

# Qair aurora

CONCEPTUAL DESIGN  
OCTOBER 2023

Arkitema - COWI





## QAIR AURORA

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QairAurora is a concept for a harmonious coexistence of nature and energy in Grundartangi, Iceland.

Drawing inspiration from the mesmerizing aurora lights in the sky we aim to establish a sustainable energy production facility that seamlessly blends with the Icelandic landscape from coast to sky.

\*Concept Visualization  
Scope and design are subject to change














# QAIR AURORA

## PROJECT SITE LOCATION

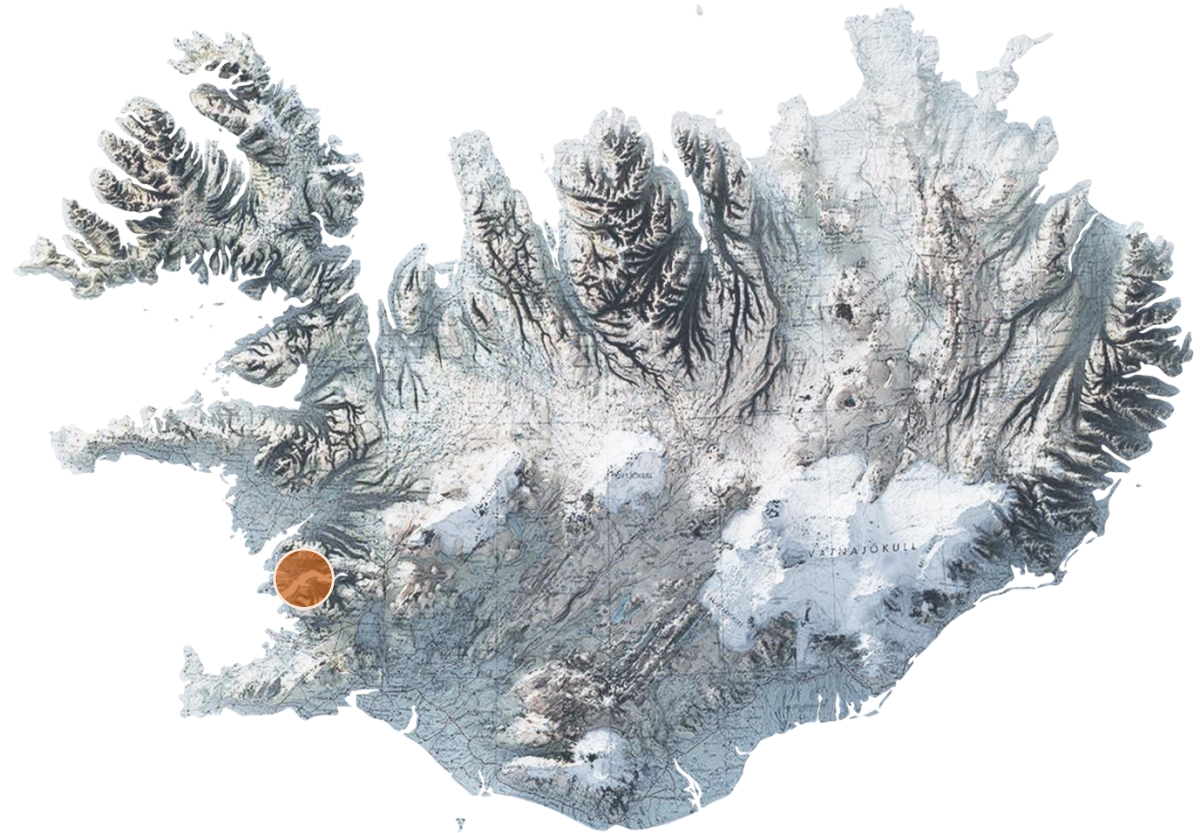
This concept design illustrates a preliminary design concept for the QairAurora Green Hydrogen Facility, located in Grundartangi in Hvalfjörður, Iceland.

The project is planned in 3 phases of each 280MW to a full scope of 840MW as is illustrated in this concept design.

Below are the key figures for the project at its current stage of development.

Unit	Scope for 840 MW
 Transformer/Substation	10.000 m <sup>2</sup>
 Electrolysis	80.000 m <sup>2</sup>
 Water treatment	4.500 m <sup>2</sup>
 Ammonia synthesis	18.150 m <sup>2</sup>
 Cooling water system	5.250 m <sup>2</sup>
 Air separation unit	6.000 m <sup>2</sup>
 Storage	6.850 m <sup>2</sup>
 Administration	2.000 m <sup>2</sup>
 Workshop + Storage	1.000 m <sup>2</sup>
 Innovation Center	2.000 m <sup>2</sup>
 Flare	300 m <sup>2</sup>
	<b>133.750 m<sup>2</sup></b>

All data is subject to change



# QAIR AURORA

## PROJECT SITE BACKGROUND



View towards Grundartangi from the southern part of Hvalfjörður

Grundartangi is a location in Iceland known primarily for its industrial and commercial significance. It is situated in the southern part of the Hvalfjörður (Whale Fjord), which is a long, narrow fjord on the western coast of Iceland, located approx. 50km north of Reykjavik.

**Industrialization:** In the latter half of the 20th century, Iceland experienced significant industrial development. Grundartangi became home to various industrial facilities and the Grundartangi Harbor, which plays a crucial role in handling goods and materials.

**Developments in the Area:**

Grundartangi has witnessed various industrial developments in recent years, and several key industries and projects have been significant: One of the most notable developments in Grundartangi is the aluminum smelting industry.

