necessity to represent the stationary sector together

Involved OEMs and prototypes (examples)



Critical issues to address joints

- > Role of authorities and players of the traditional power and heating industry (OEMs, utilities, wholesalers, installers)
- > Ability to include new FC technology in public tenders for technology supply
- > Acceptance of carbon efficient, but still gas-fired stationary fuel cell systems as sufficiently "green"
- > Use cases: e.g. product deployed, geographical location and accessibility, potential duration of fuel supply contracts

Applications for energy-to-hydrogen (e.g. storage solutions) shall be bundled in Working Group 5

Suggested Working Group 5 – Energy-to-hydrogen

Preliminary
to be validated

Applications

- > Grid services
- > Energy storage
- > Demand management
- > Frequency response
- > Injection of H₂ into the gas grid
- > Biogas conversion to hydrogen

Rationale for bundling

- > Structurally similar conversion processes for production of hydrogen (electrolysis, steam methane reforming, etc.)
- > Common challenges in business case definition and monetization (incl. market initiation)
- > Strategic role in sectorial integration / sector coupling of the renewable energy production with transportation sector, chemical industry, energy sector

Involved OEMs and prototypes (examples)



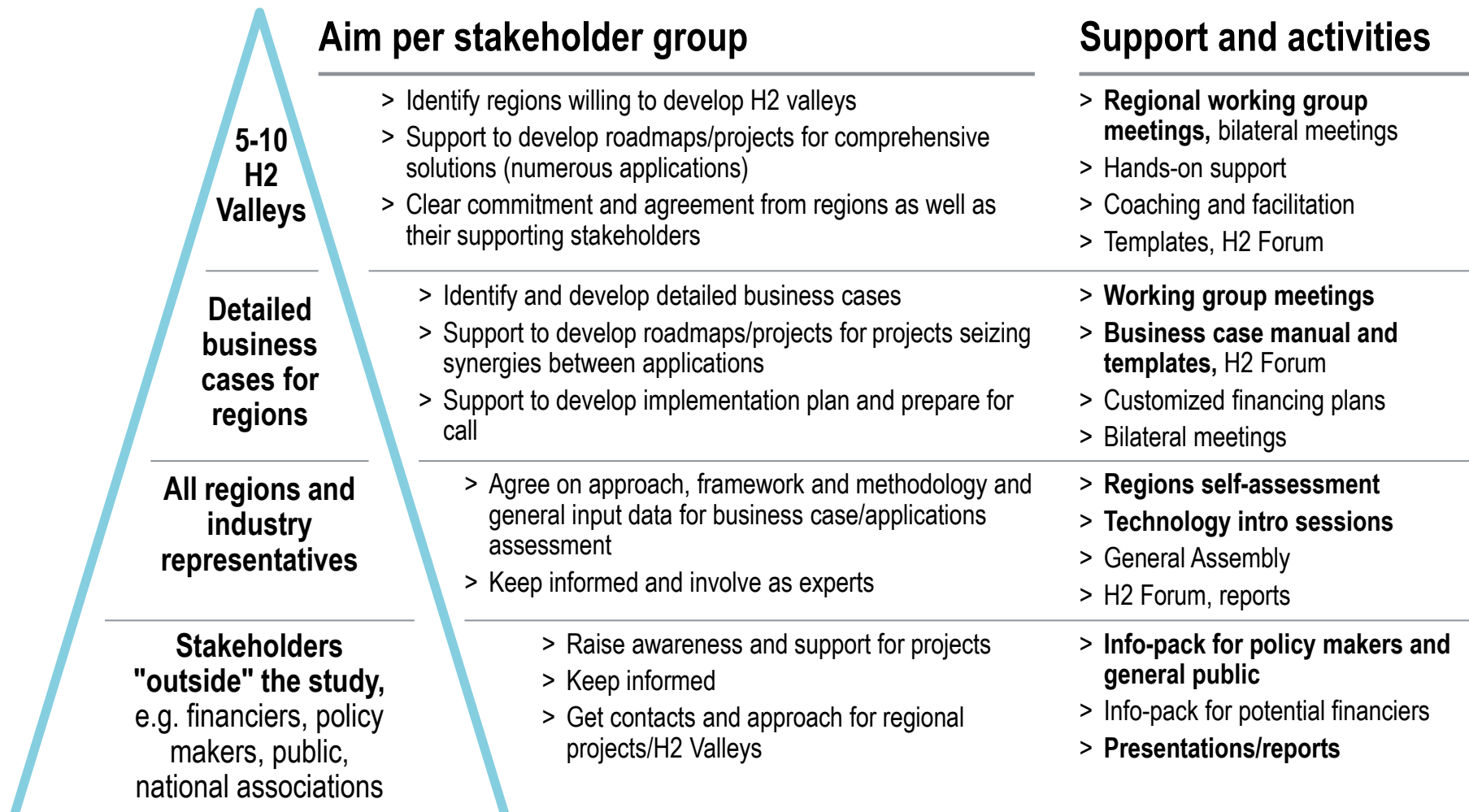
Critical issues to address joints

- > Cost items for business case evaluation, revenue model and definition of monetization mechanisms
- > Use case: units to be deployed, geographical location and accessibility, potential duration of fuel supply contracts
- > Smart exploration and piloting of sectorial integration potential – e.g. linking power-to-hydrogen with mobility or energy services applications – esp. consideration of application requirements from all angles

