LAUNCH OF THE SEA CHANGE

Introducing the First H2 Ferry in SF Bay

San Francisco Bay Ferry
A SERVICE OF WETA

WETA
WATER EMERGENCY TRANSPORTATION AUTHORITY

SWITCH MARITIME

SWITCH completed the first commercial maritime vessel powered 100% by hydrogen fuel cell… a significant milestone for the ferry industry.

SEA CHANGE

- **ZEF-75 CLASS:** The first zero-emissions ferry (ZEF-Class) design SWITCH is building is a 70-ft, 75-passenger ferry powered by hydrogen fuel cell and battery.

- **SPECIFICATIONS:** The *Sea Change* has 246 kg of hydrogen storage, 360kW of hydrogen fuel cells, 100 kWh of lithium-ion battery, and 2x 300 kW of electric traction motors.

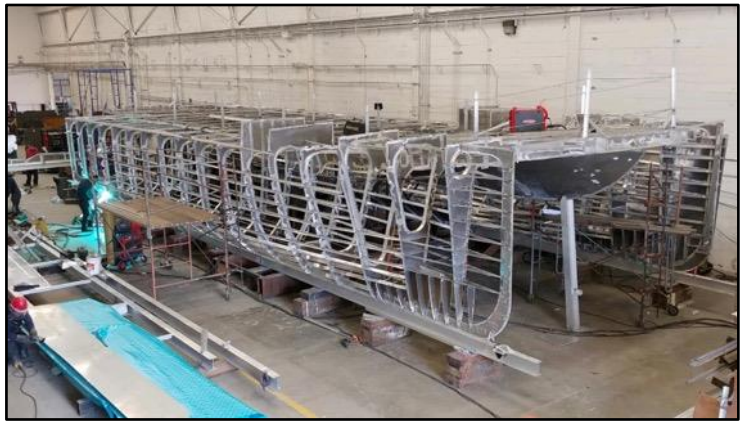
- **CONSTRUCTION:** All American Marine shipyard in Bellingham, WA.

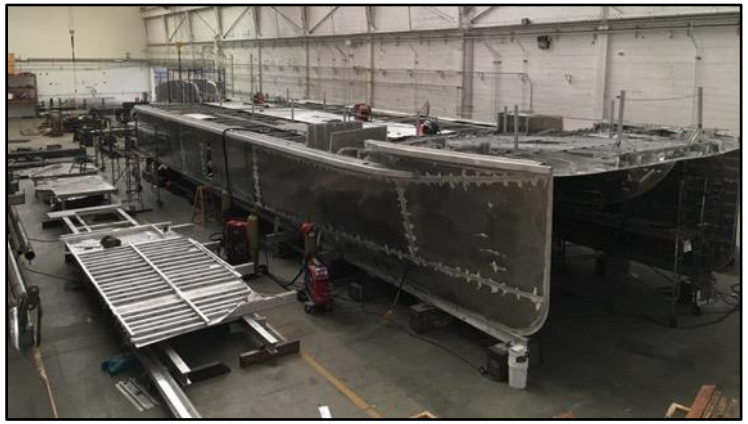
- **SPEED & RANGE:** The *Sea Change* can travel approx. 300 nautical miles at a cruising speed of 12 knots before needing to refuel. Top speed is 15 knots.

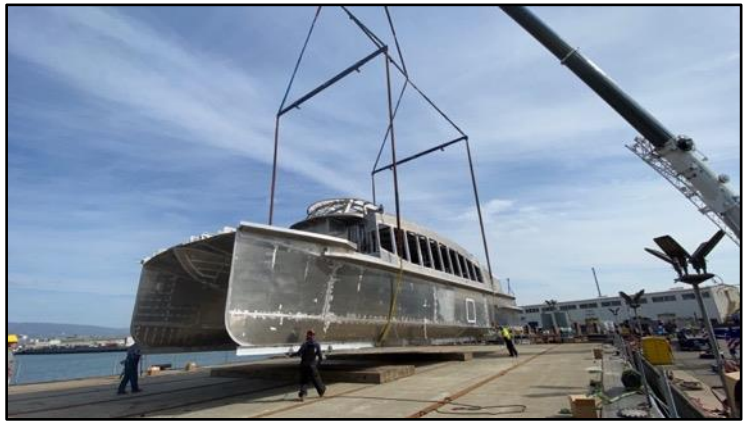
- **CO2:** The only “emission” from the *Sea Change* will be pure, distilled water vapor. No exhaust, no smoke.