**Port and Logistics:** The Grundartangi Harbor has expanded to accommodate increased shipping and logistical operations due to the growth in the aluminum industry and other related sectors.

**Renewable Energy:** Iceland, in general, has been keen on utilizing its abundant geothermal and hydroelectric resources for energy production. The industrial developments in Grundartangi often make use of clean and sustainable energy sources.

**Infrastructure:** Ongoing infrastructure developments in the area have been crucial to support industrial activities. This includes road improvements, utilities, and transportation networks.

**Environmental Considerations:** Given Iceland's commitment to environmental protection, many developments in the area focus on sustainability and minimizing their ecological footprint. Environmental impact assessments and eco-friendly practices are common.

**Economic Impact:** These developments have had a significant economic impact on the region, providing job opportunities and boosting the local economy.



# QAIR AURORA

## PROJECT SITE FEATURES



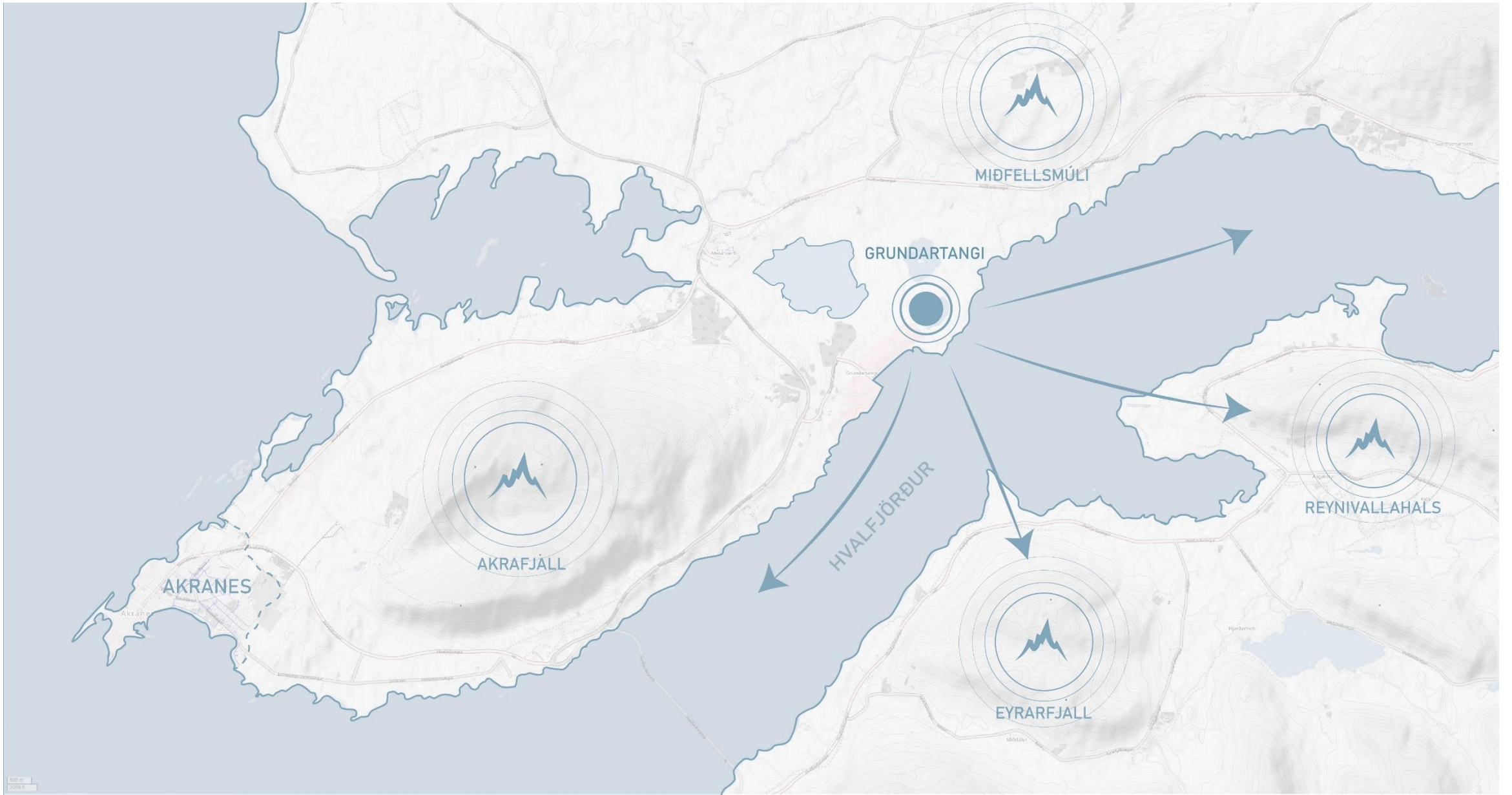
View towards Grundartangi from the South East. Akrafjall visible in the background

### Features:

- 1. Coastal Location:** Grundartangi is situated along Iceland's western coast, offering stunning views of the North Atlantic Ocean.
- 2. Fjord Surroundings:** The peninsula is surrounded by Hvalfjörður (Whale Fjord), which adds to its scenic beauty and provides opportunities for recreational activities and tourism.
- 3. Mountains and Fjords:** The landscape features mountains and fjords, creating a dramatic backdrop. The nearby mountains and fjords offer hiking, skiing, and other outdoor recreational opportunities.
- 4. Flora and Fauna:** The area is known for its unique flora and fauna, with abundant birdlife, coastal plants, and marine ecosystems.