5. Organization – Project structure, working group formation, working mode





Our objective is to engage and involve all coalition participants – Overview of tailored support measures for all involved groups



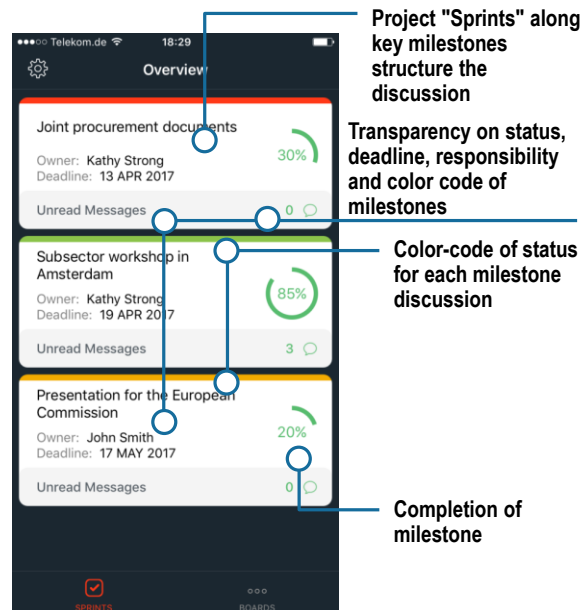
We offer dedicated engagement formats for different levels of experience

Formats to foster engagement of every region

Format	 Brief description	 Mainly targeted at
Self-assessment and individual introductory call	<ul style="list-style-type: none"> > Complete a self-assessment by every participating region and participation in individual introductory calls > Identify "newcomers" to the coalition and/or topic 	> All
Technology introductory session	<ul style="list-style-type: none"> > Provide an overview and introduction of technology (e.g. applications, level of readiness, ...) 	> All and Newcomers
Bilateral follow-up calls	<ul style="list-style-type: none"> > Regions can actively ask for help or a separate meeting/call – if need for direct coaching emerges 	> Newcomers
Assessment of fit of applications with regions to decide for focus in phase 2	<ul style="list-style-type: none"> > Assessment of fit of applications with the interest and capabilities of regions – offer orientation and consulting > Expected that experienced regions will already have clear understanding after preliminary business case 	> Newcomers
Support in developing plans for H2 Valleys in phase 2	<ul style="list-style-type: none"> > Develop business cases and roadmaps for H2 Valleys > Showcase the potential for integrating the technology and applications and drive efforts of entire community 	> Experienced regions
H2 Chat-App	<ul style="list-style-type: none"> > Jazz-App – designed as a forum to exchange information 	> All

The RB Jazz app can facilitate easy and increased interaction especially among international teams

