Technology evaluation framework – Technology scouting

Hydrogen Valley Facility

2025

Roland Berger

The H2V Facility delivers dedicated support to hydrogen practitioners via PDA services, the H2V Knowledge Centre and the H2V Platform

The Hydrogen Valleys Facility

h2v.eu

Dedicated support via the Hydrogen Valleys Facility by

Clean Hydrogen Partnership

1 **Project Development Assistance**

Provision of dedicated Project Development Assistance (PDA) for Hydrogen Valleys projects towards Final Investment Decision

2 **H2V Knowledge Centre**

Sharing & dissemination of knowledge and provision of capacity building for the broader hydrogen community

3 **H2V Platform**

Maintenance & extension of the Hydrogen Valley Platform to enhance its positioning as the global one-stop-shop for hydrogen flagship projects

Delivery partners

Roland Berger

worley

Inycom

Aspirational target 2030

50 Hydrogen Valleys **operational/under construction**

within the EU

Source: Roland Berger

This document is part of the H2V Knowledge Centre that offers hydrogen practitioners knowledge material in written and interactive formats

The H2V Knowledge Centre

Structure and scope of the H2V Knowledge Centre

	Self-service Knowledge Material	Interactive Formats
Commercial	• Knowledge material specifically developed as part of the H2V Facility project • Links and information to other third-party resources and material	• Webinars with content experts (Roland Berger, Worley and external speakers) • Project Development Assistance experience sessions with Hydrogen Valley practitioners
Technical		
Regulatory		
Valley governance		

Target audience

- Hydrogen Valleys
- Project developers
- National, regional and local authorities
- Investors
- Other hydrogen practitioners

Source: Roland Berger

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Source: Roland Berger

Key objective of this document is to support Hydrogen Valleys on scouting the most suitable technologies for their project specifics

Key objectives and content of this document

Key objectives

Conduct a **technology assessment of relevant technologies** for all major components of the Hydrogen Valley project

Key content

1 **H_2 value chain assessment**
Structured approach to evaluate and prioritize all relevant value chain steps based on their strategic relevance for the Hydrogen Valley and other potentials

2 **Technology scouting**
Comprehensive approach to prioritize focus technologies based on a detailed technology analysis considering aspects such as cost reduction and innovation potentials

3 **Partner categorization and partner scouting**
Guidance on the identification of potential partner types for focus technologies and on the scouting of potential partners

Source: Roland Berger

To select suitable technologies for key components along the Hydrogen Valley value chain, a thorough 4-step technology assessment is recommended

Technology assessment - overview

Focus of this document

Focus level	H_2 value chain	Technology	Company types	Specific companies
Process step	**1 H_2 value chain assessment**	**2 Technology scouting**	**3 Partner categorization**	**4 Partner scouting**
Description	Identification of relevant value chain steps	Prioritization of focus technologies based on concrete project setup	Identification of potential partner types for focus technologies	Scouting of potential partners
Deliverables	High-level analysis with key value chain steps	Detailed analysis with key technologies	List of potential partner categories	Short-list of potential partners

It is recommended to repeat the technology assessment in regular intervals

Source: Roland Berger

The technology scouting aims to analyze the most relevant technologies along the value chain and prioritize them based on innovation potential & strategic fit

Technology scouting objective and framework

Objective

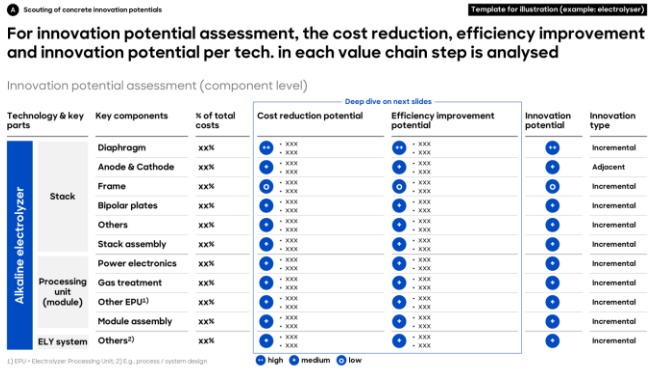
- Prioritization of **key technologies** per selected focus areas based on:
  - Concrete innovation potential per key component
  - Strategic fit
- Identification **key enablers** per key cost/efficiency lever