### Climate:

- 1. Cool Temperate Climate:** Grundartangi experiences a cool temperate maritime climate, influenced by the North Atlantic Ocean. Winters are relatively mild, and summers are cool.
- 2. Precipitation:** The area receives a significant amount of rainfall throughout the year, with the highest precipitation during the winter months.
- 3. Wind:** Due to its coastal location, Grundartangi can be quite windy, especially during the winter season. Predominant wind direction is from the East.
- 4. Temperature Extremes:** While the climate is generally mild, temperature extremes can occur. Winters may bring sub-zero temperatures, and summers are relatively cool, with daytime temperatures rarely exceeding 20°C





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PROJECT SITE PHOTOGRAPHY



Aerial view from the east with project location in the foreground.



Aerial view from the west with Grundartangi Harbour in the foreground.

# QAIR AURORA

## STRATEGIC APPROACH



Aurora Borealis dancing across Grundartangi.

### Design Strategies for QairAurora

When introducing a large industrial development into Grundartangi, it's essential to consider preserving and enhancing the site's unique characteristics and develop a flexible, safe and functional facility. Below are some of the main points we have tried to address in the initial phases of developing the concept:



**Flexible and informed :** We aim to effectivize plot use, develop well thought out options for phasing in the construction and development of the site. Develop robust and flexible technical solutions with ease of operation and maintenance. Comply with all local and national regulations regarding land use, environmental protection, and industrial operations.



**Sustainable Design:** We Incorporate sustainable and eco-friendly architectural and landscape design elements to minimize the carbon footprint of the development and support local industries and communities. We focus on conservation and management practices to protect and ensure responsible use of resources in all levels of construction and operation.



**Contextual Integration:** Ensure that the industrial structures are designed to blend with the surrounding landscape and are aesthetically pleasing. Buildings and structures are placed so they flow along and accentuate the natural contours of the landscape



**Design with Care:** We focus on developing the project to minimize noise and light pollution, which can disrupt the local ecosystem and affect nearby residents. The "front stage" will act as a screen towards the surrounding areas, thereby protecting the fauna in the coastal zones by limiting and containing light and noise from the facility



**Engagement:** Involve the local community in the planning process and consider their input on how the industrial development can best benefit the region. The Innovation centre and administration building can be a catalyst to develop opportunities for the region.



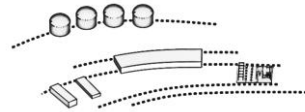
# QAIR AURORA

## DESIGN PLANNING STRATEGIES



### ACCENTUATE

Buildings and structures are placed so they flow along and accentuate the natural contours of the landscape and mimic the aurora lights above