RB Jazz features



Example for the interface of the Sprint feature

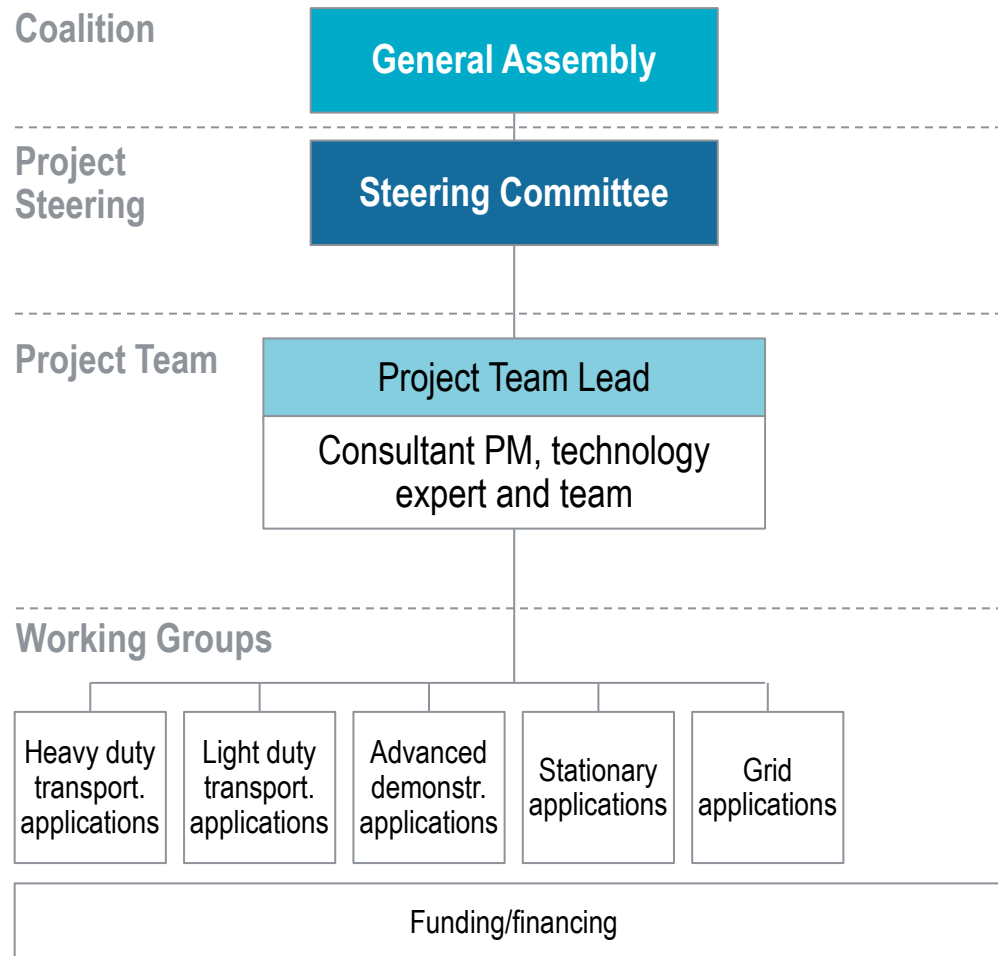
Key features and benefits

RB Jazz offers **four distinctive features**

- 1) **Sprint** – Set milestones and deadlines and track the implementation status
- 2) **Boards** – Spur discussions in topic specific open forums (e.g. H2-valley, technology application, frequently asked questions, ...)
- 3) **Polls** – Collect the opinions of large groups quickly to help build consensus
- 4) **Notifications** – Be informed on content updates

Introduce digital messaging solutions among stakeholders to foster transparency and proactive interaction between the participants

Project organization – Phase 1



General Assembly

- > Fundamental decisions/stakeholder involvement

Steering Committee

- > FCH2JU, Steering Committee reps of WG, RB
- > Overall project steering, strategic decisions

Project Management and Team

- > Operational project work
- > Consultants team: Data analysis
- > Integrated scoping team with coal. members
- > Close cooperation with working groups

Working Groups

- > Integrated teams to elaborate business cases
- > Guiding, inputting and reviewing analytic work regarding the different aspects of the project
- > Supporting data collection
- > Groups for operational cooperation in which regions apply specific data to business cases

Allocation of regions/cities to the Working Group in phase 1 (1/3)

Illustration of Working Groups composition – Suggestion

Working Group 1: Heavy duty transportation applications

Delegates for Steering Committee

- > ...
- > ...
- > ...
- > ...

