

Quick guide

Going from 'Power' to 'X'

Get started with confidence

RAMBOLL

Bright ideas.
Sustainable change.



The main question for Power-to-X and hydrogen is not whether they reach scale, but when.

As the market and technologies are not yet fully mature, hydrogen projects are especially sensitive to getting the early-stage planning right, to realise the investment without unnecessary risks or delays.

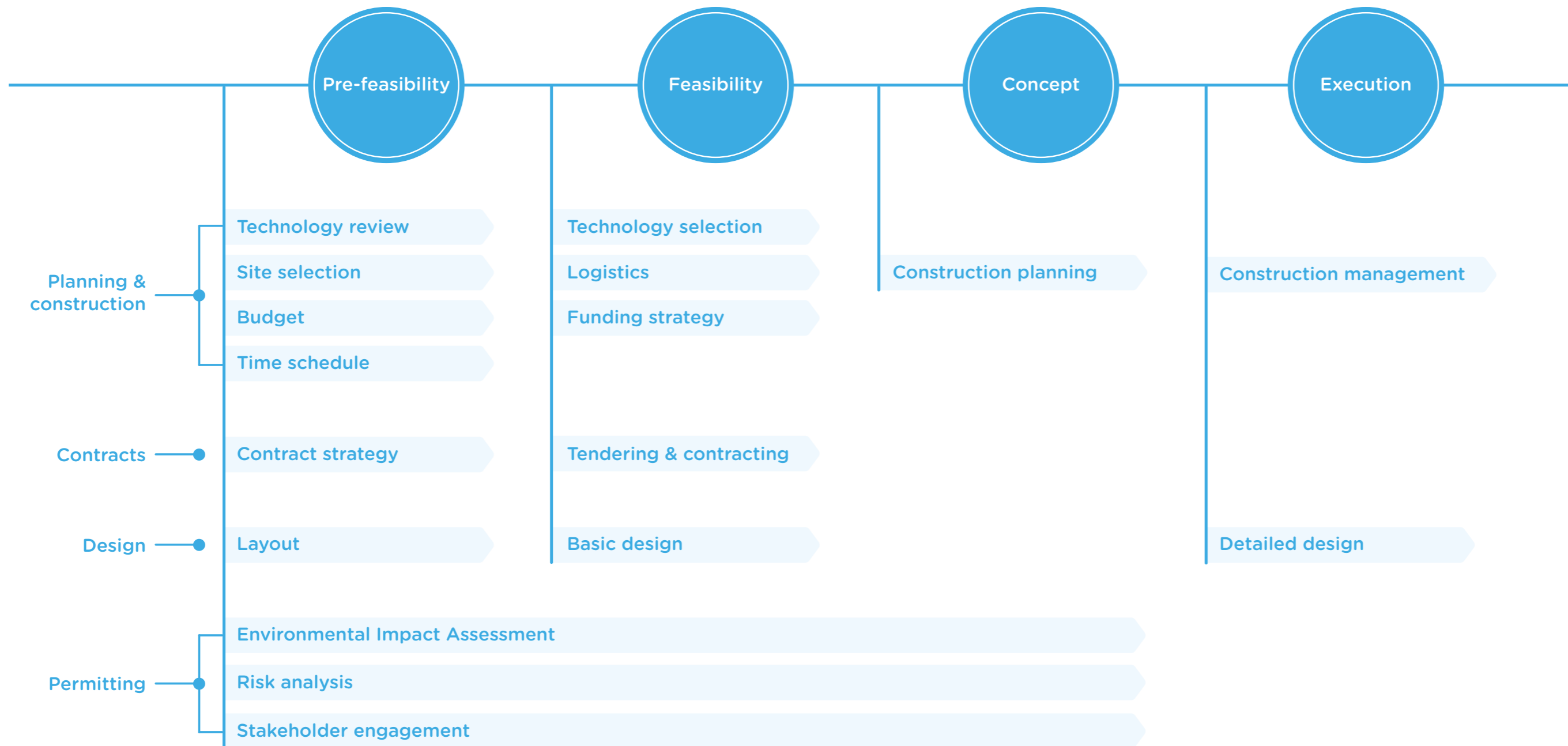
In this guide, we focus on four tracks in the early project phases that are key to get hydrogen and Power-to-X projects off the ground:

- Funding
- Contract strategy
- Permitting
- Site selection

Let's explore!