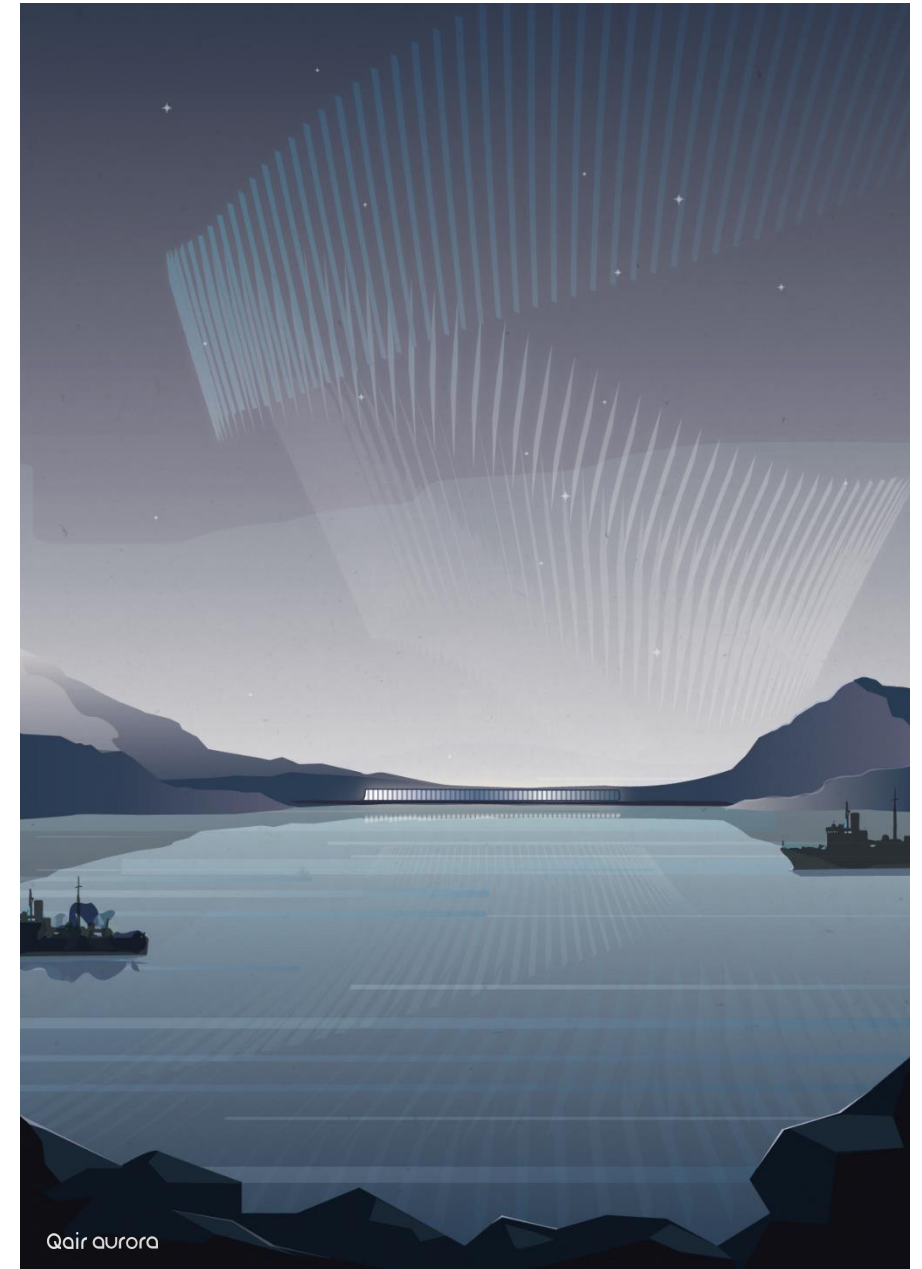
### TEXTURIZE

The use of organic materials and textures in the design creates a natural blend with the Icelandic landscape and ensures locally sourced and sustainable use of resources where possible.



### OBSERVE

The project incorporates views towards the surrounding landscape and transparency into buildings. Well organized planning of the facility minimizes visual clutter in the landscape



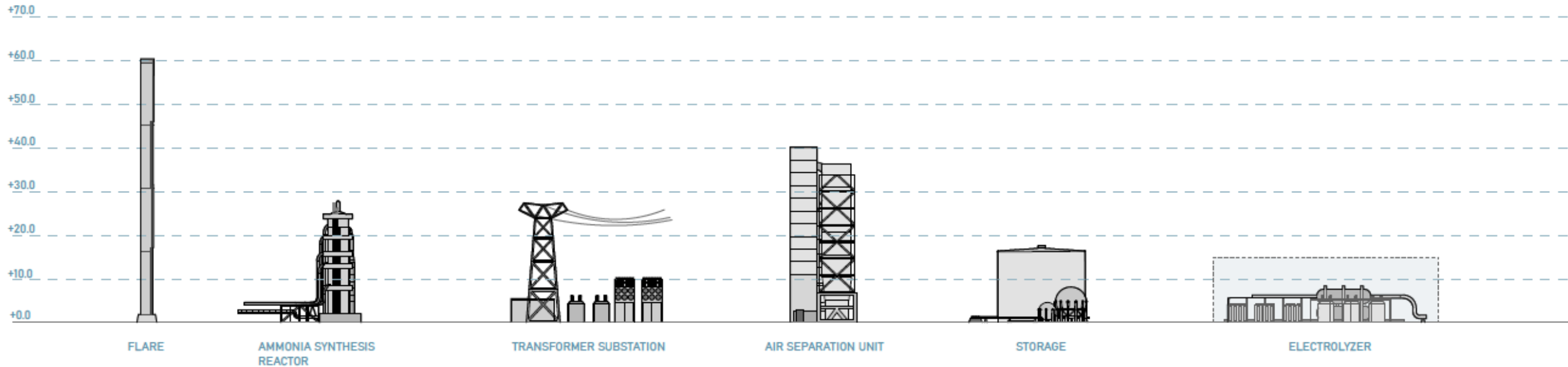




# QAIR AURORA

## FACILITY PROFILE

*This diagram shows a preliminary mapping of the various heights of the industrial components in meters in the QairAurora facility\*  
\*heights may change pending component specific supplier*



Mapping the height of various industrial elements in the design and planning of the QairAurora facility holds significant importance when considering a sensitive ecological environment.

A facility masterplan that carefully takes into account the profile in the landscape is vital for several reasons;

First and foremost, for the facility to coexist harmoniously with the surrounding environment, minimizing disruption to local ecosystems and preserving the natural beauty of the area. By paying close attention to the height and architectural design of industrial structures, we can mitigate visual clutter and ensure that the facility seamlessly integrates with the landscape, making it less obtrusive.

Moreover, the thoughtful design of the facility's profile is essential for maintaining a healthy ecological balance. Sensitive ecosystems are often fragile and easily disturbed, so it's crucial to reduce the environmental impact of industrial activities.

Practical organization of buildings and components can help in preserving critical habitats, protecting wildlife, minimize noise and light pollution and safeguard water bodies.

Additionally, a well-designed industrial profile has a positive influence on public perception and community acceptance. An industrial facility that is respectful of the natural surroundings, aesthetically pleasing, and well organized, fosters public goodwill and demonstrates a commitment to environmental responsibility and regional development.



The facility seen from the south side of the Hvalfjörður.