Participating regions/cities

- > ...
- > ...
- > ...
- > ...
- > ...
- > ...
- > ...
- > ...
- > ...

To be allocated during the meeting

Allocated applications

- > Heavy-duty trucks, lorries
- > Buses (coaches)
- > Railway

Working Group 2: Light duty, highly dynamic transportation applications

Delegates for Steering Committee

- > ...
- > ...
- > ...
- > ...

Participating regions/cities

- > ...
- > ...
- > ...
- > ...
- > ...
- > ...
- > ...
- > ...
- > ...

To be allocated during the meeting

Allocated applications

- > Cars
- > Delivery vans
- > Construction mobile equipment
- > Sweepers
- > Refuse garbage trucks
- > Bikes
- > Scooters

Allocation of regions/cities to the Working Group in phase 1 (2/3)

Illustration of Working Groups composition – Suggestion

Working Group 3: Adv. research & demonstration transport applications

Delegates for Steering Committee

- > ...
- > ...
- > ...
- > ...

Participating regions/cities

- > ...
- > ...
- > ...
- > ...
- > ...
- > ...
- > ...
- > ...
- > ...

To be allocated during the meeting

Allocated applications

- > Boats
- > Ships
- > Ferries
- > Aircraft
- > Port operations
- > Airport Ground Handling operations

Working Group 4: Stationary applications

Delegates for Steering Committee

- > ...
- > ...
- > ...
- > ...

Participating regions/cities

- > ...
- > ...
- > ...
- > ...
- > ...
- > ...
- > ...
- > ...
- > ...

To be allocated during the meeting

Allocated applications

- > Gen-sets
- > Back-up power
- > Off-grid power
- > Residential use
- > Commercial buildings
- > Industrial use cases
- > District heating
- > Biogas in fuel cells

Allocation of regions/cities to the Working Group in phase 1 (3/3)

Illustration of Working Groups composition – Suggestion

Working Group 5: Energy-to-hydrogen

Delegates for Steering Committee

- > ...
- > ...
- > ...
- > ...

