



Electric Power
Technology Platform

RWE

IERE Technology Foresight

IERE – RWE Technology Scouting project on Hydrogen

Summary of Phase 1 – Scouting

Status: 20.03.2020

RWE Generation SE

We have learned a lot from the first phase of the IERE Foresight Study with focus on hydrogen technology scouting.

1 We gained insights in national hydrogen activities by bilateral talks with the project participants.

- Hydrogen is gaining pace – but uneven around the world!
- We summarized individual country perspectives for 11 countries with the focus on a hype cycle analysis, current activities and future perspectives and on selected KPIs, which have been compiled and compared to each other.

2 We investigated hydrogen-related lighthouse projects and derived major market opportunities.

- 5 major market opportunities have been identified from lighthouse projects in the considered countries.
- We compiled an overview of the lighthouse projects for 4 regions: North America, Europe, Asia and Australia.
- The main market opportunities focus on the mobility sector, Power-to-X, substitution in industries, technology development and export of H₂.

3 We analysed available data of products from relevant technology manufacturers.

- A very brief techno-economic analysis of products has been done due to a limited number of feedbacks.
- We used also available online data of product specifications for an analysis of electrolyzers, as this technology plays a key role in green H₂ production.
- 43 manufacturers have been selected for the inquiry - 13 offer products for more than one value chain element.
- Four electrolyser units in utility scale (10...24 MW), but some others can also be stacked to larger units.

4 Nations prepare their hydrogen strategies and a large variety of funding programs are available.

- Funding volumes in dedicated countries are in the range of ~US\$ 100-160m for the development of H₂ projects.
- Japan is seen as a special case: ~US\$ 350m for the development of a hydrogen society.

The main purpose of the IERE foresight project is to scout for technologies and identify R&D collaboration opportunities.

Phase 1 - Scouting

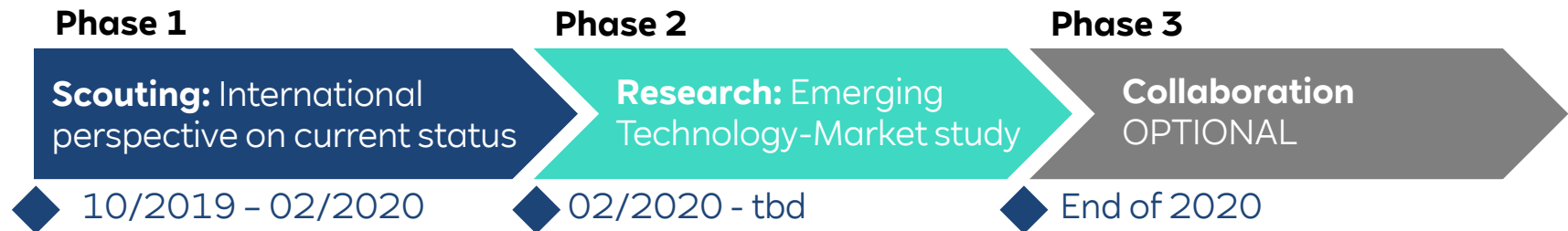
Share the international perspective on current status of technology, market and R&D and identify most relevant technology – market combinations.

Phase 2 - Research

Focus on the future perspectives and the most relevant R&D demand and collaboration opportunities.

Phase 3 - Collaboration

Develop collaborative hydrogen related projects within IERE members.



The scope of the project is along the hydrogen value chain.

Goals

International state of the art technology – market perspective from industries for industries.

Techno-economic evaluation

Technology solutions/ -supplier
Costs and cost-reduction potential

Market opportunities

Utilisation technologies of H2 & by-products
Most relevant sectors and market value pools

Framework

National targets and political/regulatory frameworks
Relevant funding programs and volumes

Future perspective

Aggregating and analysing findings: Interpretation and guidance for indications for Innovation, Research & Development and business opportunities.