Outcome

- Cost reduction and efficiency improvement potentials
- Strategic fit per analyzed technology
- Prioritization of analyzed technology for further analysis

Framework

A Scouting of concrete innovation potentials


Scouting of concrete innovation potentials

Template for illustration (example: electrolyser)

For innovation potential assessment, the cost reduction, efficiency improvement and innovation potential per tech. in each value chain step is analysed

Innovation potential assessment (component level)

Deep dive on next slides

Technology & key parts	Key components	% of total costs	Cost reduction potential	Efficiency improvement potential	Innovation potential	Innovation type
Alkaline electrolyzer – Stack	Diaphragm	xx%	++ • XXX • XXX	++ • XXX • XXX	++	Incremental
	Anode & Cathode	xx%	+ • XXX • XXX	+ • XXX • XXX	+	Adjacent
	Frame	xx%	o • XXX • XXX	o • XXX • XXX	o	Incremental
	Bipolar plates	xx%	+ • XXX • XXX	+ • XXX • XXX	+	Incremental
	Others	xx%	+ • XXX • XXX	+ • XXX • XXX	+	Incremental
	Stack assembly	xx%	+ • XXX • XXX	+ • XXX • XXX	+	Incremental
Processing unit (module)	Power electronics	xx%	+ • XXX • XXX	+ • XXX • XXX	+	Incremental
	Gas treatment	xx%	+ • XXX • XXX	+ • XXX • XXX	+	Incremental
	Other EPU[1]	xx%	+ • XXX • XXX	+ • XXX • XXX	+	Incremental
	Module assembly	xx%	+ • XXX • XXX	+ • XXX • XXX	+	Incremental
ELY system	Others[2]	xx%	+ • XXX • XXX	+ • XXX • XXX	+	Incremental

++ high + medium o low

1) EPU = Electrolyzer Processing Unit; 2) E.g., process / system design

Source: Roland Berger

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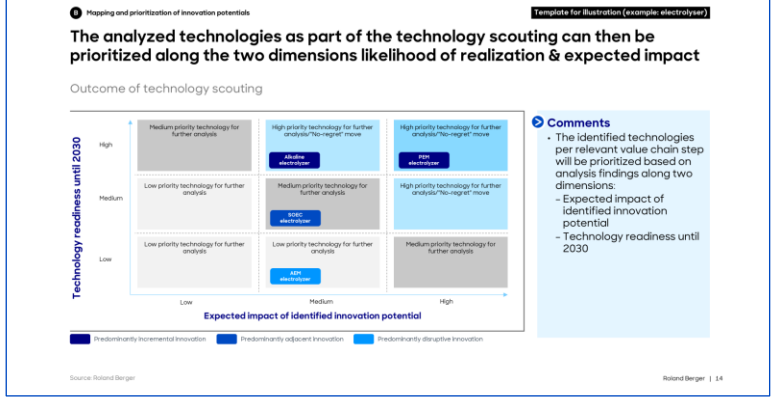
B Mapping and prioritization of innovation potentials


Mapping and prioritization of innovation potentials

Template for illustration (example: electrolyser)

The analyzed technologies as part of the technology scouting can then be prioritized along the two dimensions likelihood of realization & expected impact

Outcome of technology scouting

Technology readiness until 2030

High

Medium

Low

Medium priority technology for further analysis

High priority technology for further analysis/"No-regret" move

Alkaline electrolyzer

High priority technology for further analysis/"No-regret" move

PEM electrolyzer

Low priority technology for further analysis

Medium priority technology for further analysis

SOEC electrolyzer

High priority technology for further analysis/"No-regret" move

Low priority technology for further analysis

Low priority technology for further analysis

AEM electrolyzer

Medium priority technology for further analysis

Low Medium High

Expected impact of identified innovation potential

Predominantly incremental innovation

Predominantly adjacent innovation

Predominantly disruptive innovation

Comments

- The identified technologies per relevant value chain step will be prioritized based on analysis findings along two dimensions:
  - Expected impact of identified innovation potential
  - Technology readiness until 2030

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Source: Roland Berger

Template for illustration (example: electrolyser)

The technology scouting consists of an analysis of the technology readiness level (TRL), cost, efficiency and innovation potential as well as strategic fit