Participating regions/cities

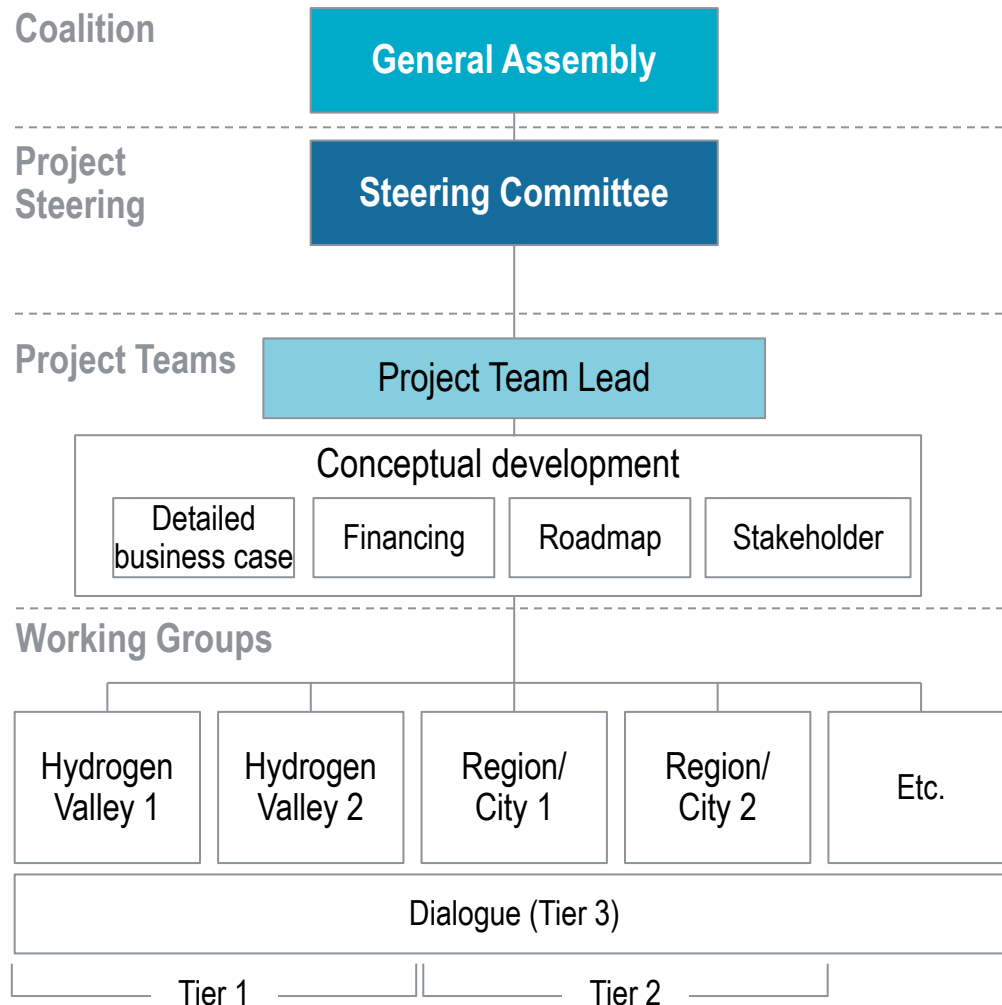
- > ...
- > ...
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- > ...
- > ...
- > ...

To be allocated during the meeting

Allocated applications

- > Grid services
- > Energy storage
- > Demand management
- > Frequency response
- > Injection of hydrogen into the gas grid
- > Biogas conversion to hydrogen

Project organization – Phase 2 from module 8 onwards



General Assembly

- > Fundamental decisions/stakeholder involvement

Steering Committee

- > Coalition repr./working group chairs/FCH JU
- > Overall project steering, daily decisions

Project Management and Team

- > Operational project work
- > Conceptual preparations for working groups, e.g. to prepare frameworks, templates etc.
- > Close cooperation with working groups

Working Groups

- > Integrated teams to elaborate functional framework for business cases (for H2 valleys or individual projects)
- > Guiding, inputting and reviewing analytic work regarding the different aspects of the project
- > Supporting data collection

Project team will review and validate obtained data – Consolidated and anonymized dataset will be presented in working groups

Overview data collection approach

Process step	1 Preparation & definition of data requirements	2 Data collection/validation by consultant	3 Review and feedback from coalition members	4 Refinement and anonymization of dataset
Actors involved	<ul style="list-style-type: none"> > Consultants/ Experts > Working groups 	<ul style="list-style-type: none"> > Consultants/ Experts > Industry members > RB global network 	<ul style="list-style-type: none"> > Consultants/ Experts > Working groups 	<ul style="list-style-type: none"> > Consultants/ Experts
Description	<ul style="list-style-type: none"> > Determine relevant indicators (costs, technological performance) for each transport and stationary application under consideration > Set up basic structure for the preliminary dataset 	<ul style="list-style-type: none"> > Collect data from industry coalition members > Collect data from RB/network internal and external sources > Validate, challenge and refine expert estimates with RB data set > Compile anonymized dataset 	<ul style="list-style-type: none"> > Present dataset to working groups > Multilateral discussions in working groups > Bilateral feedback (comments, confidential data) with working group members/industry members 	<ul style="list-style-type: none"> > Check plausibility of obtained data > Aggregate and anonymize data to compile consolidated dataset > Refine dataset to ensure "best in class" data > Apply in business cases

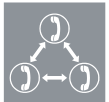
The entire process will be highly interactive – The Roland Berger Team, FCH JU Team and Coalition Members work together regularly