Scope

Technologies

1

Production of Hydrogen

2

Transportation / Storage

3

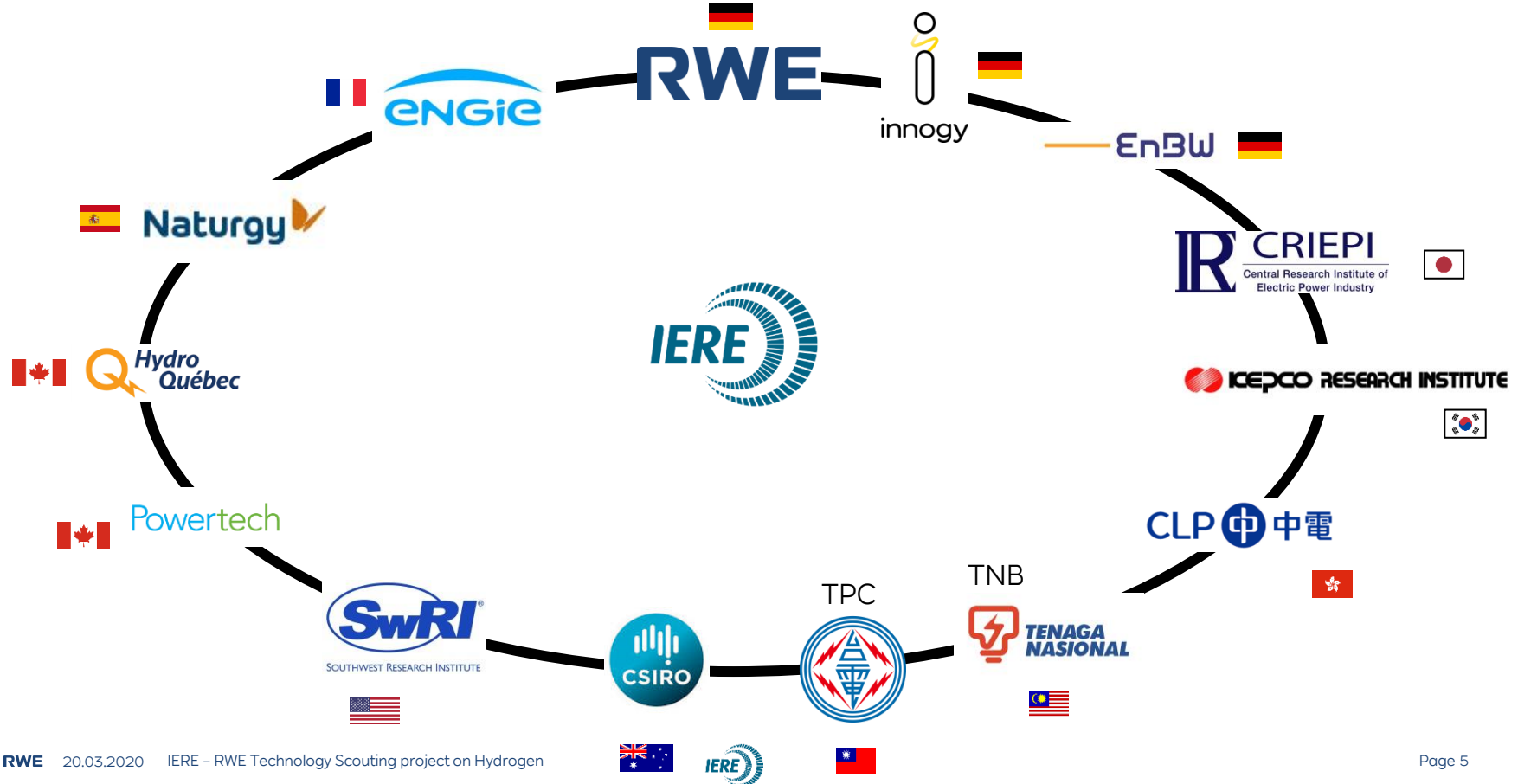
Utilisation technologies and
Hydrogen markets/sectors