The project process in short



Find your funding opportunities

Deciding on the right funding strategy is critical to project success.

Will your project be realised with public funding, private financing, or a combination of both? There are a number of options to consider:

- Research-focused public funding, which will likely require that you collaborate with universities and share project knowledge and learnings with peers.
- Public regional, national or international funding programmes, such as the European Innovation Fund.
- Private investment funds.
- Loan funding, for example with the European Investment Bank or the Innovative Clean Energy Loan Guarantee Program in the US.

Start by creating an overview of the options in the market(s) where you plan to operate. The criteria and conditions across public funding programmes vary greatly, but they have one thing in common: it takes considerable planning and preparatory work to secure funding.

To increase the likelihood of receiving a grant, map conditions and deadlines at the project outset and start the application process six months, not six weeks, before the deadline.

Want an overview of public funding options?

The European Commission has created an online database, designed as a single point entry for information on public funding programmes and funds for renewable and low-carbon hydrogen in Europe.



Create your contract strategy

As the markets for hydrogen and other types of Power-to-X are still maturing, many technologies have yet to be fully scaled and there are relatively few suppliers across the value chain.

If you don't have fixed agreements with suppliers, for example to guarantee delivery of electrolysis, it can very easily create bottlenecks and lead to significant project delays.

A contract strategy for procurement is key to keep the project on track and on time.

As a project owner or developer, you first need to decide how to handle the procurement process:

- Do you want to handle coordination with all relevant parties - from supply of electrolysis and water treatment to finding storage?
- Do you want to form partnerships and run the project as a consortium?

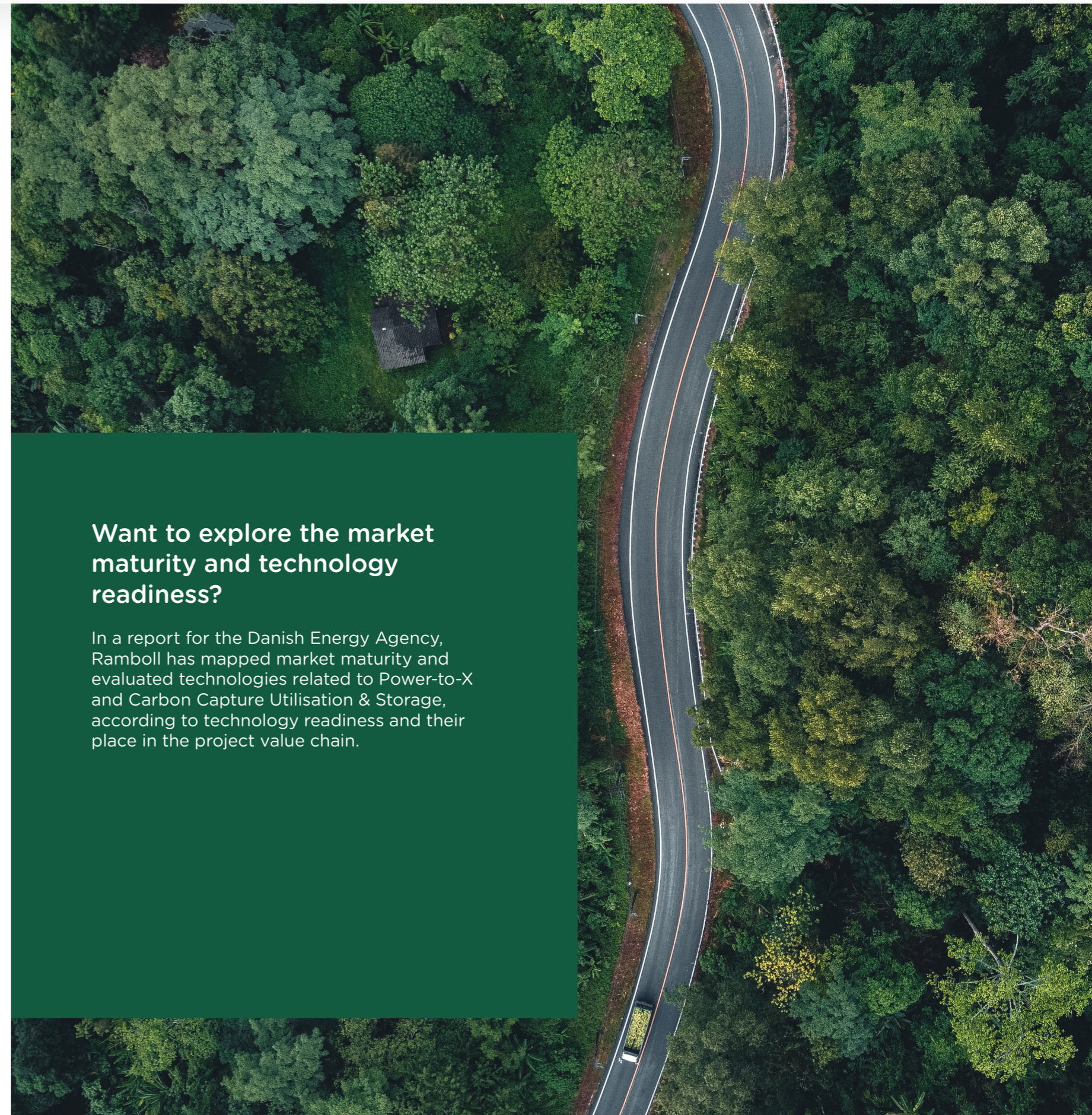
- Do you want to find a contractor to take care of the full supply chain?

