

# Green City Ferries

Upgrade to Zero-Emission Fast Ferries  
and Create Opportunities for attractive Intermodality





# Replace Car Commuting with Green Intermodal Vessels

## Two Market Opportunities For GCF

1. Existing Diesel Ferry Replacement
2. New Sustainable Waterborne Mobility for Cities
  - Integrated Public Transportation
  - Congestion-free and attractive Intermodality

## One Zero-emission Vessel For The Planet

- High-Speed and Zero-emission
- Frequent departures with fast charging
- Minimal Wakes and Noise free
- No traffic congestion or flooding delays





# Company Overview

## About Green City Ferries

- Founded in 2014, Sweden.
- Parent company in Stockholm.
- Subsidiary in the US.
- Production facilities located in Härnösand, Sweden.
- Asset-light and scalable business.
- Established strategic alliances.

## Resources

- The team has world-class knowledge in carbon fiber vessel production as well as in battery and fuel cell drivelines.
- We own the IP for this unique market-ready foil-supported catamaran built in light-weight carbon fiber.
- The vessel is designed by Teknikraft in New Zealand.

# History

Green City Ferries began as a part of Echandia AB, a Stockholm based company specializing in heavy duty maritime batteries and fuel cells.



Formal Launch of new Green City Ferries AB



2014

Launch of Movitz – the world’s first supercharged passenger ferry. The ferry, which is still in operation, has provided vital insights on designing electric propulsion systems and operational requirements.

2016

Launch of the electric prototype vessel BB Green. This prototype has significantly increased our knowledge about light-weight construction and battery chemistries for fast vessels.



2017-2018

Within the EU Project GFF (Green Fast Ferries) the new LTO battery system was developed to enable safe fast charging for the maritime industry.



2019

New Green City Ferries AB established by Hans & Fredrik Thornell.

2020

Strategic initiative to replace Stockholm’s passenger vessel fleet with emission free vessels.

2021

- Design of the Beluga24
- Winners of the UITP startup mobility challenge
- Establishment of GCF Production AB
- Awarded with SEK 84m in grants from Sweden and EU



2022

- Long term rental agreement of 10+ years with shipyard facilities
- Launch of first investor round
- Production of the first vessel started
- Establishment of Green City Ferries Inc (USA)
- Building partnership with charging Infrastructure providers
- Extended organization



# Strategic Technology Partnerships

GCF have together with its exclusive alliances created based on proven technology the most energy-efficient, lightweight, ruggedized electric vessel on the market.

## Emission-Free Power

The Beluga24 is 100% electric with a power system offered in two versions;

- **Electric**  
Battery powered for urban commuting in high-speed up to 20\*NM comprising a high-performance battery system using Toshiba's LTO (Lithium-Titanium-Oxide) cells. For distances up to 40\*NM we are using light weight LFP or NMC batteries.
- **Hydrogen**  
Hydrogen powered for longer range.

## Foil-assisted Hull Technology

A hydrofoil is fitted midships. Hydrodynamic forces raise the vessel partly out of the water, thus reducing drag and power consumption up to 30%. Another important benefit is the extreme low wake signature.

## Wave Piercers

Advanced wave piercing bulbs are integrated in the hulls ensuring good seakeeping and a comfortable ride.

## Low Structural Weight

The hull and superstructure are built from carbon fiber composite, resulting in 30 % reduced weight compared to a conventional aluminum design.

## Waterjet Propulsion

Quad installation of latest Hamilton Jets provide highest propulsion efficiency and outstanding maneuverability. A robust solution for commercial applications.



**TOSHIBA**



**BAE SYSTEMS**



**HAMILTON**

**STUDIO SCULLI**

\* Range depends on battery types, Beluga version, & number of passengers





# Introducing Beluga24

The Beluga24 is a Premium 100% electric foil-assisted carbon fiber catamaran designed for comfortable high-speed operations and compliant with the international HSC-code and DNV high speed craft rules: +1A HSLC Passenger Battery E0 R4 or R3.



## Lower Cost of Operations

An energy efficient hull and light-weight design is vital. Weight has an unfavourable outcome on speed, power consumption, range, payload, wake signatures, and total cost of ownership.

## High-Speed

Short travel time and high frequency is a prerequisite to attract commuters to leave the car at home and use public waterborne transportation instead.

## Emission-Free

Traditional diesel-powered high-speed vessels are large polluters and not a viable alternative for future commuting. Green electricity and green hydrogen are two of the cleanest fuels to facilitate the transition to new mobility on water.

## Low Wakes

Water disturbance and large wakes cause coastal erosion and are showstopper for efficient waterborne commuting. With high-speed wakes of no more than 25 cm (10"), the Beluga24 creates new opportunities for waterborne commuting.