Approach for technology scouting

Value chain step	Technology	TRL[1)]	Cost reduction innovation areas	Efficiency impr. innovation areas	Innovation potential	Strategic fit for Hydrogen Valley	Prioritization
0. Process input generation							
1. Green hydrogen production	**Alkaline**	xx	• xx • xx • …	• xx • xx • …	++ / + / o	++ / + / o	Low/medium/high priority
	PEM	xx	• xx • xx • …	• xx • xx • …	++ / + / o	++ / + / o	Low/medium/high priority
2. Conv. & storage	**SOEC**	xx	• xx • xx • …	• xx • xx • …	++ / + / o	++ / + / o	Low/medium/high priority
…	**AEM**	xx	• xx • xx • …	• xx • xx • …	++ / + / o	++ / + / o	Low/medium/high priority

1) Technology Readiness Level

++ high + medium o low

Source: Roland Berger

The innovation potential assessment takes place for key technologies on a component level – Considering costs and efficiency

Innovation potential assessment (component level)

Technology & key parts		Key components	% of total costs	Deep dive on next slides: Cost reduction potential	Deep dive on next slides: Efficiency improvement potential	Innovation potential	Innovation type
Alkaline electrolyzer	Stack	Diaphragm	xx%	++/+/o • xxx • xxx	++/+/o • xxx • xxx	++/+/o	Incremental
		Anode & Cathode	xx%	++/+/o • xxx • xxx	++/+/o • xxx • xxx	++/+/o	Adjacent
		Frame	xx%	++/+/o • xxx • xxx	++/+/o • xxx • xxx	++/+/o	Incremental
		Bipolar plates	xx%	++/+/o • xxx • xxx	++/+/o • xxx • xxx	++/+/o	Incremental
		Others	xx%	++/+/o • xxx • xxx	++/+/o • xxx • xxx	++/+/o	Incremental
		Stack assembly	xx%	++/+/o • xxx • xxx	++/+/o • xxx • xxx	++/+/o	Incremental
	Processing unit (module)	Power electronics	xx%	++/+/o • xxx • xxx	++/+/o • xxx • xxx	++/+/o	Incremental
		Gas treatment	xx%	++/+/o • xxx • xxx	++/+/o • xxx • xxx	++/+/o	Incremental
		Other EPU[1)]	xx%	++/+/o • xxx • xxx	++/+/o • xxx • xxx	++/+/o	Incremental
		Module assembly	xx%	++/+/o • xxx • xxx	++/+/o • xxx • xxx	++/+/o	Incremental
	ELY system	Others	xx%	++/+/o • xxx • xxx	++/+/o • xxx • xxx	++/+/o	Incremental

1) EPU = Electrolyzer Processing Unit

++ high + medium o low

Source: Roland Berger

For the cost reduction assessment, key cost reduction levers and required enablers to achieve cost reduction can be analyzed

Cost reduction potential assessment (component level)

Technology & key parts		Key components	% of total costs	Cost reduction levers/Innovation areas	Key required enablers	Likelihood of realization	Expected impact	Cost red. potential
Alkaline electrolyzer	Stack	Diaphragm	xx%	xxx	• xxx • xxx • xxx	++	+	+
				xxx	• xxx • xxx • xxx	++	+	+
		Anode & Cathode	xx%	xxx	• xxx • xxx • xxx	++	+	+
				xxx	• xxx • xxx • xxx	++	+	+
		Frame	xx%	xxx	• xxx • xxx • xxx	++	+	+
		...	...	...	...	++	+	+

++ high + medium o low

Source: Roland Berger

For the efficiency improvement assessment, efficiency levers and enablers for key components can be analyzed

Efficiency improvement assessment (component level)