General Assemblies



- > Coalition members (all or Working Groups), FCH JU, RB interact to produce/validate content
- > Content is developed based on drafts/proposals and discussion
- > General Assembly meetings every 6-8 weeks
- > In-person (locations may vary) and ITC-enabled

Phone Conferences



- > The Working Groups and RB team communicate regularly
- > Topics vary, e.g. discussions, progress updates
- > Frequency is weekly, ~0.5-1.5h
- > Schedule will be disseminated
- > Phone conference information provided separately

Individual Consultations



- > Individual Coalition Members and RB team interact
- > Interviews and discussion on select topics
- > Consultations scheduled individually, ~15-30 min.
- > ITC-enabled (phone calls)

Data collection and discussion



- > Respective Coalition Member and RB team
- > Collection, sanitization, aggregation, analysis of data
- > Restricted access to individual folder provided on secure online project space if required

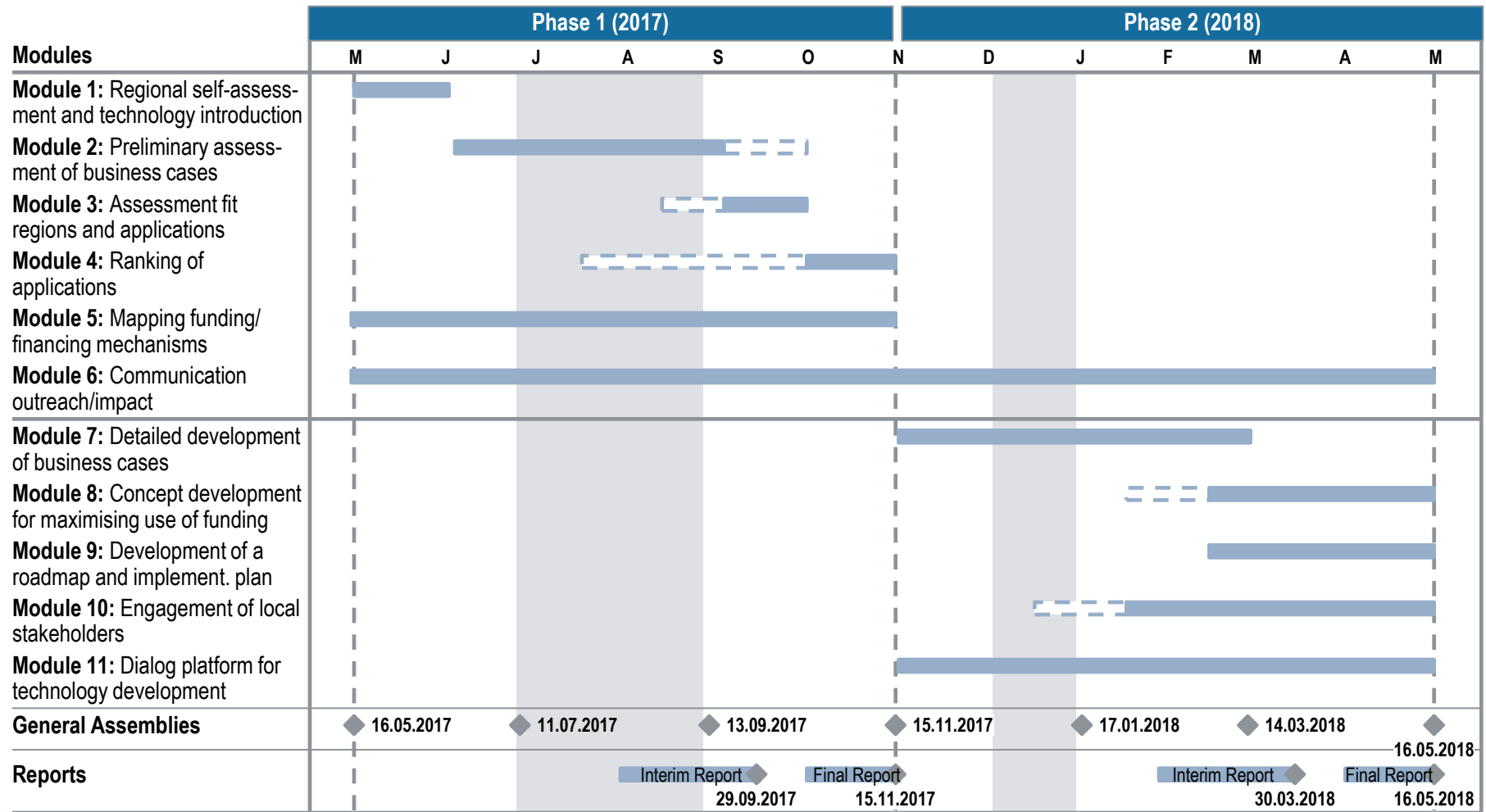
The conference calls with the Working Groups take place every week on Wednesdays – SteerCo and GA at major milestones