### Freeboard - DNV R4

1.5 m  
(4.92 feet)

### Freeboard - DNV R3

2.2 m  
(7.2 feet)

### Maximum draft with foil

1.35 m  
(4.3 feet)

### Height

4.6 m  
(15.1 feet)

### LOA (length overall)

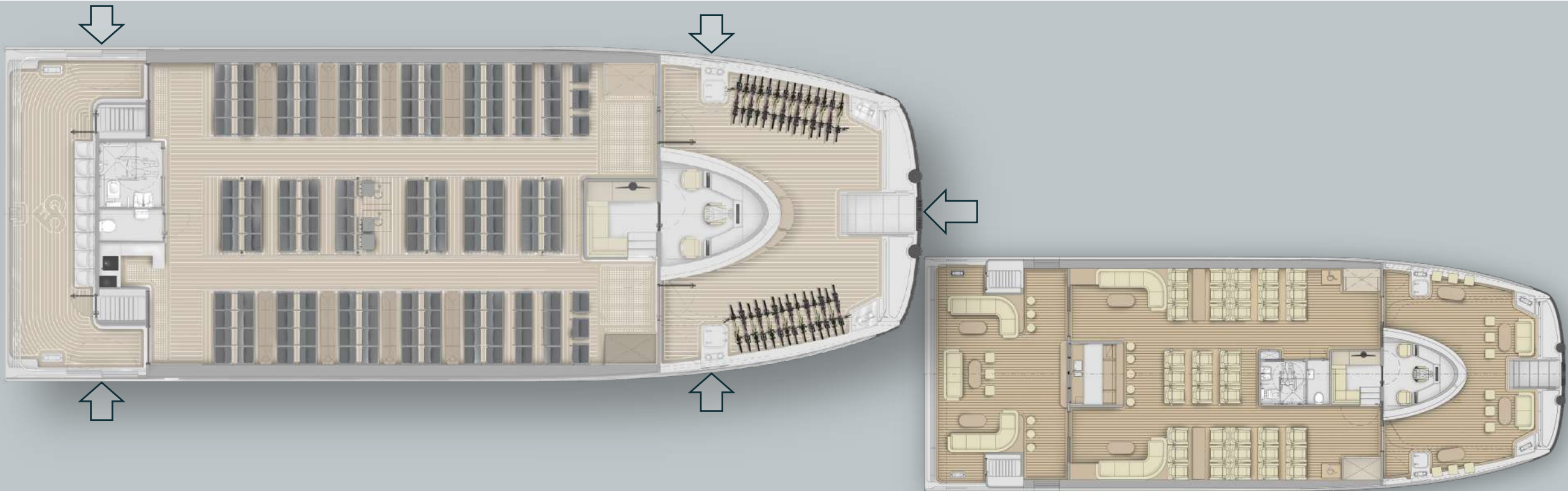
25.8 m  
(84.6 feet)

### Beam

9.5 m  
(31.2 feet)

# General Arrangement

The Beluga24 is a comfortable commuter for up to 150 passengers and 28 bikes which solves the fast ferry challenges of low cabin efficiency and high operating costs. Being smaller and lighter, 150 pax vessels will revolutionize timetables with more frequent, attractive, and comfortable trips for commuters. The Beluga24 is also built on an **80/20\*** concept with a flexible interior that can adapt to specific client needs.



*\*A sample of the Beluga VIP version with a 50 pax arrangement*



# Innovation based on **Proven Technologies**

Bringing together world class state-of-the-art technologies enables Green City Ferries to create an innovative and unique design with unrivaled performance



## **Carbon Fiber Construction**

The hull and superstructure built by Vaxholm Komposit. The carbon fiber system used on the Beluga24 is similar, to what was developed for the Swedish Navy's Visby class corvettes already in the 1990s and is in-house competence at GCF. Military-grade Carbon Fiber is 3X stronger than Aluminum and will reduce vessel weight by approximately 7 tons that compensates for the extra weight of batteries.

## **Foil-assisted Design**

With well over 150 vessels in operation around the world, Teknicraft's designs demonstrate a fine balance between stability, low resistance and ride comfort. Great research and engineering efforts have been spent to create a low-wake signature and environmentally safe design. GCF has worldwide exclusivity and owns the design & IP of the Beluga together with Teknicraft.