At this stage of market maturity, it is near impossible to find a contractor who will manage the entire process, so this option will likely not be feasible in the next 3-5 years.

No matter which strategy you choose, you need a comprehensive understanding of the market you operate in, the key players, and the technologies available to help you choose the right partners and suppliers

Want to explore the market maturity and technology readiness?

In a report for the Danish Energy Agency, Ramboll has mapped market maturity and evaluated technologies related to Power-to-X and Carbon Capture Utilisation & Storage, according to technology readiness and their place in the project value chain.



Plan your permitting process

The permitting process can be time-consuming and – if not done right – costly. From starting the dialogue with authorities to securing your permits, the process can take as long as 2½ years.

There are three cornerstones in this process: the safety, risk, and environmental impact analyses. Although these follow methodologies known from other large-scale projects, there is limited experience with large-scale production and storage of hydrogen and e-fuels.

On both the project developer and authority side, many are working through the application process for the first time.

Getting the application right on the first take is important, as multiple application rounds can lead to critical project delays and dramatically increase costs, due to added processing time and resource demand.

To increase your chances of success, you will benefit from a partner with in-depth knowledge of local authorities and regulations to ensure compliance and optimal stakeholder management.

Moreover, you need to facilitate a close continual dialogue with authorities throughout the process, to ensure that you discover potential red flags and can adjust before the first submission of your application.

Markets with hydrogen or Power-to-X strategies

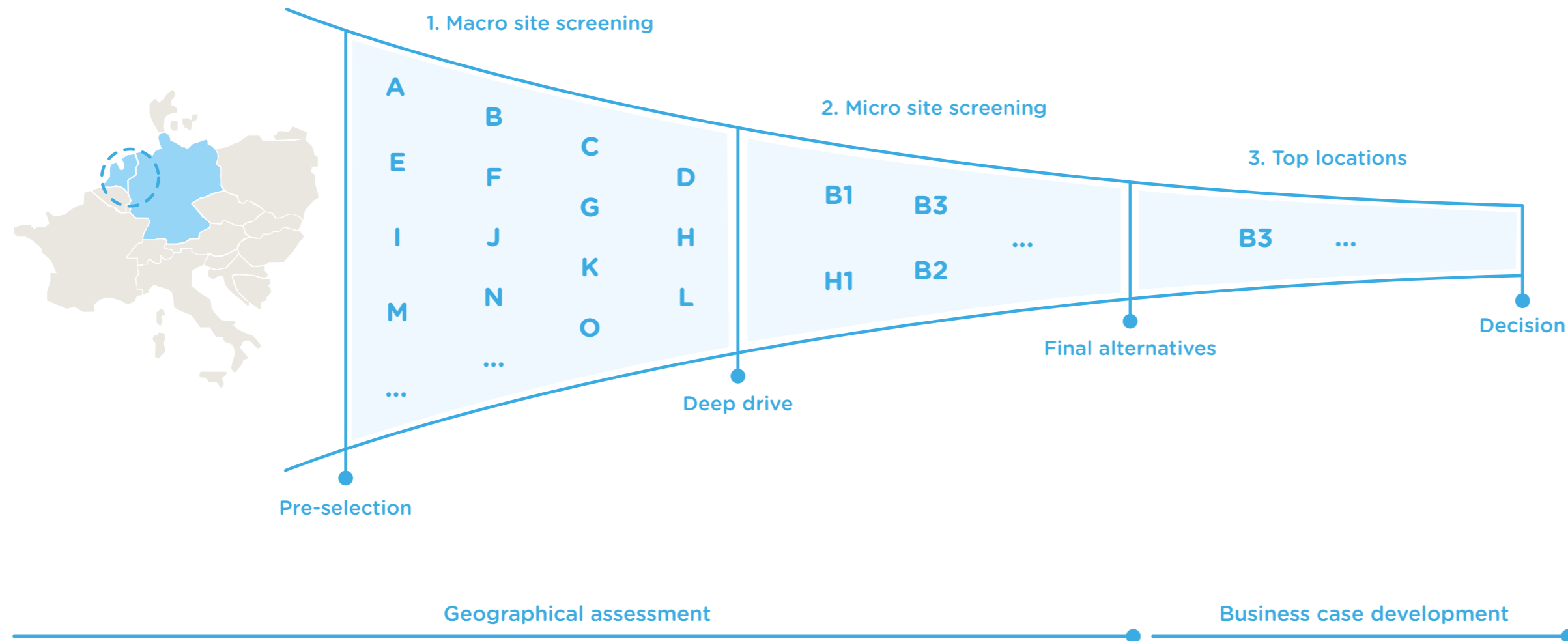
It is easier to secure permits and funding in countries and regions that have outlined a strategy for hydrogen or Power-to-X, as authorities have a vested interest in furthering projects that support the strategy.