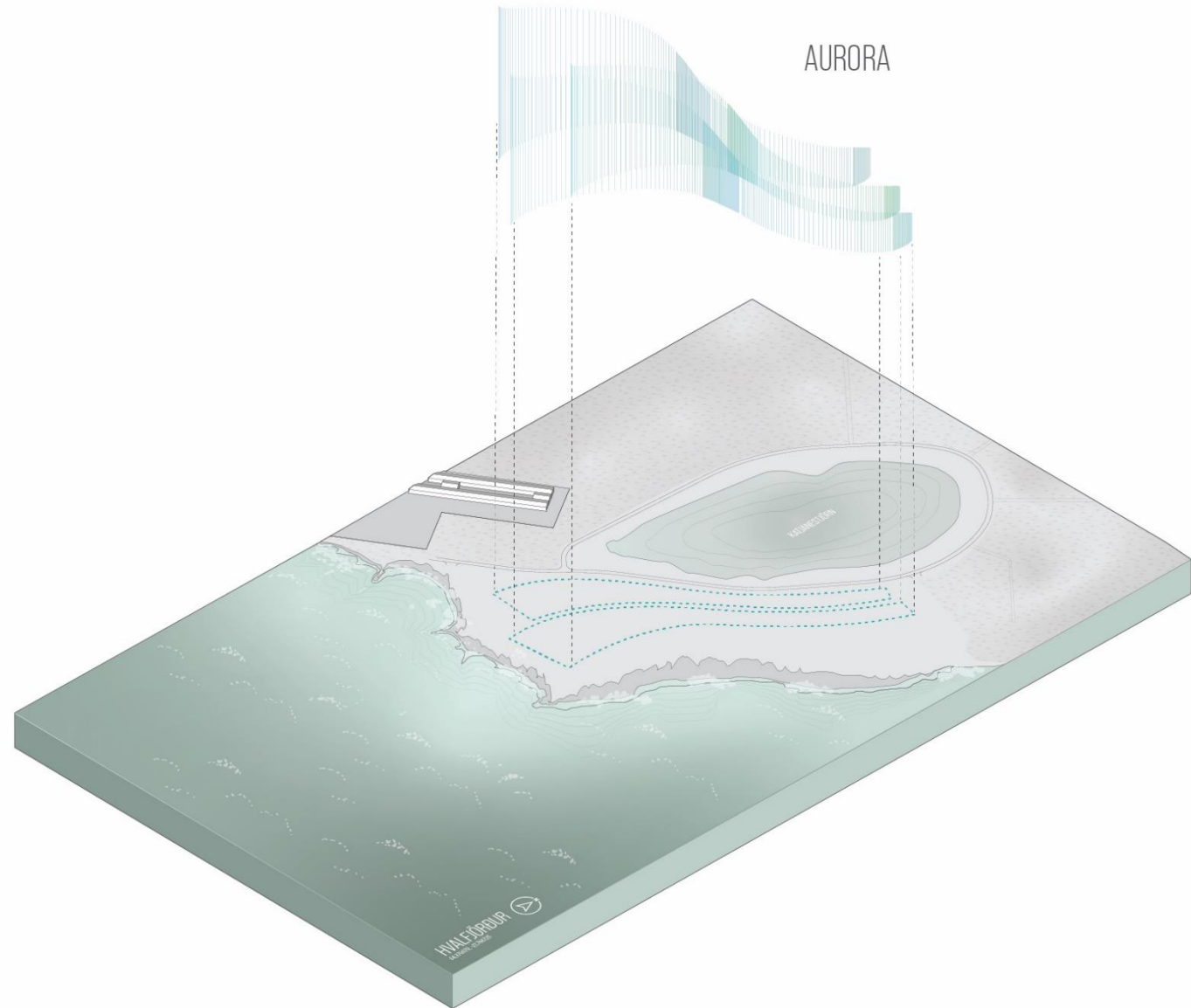


# QAIR AURORA

## CONCEPT

Dancing across the clear skies the amazing aurora borealis are a sight to behold. Also known as the northern lights, the natural light displays are governed by sun storms and are usually observed at night.

The direction and organization of the project mimics the aurora borealis and accentuates the natural curvatures of the coastline.