4

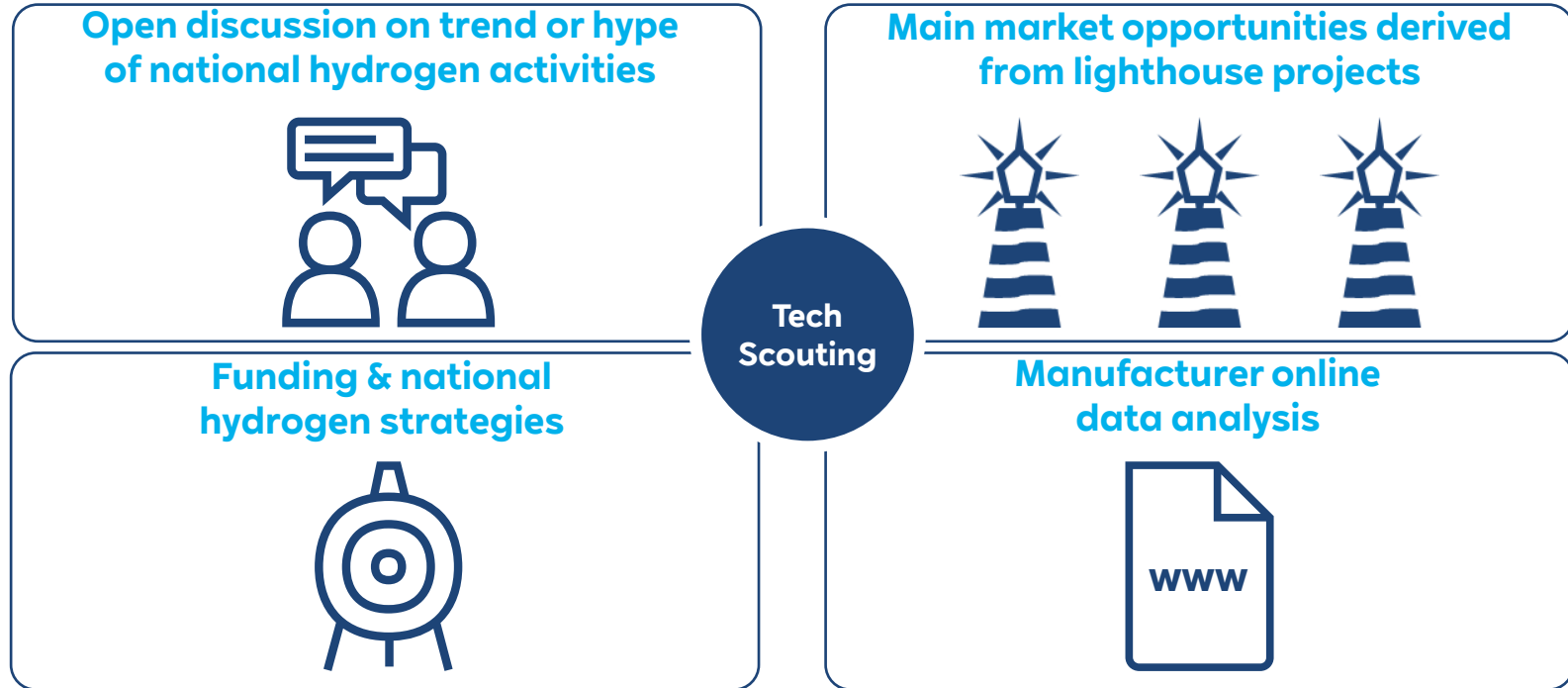
National/regional funding schemes
(Political / Regulatory framework)

Markets

14 IERE member companies around the world joined the project.



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Conclusion

- **The scouting project offers a helpful starting point for all participants for**
 - learning from others – project ideas, ways of funding or market opportunities
 - get in touch with market players or manufacturers
 - and having a base for deeper technology discussion.
- **The development of a hydrogen economy requires in short term**
 - supply of reliable technologies for a variety of applications
 - further development of commercial scale projects of market players
 - and broad and comprehensive covering funding regimes.
- **The development of new technologies will pave the way to**
 - increase the implementation of hydrogen in industries
 - offer alternatives in or the replacement of rare or hazardous materials
 - and further reduce the emissions of CO₂.