Tentative time schedule for Working Groups 1-6, SteerCo and GA

Initial proposal

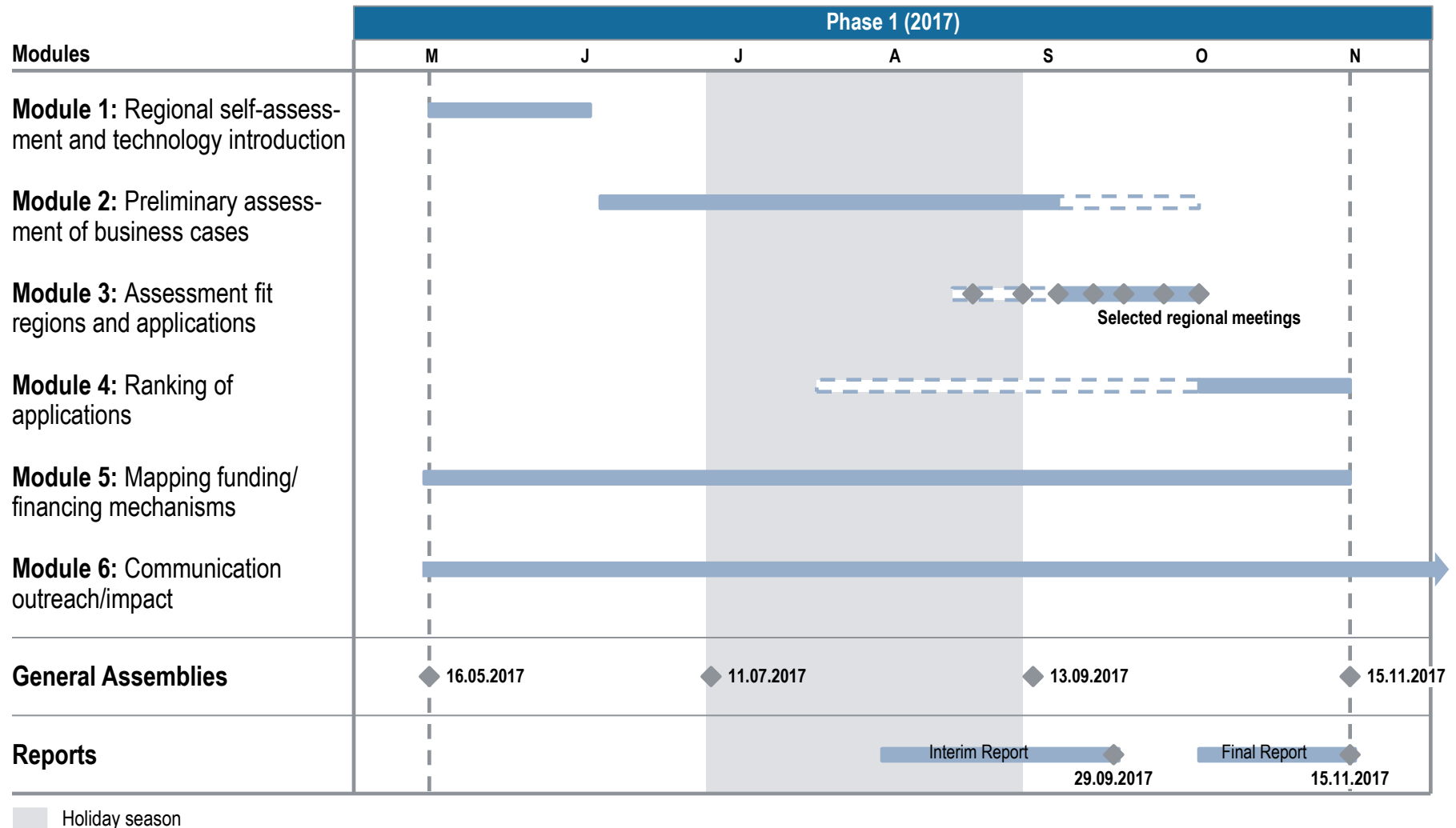
WG 1 Tr heavy duty	Conference calls will be on Wednesdays, regular slot to be announced (First conf. call on 14 or 21 June at 9:00 , 30-90 min)	Initially, 2 joint conference calls on self-assessment and technology introduction
WG 2 Tr light duty	Conference calls will be on Wednesdays, regular slot to be announced (First conference call on 14 or 21 June at 11:00 , 30-90 min)	
WG 4 St applications	Conference calls will be on Wednesdays, regular slot to be announced (First conference call on 14 or 21 June at 14:00 , 30-90 min)	
WG 5 Energy to H2	Conference calls will be on Wednesdays, regular slot to be announced (First conference call on 14 or 21 June at 16:00 , 30-90 min)	
WG 3 (Tr demo)	to be defined	
SteerCo	SteerCo conference calls: Every 3 weeks on Fridays, from 10:00 to 11:00 (dates will be defined until May 29th)	
General Assembly (GA)	Meetings of all project participants: July 11, September 13, November 15 each from 10:30 to 15:30	