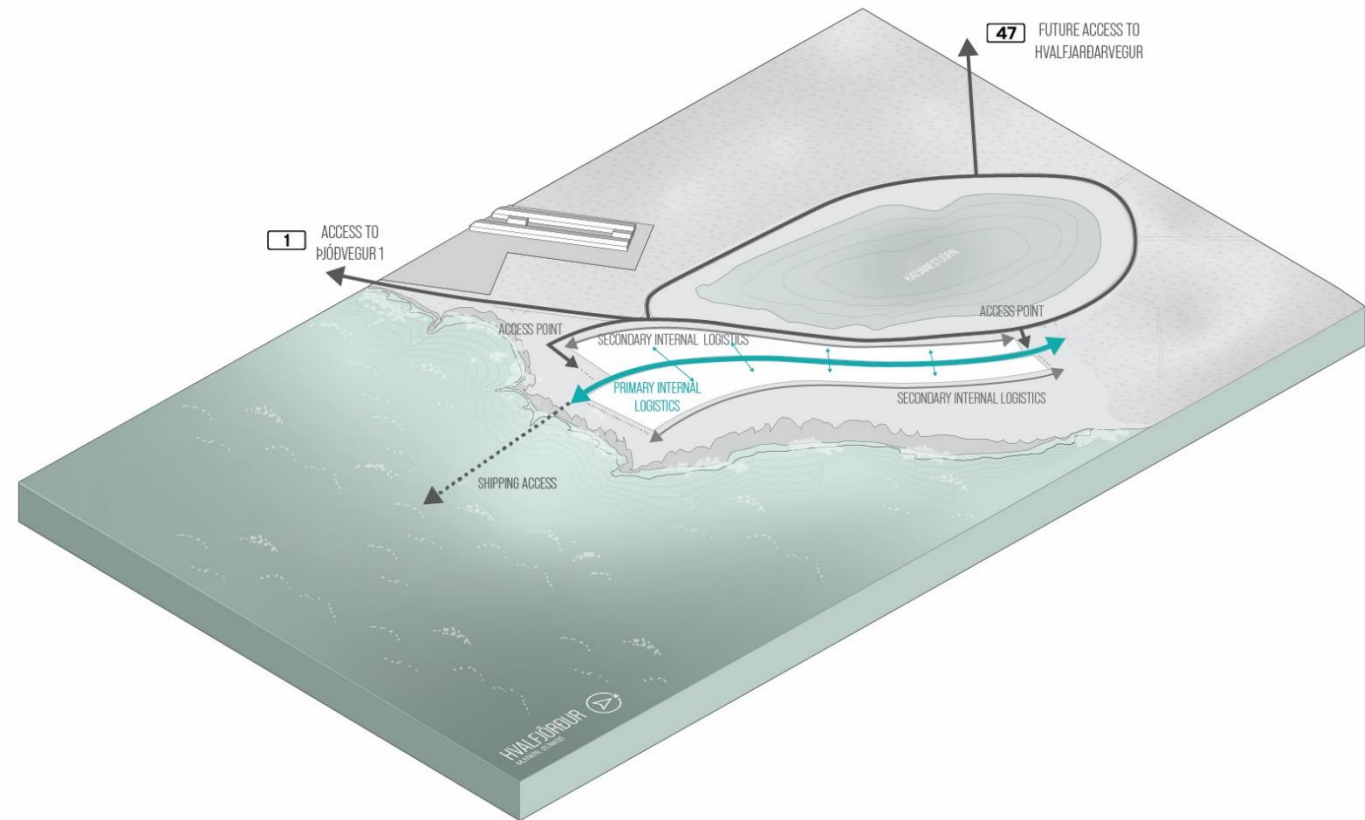
# QAIR AURORA

## ORGANIZATION

The conceptual layout of the project revolves around a series of strips spanning the long-direction of the plot.

A central strip serves as the internal backbone, creating a complete circulation loop with access nodes at both ends.

These access nodes are secure strategic entry and exit points, enhancing connectivity with external pathways while facilitating smooth movement within the project.





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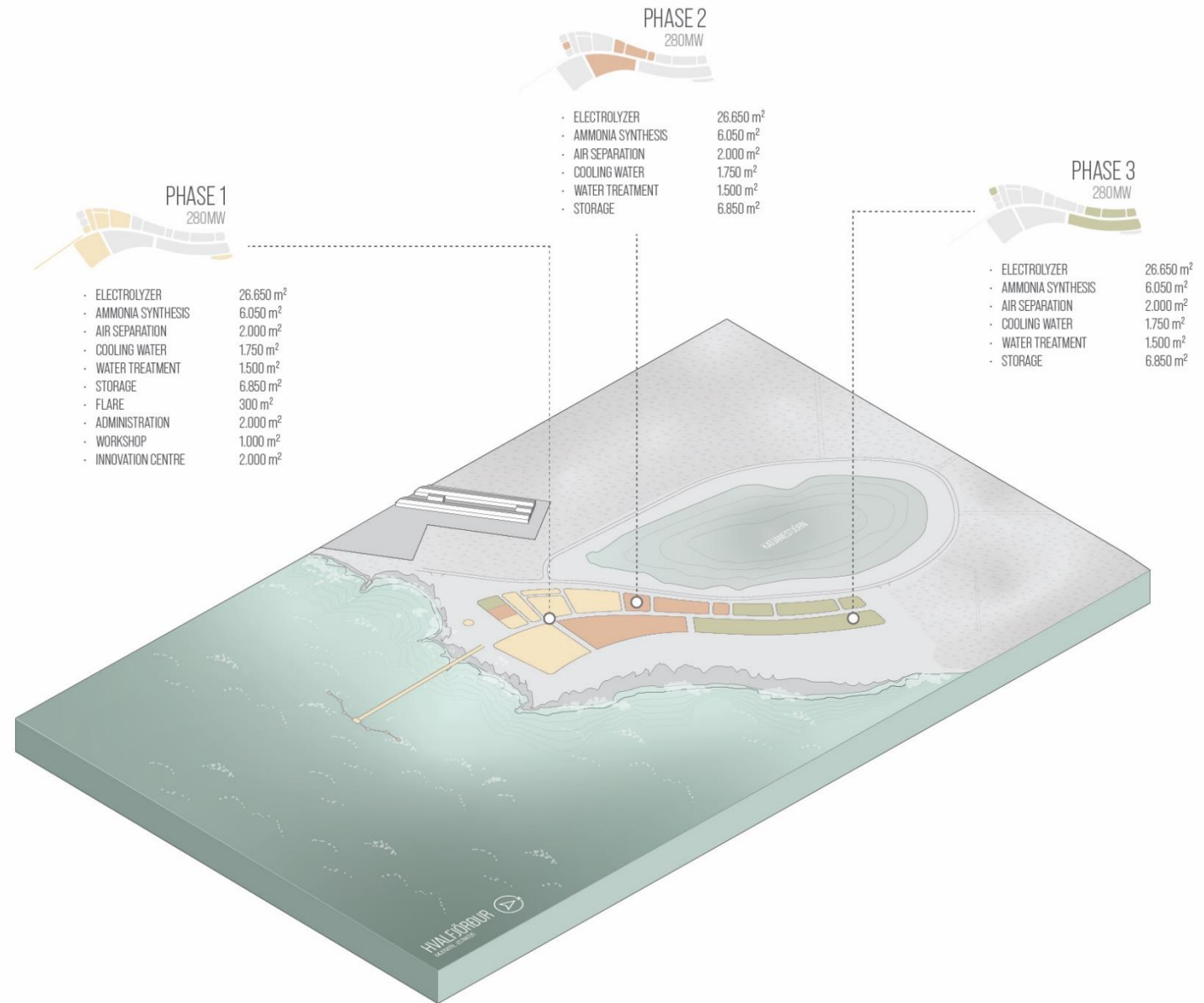
## SUBPLOTS & PHASING

The project will be executed in three phases, each with a capacity of 280MW, totaling 840MW.

In all three phases, equally-sized subplots will house electrolyzers, ammonia synthesis, water treatment, cooling water systems, and storage facilities.