- **EXPERIENCE:** The *Sea Change* will feature a comfortable, customizable interior and provide commuters with a silent ride across the water (no diesel engine noise).

SEA CHANGE CONSTRUCTION

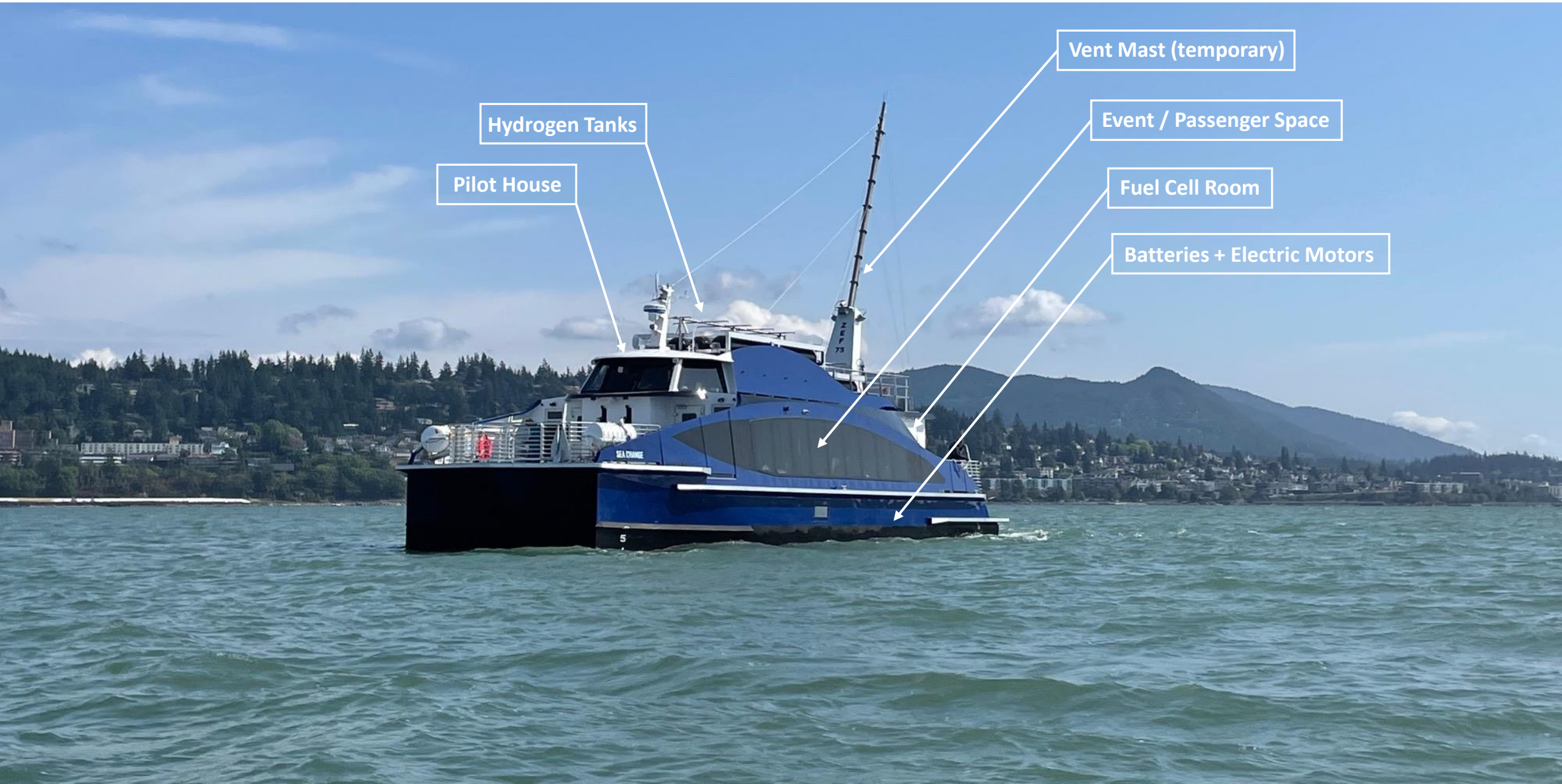






VESSEL LAUNCH IN 2022 AT ALL AMERICAN MARINE

OVERVIEW OF DESIGN



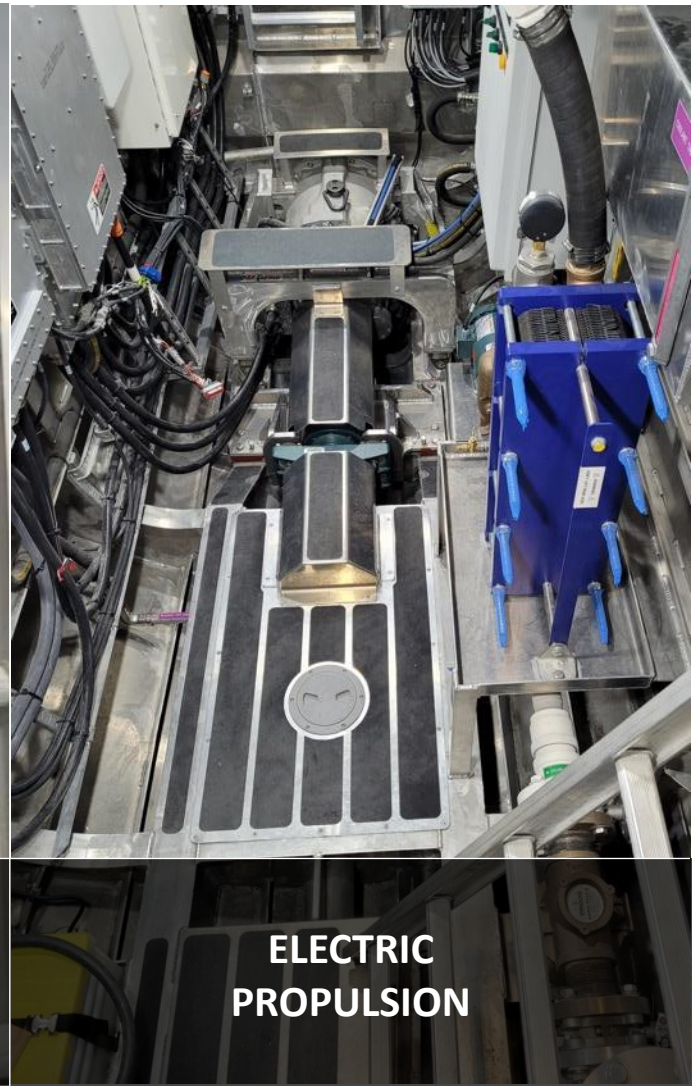
ZERO-CARBON VESSEL TECHNOLOGIES

The zero-carbon technologies on the *Sea Change* are a first-of-kind integration in a maritime application, but proven and widely used other sectors. The zero-carbon powertrain equipment on the *Sea Change* is **modular and scalable**, and could power the largest ships in the world.