Proposed project plan for phases 1 and 2



■ Holiday season

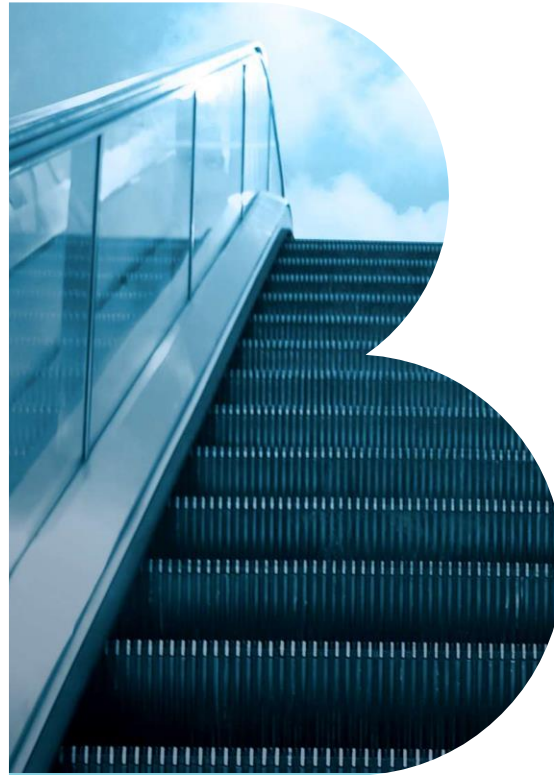
Proposed project plan for phase 1



6. Discussion – Your feedback and input



7. Closing – Summary of workshop results and next steps



Next steps

- 1 **Distribution of presentation** – Presentation with a short summary of today's discussion results will be distributed by the beginning of next week

- 2 **Dissemination of milestones and meeting schedule** – Schedule for working groups as well as meeting dates will be distributed by end of next week

- 3 **Distribution of working mode information** – Presentation with information regarding the data exchange server, outlook invitations, dial-in numbers and online presentation details

- 4 **Feedback from dial-in participants** – Request for feedback regarding the distributed presentation by next week

- 5 **Scheduling two joint conference calls** regarding self-assessment and technology introduction (1st June 2017)

- 6 **Starting within working groups** – **First conference calls** will take place in mid-June, conference materials will be sent out the day before and explained during the call

The RB team is at your disposal; please do not hesitate to get in touch with us

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navigating
complexity