The IEA's Policies and Measures Database provides information on existing and planned government policies to reduce greenhouse gas, improve energy efficiency, and support the development of renewables and other clean energy technologies. Here, you can also find information about national and regional strategies for hydrogen and Power-to-X.



Select your site

For projects that involve establishing new facilities, site selection is a central part of project planning and is closely connected to the permitting process. At Ramboll, we have worked on more than 70 hydrogen and Power-to-X projects, and our approach can be divided into three overall stages:



1. Macro site screening

First, you screen geographical locations on a national or regional scale.

We apply a range of criteria, some of the important being market maturity, national regulation, options for subsidy schemes, availability of renewable energy, and cost of electricity.

Regions with low electricity prices are attractive, as the cost of electricity often constitutes up to 80% of the production costs for green hydrogen.

2. Micro site screening

Based on the outcome of stage 1, you need to assess possible micro site locations. We evaluate each site based on cost driver, logistics and infrastructure, including access to renewable energy and a water source, storage possibility, access to CO2 etc.

To avoid expensive energy loss over distances, electrolyzers should be close to both a power and a water source.

If you plan to produce green hydrogen, the electrolysis must be supplied with renewable energy. If your project involves production of carbon containing e-fuels, you also need access to CO2. And if you aim for e-fuels that are truly renewable, the CO2 must come from biogenic sources.

3. Business case development

In the last stage, a thorough business case is developed for the top locations, usually one to three locations, including scenario and sensitivity analysis.

Are you planning for EU certified green hydrogen?

The European Commission's delegated act will soon define the criteria for counting hydrogen and its derivatives as green, i.e. fully renewable. Although the precise requirements for certification are not yet public, they will involve a focus on additionality.

This means that it might not be enough to enter into Power Purchase Agreements (PPA) for existing renewable supply when the new criteria take effect. Projects will likely need to expand capacity by adding new installations for renewables to the grid, prove that the renewable electricity used is 'additional' and directly correlated with the hydrogen production, or count only a share of the hydrogen produced as renewable.



How we can help you navigate opportunities in hydrogen and Power-to-X

With more than 50 years of experience planning, designing and implementing energy solutions, Ramboll is at the forefront of the transition from fossil fuels to renewables and taking new technologies to scale.

Since 2020, we have worked on 70+ green hydrogen and Power-to-X projects across the value chain, from renewable energy production to hydrogen electrolysis and synthesis with CO2 or nitrogen.

Working as an independent advisor, we produce best practice guidance through all project phases, from inception and feasibility to design, construction and operation.

We can help your business with:

Access to funding



Technical and economic analysis



Risk assessment



Environmental impact assessment



Planning and engineering design



System integration



Construction management



Project management

Get in touch



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Want to know more?

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