HYDROGEN STORAGE

FUEL CELL

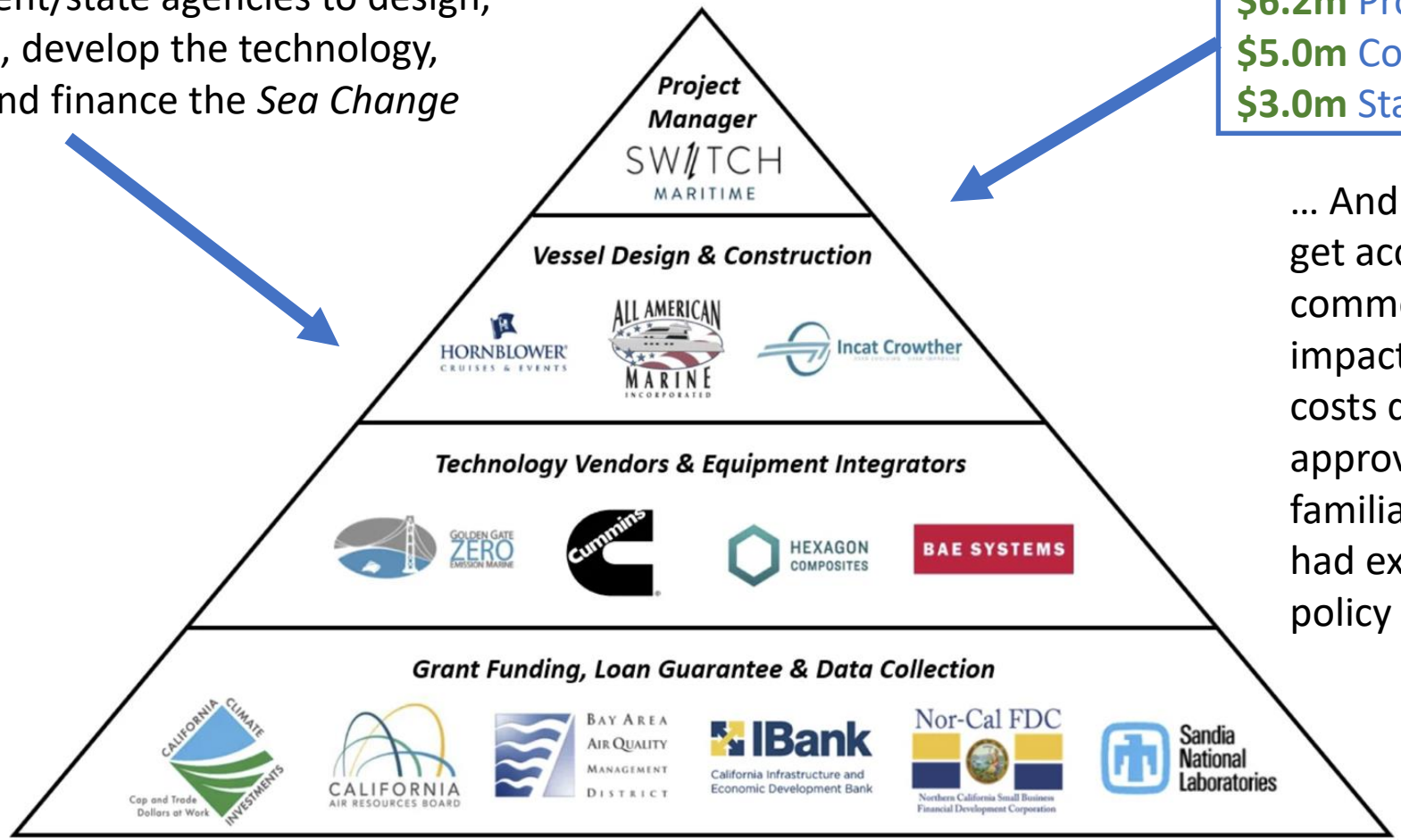
BATTERY RACK



ELECTRIC PROPULSION

WHAT IT TOOK TO GET HERE

SWITCH assembled & managed ~20 different project partners (including 8 government/state agencies to design, construct, develop the technology, permit, and finance the *Sea Change*



Funds invested to date:
$6.2m Project equity (SWITCH)
$5.0m Construction loan (commercial bank)
$3.0m State grant (air quality agency)

… And used every funding source it could get access to launch the project, get it commercialized, see it through the impacts of COVID, and withstand rising costs during a prolonged regulatory approval process with the USCG getting familiar with a fuel type that it's never had experience with and no existing policy could be used for.