## **State of the Art Power**

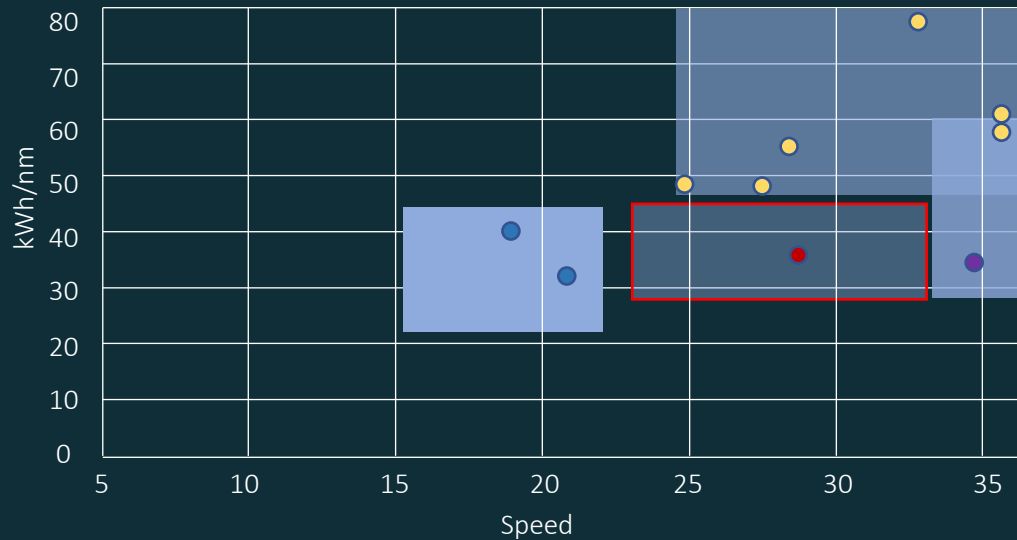
Marine-duty LTO battery systems and integrated fuel cell solutions for applications in maritime and industrial use. The new LTO technology was co-funded by the EU and developed, in partnership with Toshiba by our sister company Echandia Combined with the BAE power train, it provides excellent power management with the quickest recharging times.



# Our USP

is Energy Efficiency and low wakes at High-Speed

“ Our Unique Selling Proposition is based on making the combination possible between **high-speed with low wake signature** and **emission-free** with our energy efficient hull and light-weight construction. ”



The diagram above shows the Beluga24 efficiency curve compared to conventional diesel driven catamarans at their max speed vs power consumption.



## Foil-assisted catamaran – The Beluga24

Beluga24 is a high-speed catamaran and has its sweet spot at 28 knots and is 40% more energy efficient than competitors.



## High speed catamarans

- Most high-speed vessels are in this segment
- Less energy efficiency, means need for more power
- Existing vessels are difficult to retrofit into electric



## Foil vessels

- First pilot vessel planned in 2025
- Higher price and much more sensitive to debris
- Depth draft up to 3,4m



## Monohulls or slow speed catamarans

- Large wakes when speed over 15kn
- Almost same energy consumption.
- Not in the high-speed segment.

# Cost of Ownership

Based on forecasted local Energy prices

The Beluga24 consumes 50 % less energy in high speed than other traditional vessels.

Model Comparaison*	Beluga Electric	Beluga Hydrogen	Traditional Diesel
Operating Hours	3,500	3,500	3,500
Cruising Speed	28	28	21
Energy Usage	1,900,000 kWh	105,000 kg	666,000 L
Energy costs	4,37 c\$/kWh	2 \$/kg	1,4 \$/L
Operation Costs	\$ 83,000	\$ 210,000	\$ 935,000