Phase 1 will prepare the storage facilities and the transformer/substation, reducing piping and cable lengths, respectively.

Additionally, administration, an innovation centre, a workshop, and a flare will also be established during phase 1, ensuring immediate functionality and support for all subsequent phases.



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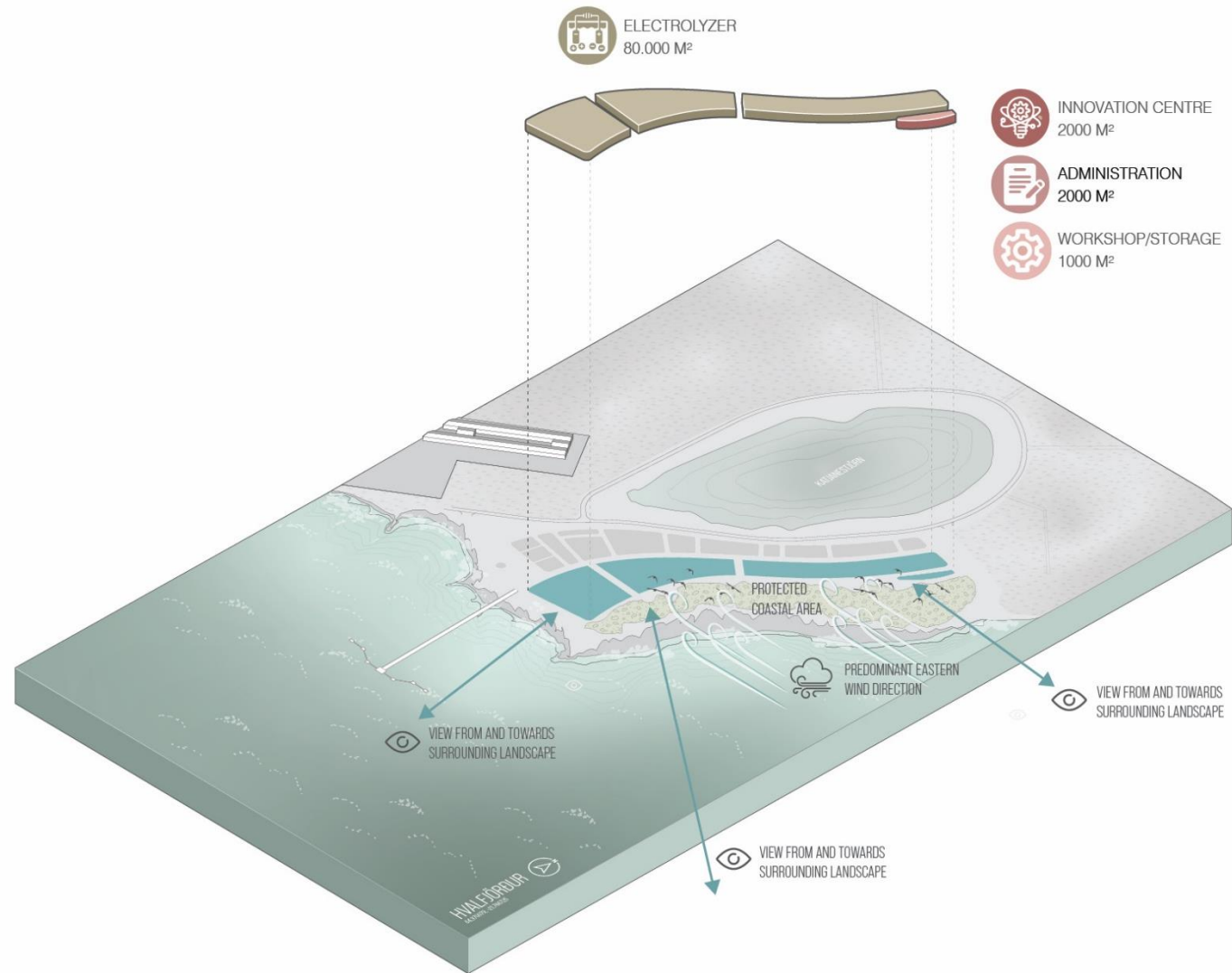
## FRONT-STAGE

“Front stage” covers the enclosed programmatic part of the project, The electrolyzers and Administration and workshop respectively.

The front stage is the most exposed towards the surrounding area. It offers the most breathtaking views of Hvalfjörður to the south.

The front stage shields the technical parts of the facility (“Back Stage”) and as a result will be a balanced and integrated visual presence the Grundartangi plateau between Akrafjall and Miðfellsmúli.

The strategic placement of the front stage functions also serves as a respectful transition to the protected coastal area and shields the facility from the prevailing eastern winds.