SEA CHANGE

HYDROGEN FERRY DEMONSTRATION PROJECT

SEA CHANGE

HYDROGEN FERRY DEMONSTRATION PROJECT

POWERED BY

San Francisco Bay Ferry

Chevron

Golden Gate Ferry

Golden State Warriors

Blue & Gold Fleet San Francisco

VESSEL PERFORMANCE & LESSONS LEARNED: TBD

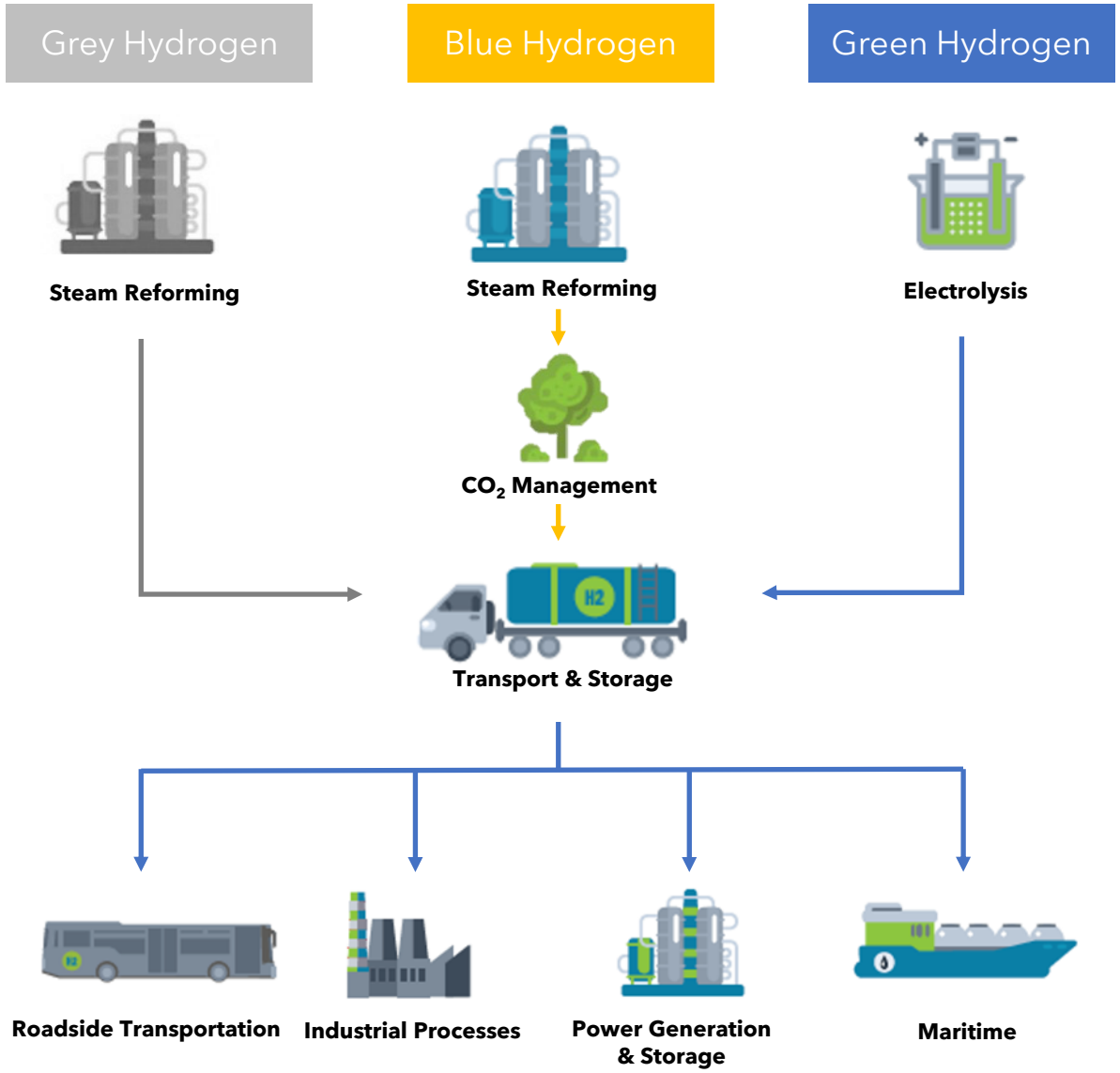
Types of hydrogen

- ***Grey hydrogen***: Most carbon-intensive form, based on hydrocarbon-feedstock and fuel processes, typically natural gas for steam methane reforming ("SMR").