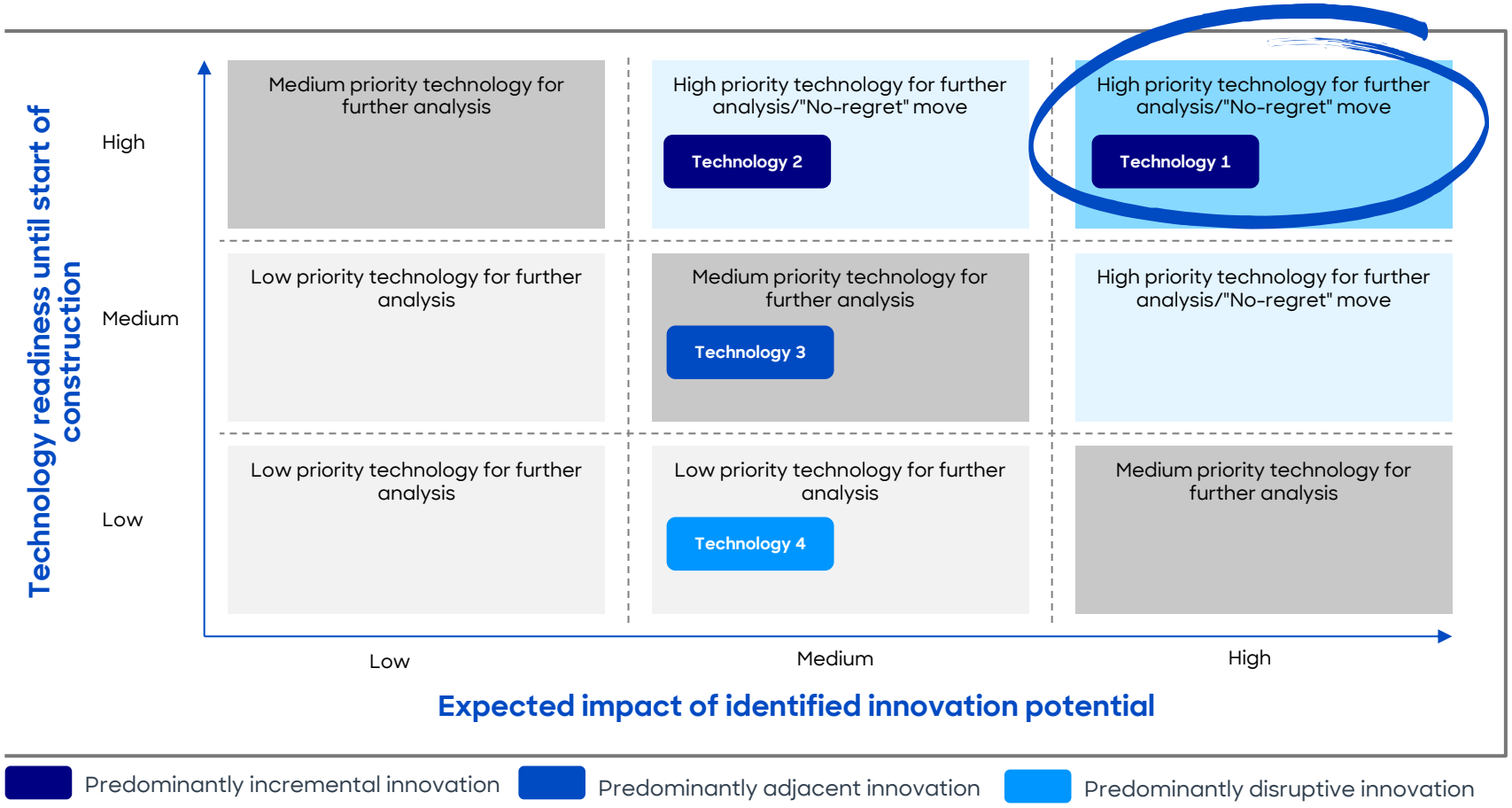
Technology & key parts		Key components	Efficiency improvement levers/Innovation areas	Key required enablers	Likelihood of realization	Expected impact	Efficiency potential
Alkaline electrolyzer	Stack	Diaphragm	xxx	• xxx • xxx • xxx	++	+	+
			xxx	• xxx • xxx • xxx	++	+	+
		Anode & Cathode	xxx	• xxx • xxx • xxx	++	+	+
			xxx	• xxx • xxx • xxx	++	+	+
		Frame	xxx	• xxx • xxx • xxx	++	+	+
		...	... ...	...	++	+	+

++ high + medium o low

Source: Roland Berger

After having analyzed all key technologies, they can be prioritized along the two dimensions likelihood of realization & expected impact for decision-making

Outcome of technology scouting



Comments

- The two-dimensional matrix supports the prioritization of all analyzed technologies to facilitate decision-making
- In this **illustrative example**, **Technology 1** would be the **most prioritized** technology as it has
  - the highest degree of technological readiness and
  - is expected to have the highest impact regarding the innovation potential

Source: Roland Berger

Roland Berger