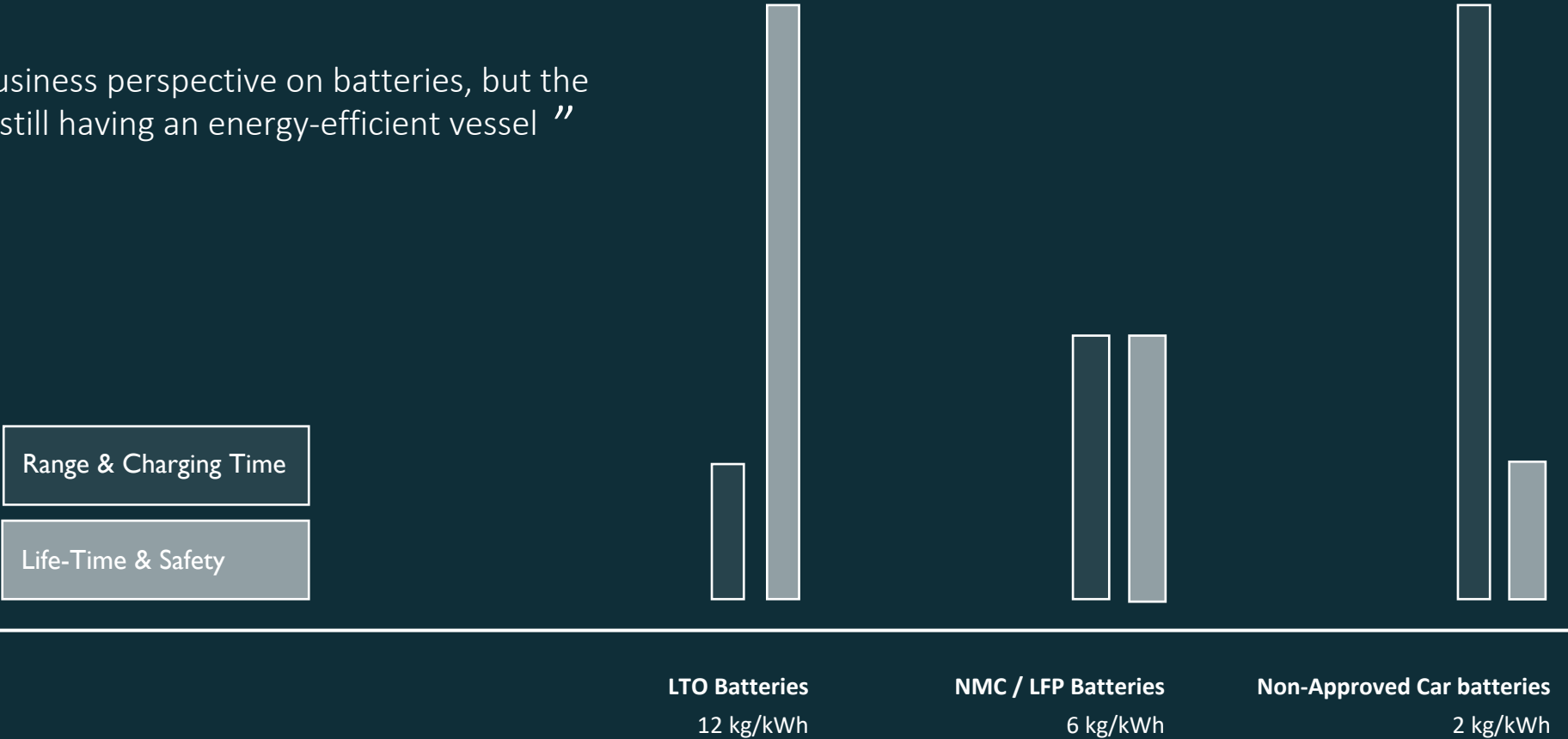
\* This comparison is made on a particular case including subsidized hydrogen



# Batteries

## Weight & Ranges

” Our business perspective on batteries, but the Key is still having an energy-efficient vessel ”





# Capacity & Productivity

- Standardization and serial production in our own cat factories will ensure our capacity and productivity development as well as scalability
- We protect our IP and core technology by exclusive partnership in our cat factories for the carbon fiber construction in Sweden and the US.
- We use local shipyards for final outfitting and powertrain support.
- Our model enables asset-light production upscaling and creates jobs locally.



## Primary focus

Asset-light growth through sales representatives in our target markets, scale-up our production through licensed partners in the beginning and then implementing our own carbon fiber cat factories in key market like the US. The fitting of the vessels will continue to be through local shipyards.

## Strategic Location

Situated isolated on the east coast of Sweden, which provides a strategic location for production. The area has access to skilled labor and a network of sub-contractors. Housing supply is good and cost levels are more reasonable than in Sweden's major city regions. The RISE "Research Institute of Sweden" together with the municipality and schools of Härnösand have plans for a maritime cluster and test site which will attract other maritime businesses.

## Constant improvement

Constant improvement (Kaizen) is a Japanese concept for improving productivity on standardized products in standardized processes. The purpose is to stay competitive. This has not been the case in shipyards with short series of customized vessels. Here is an opportunity to introduce efficient production methods.



# GCF in a Nutshell

“ At the heart of our solution lies the Beluga24, a Premium commuter vessel based on proven technology and the most energy-efficient and technically advanced vessel of its type on the market today. ”



## Green City Ferries AB

With the headquarter located in the old part of Stockholm in Sweden. GCF has the ambition to sell 150 vessels within the next ten years. Traditionally, the shipyard industry has built vessels to customers order and thus there are almost no economy of scale. As the emission-free high-speed ferry market is in its infancy, there are possibilities to set new rules.

## Green City Ferries Inc - Americas

USA is the largest high-speed vessel market in the world. To expand in USA and because of the Jones Act and by American Legislation we need to have a US based company with local production. GCF Inc have been set up during Q4 2022 with local representatives on the East and West coast.

## GCF Production AB

We foresee a limitation not in the market but in the production capacity. Our intention is to build standardized ferries in long series and thereby have an opportunity to improve productivity. So, the purpose of our Production strategy is to control capacity and productivity for growth and competitiveness and at the same time protecting our IP.







Starting **2024**

Routes in Stockholm & New York

“ *New York Cruise Lines plans to operate  
first zero-emissions electric ferry in NYC* ”

Marinelog, November 03, 2022



**Let's connect !**  
to make attractive  
intermodality  
possible

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