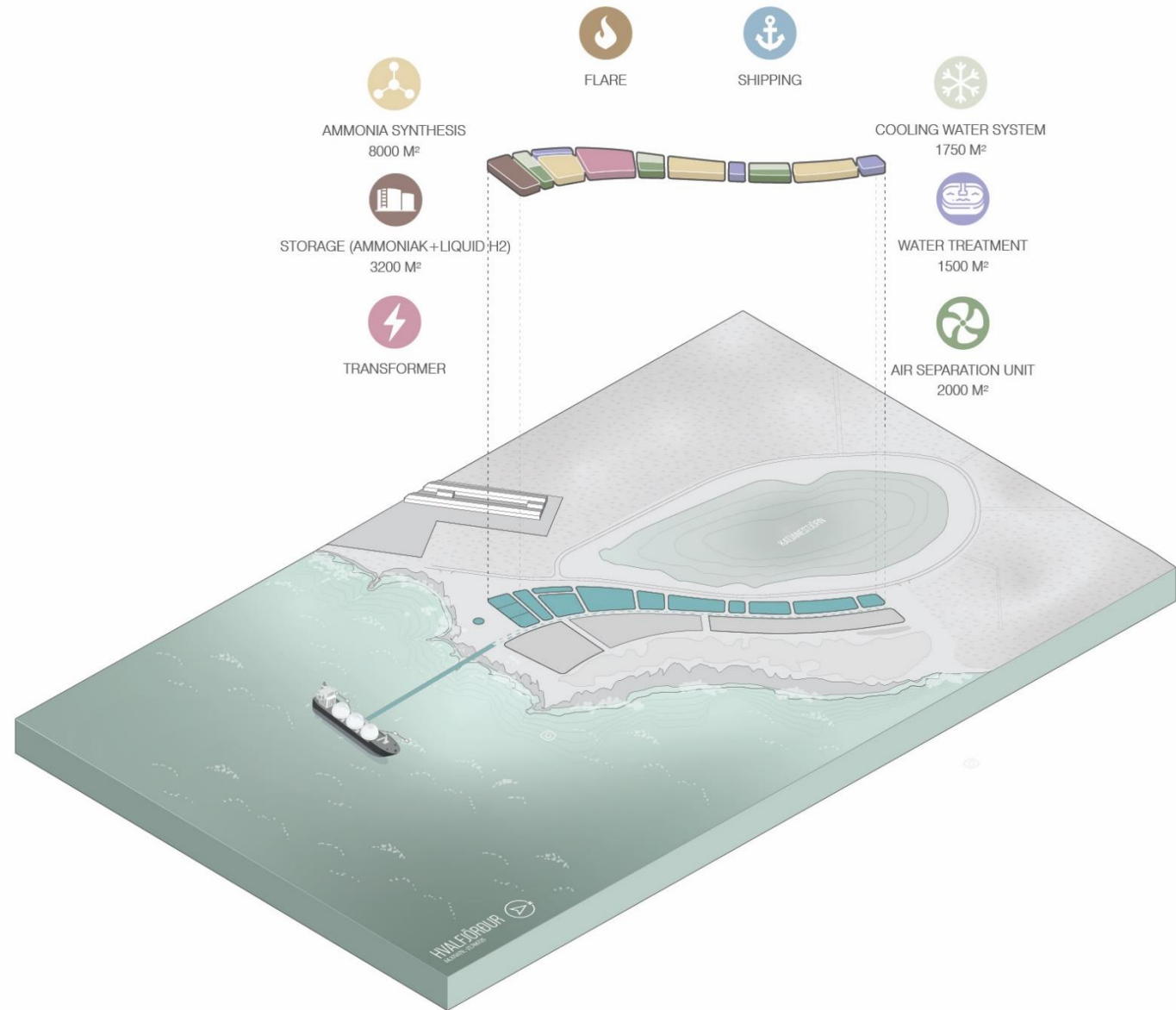


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## BACK-STAGE

Back stage covers the programmatic part of the project which covers the storage and support functionality and ammonia synthesis part of the scope.

By placing these functions along the widest part of the plot we ensure maximum use of the available plot and are able to maintain safety bounds and distances for the ammonia synthesis and storage facilities.







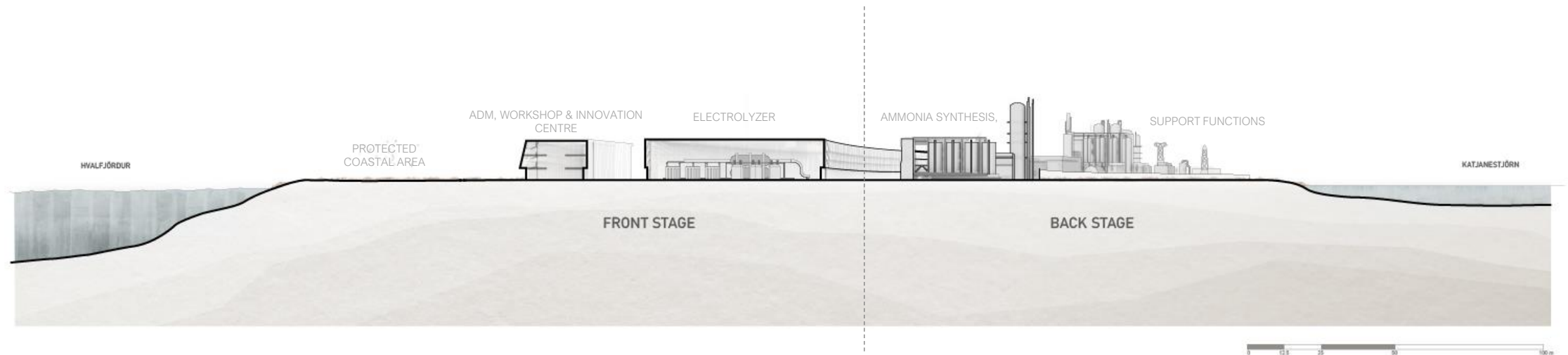


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## PRINCIPAL CROSS-SECTION

The "front stage" encompasses the project's programmatic elements, including the electrolyzers, administration, and workshop. This part of the site not only offers captivating views of Hvalfjörður to the south but also serves to ground the project as a well-balanced and visually integrated presence within the Grundartangi plateau, providing a seamless transition to the protected coastal zone and protection against prevailing eastern winds.

The "back stage" is dedicated to storage, support functions, and ammonia synthesis, placed strategically to maximize plot utilization while ensuring safety standards.







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