- ***Blue hydrogen***: Hydrogen produced from conventional natural gas-based processes, like SMR, paired with carbon capture.

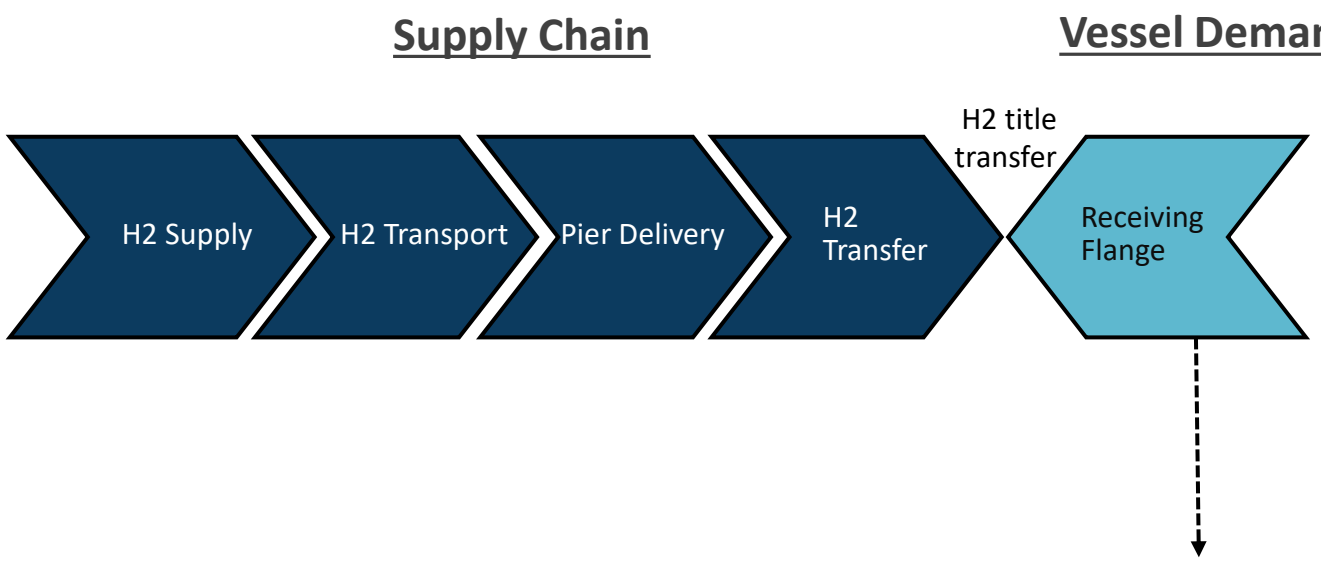
- ***Green hydrogen***: Hydrogen produced from water electrolysis where the electricity is sourced from zero carbon energies.

HYDROGEN SUPPLY CHAINS



H2 FUELING TRUCKS FOR INITIAL OPERATIONS

The *Sea Change* will be fueled with a mobile trucking solution, providing compressed hydrogen with a cascade fill.



- ~150 kgs of H2 per bunkering
- 2x GTM 1500 trailers – 450bar
- Transfer rate: 80 kg/hr
- Bunkering operation: 2 hrs

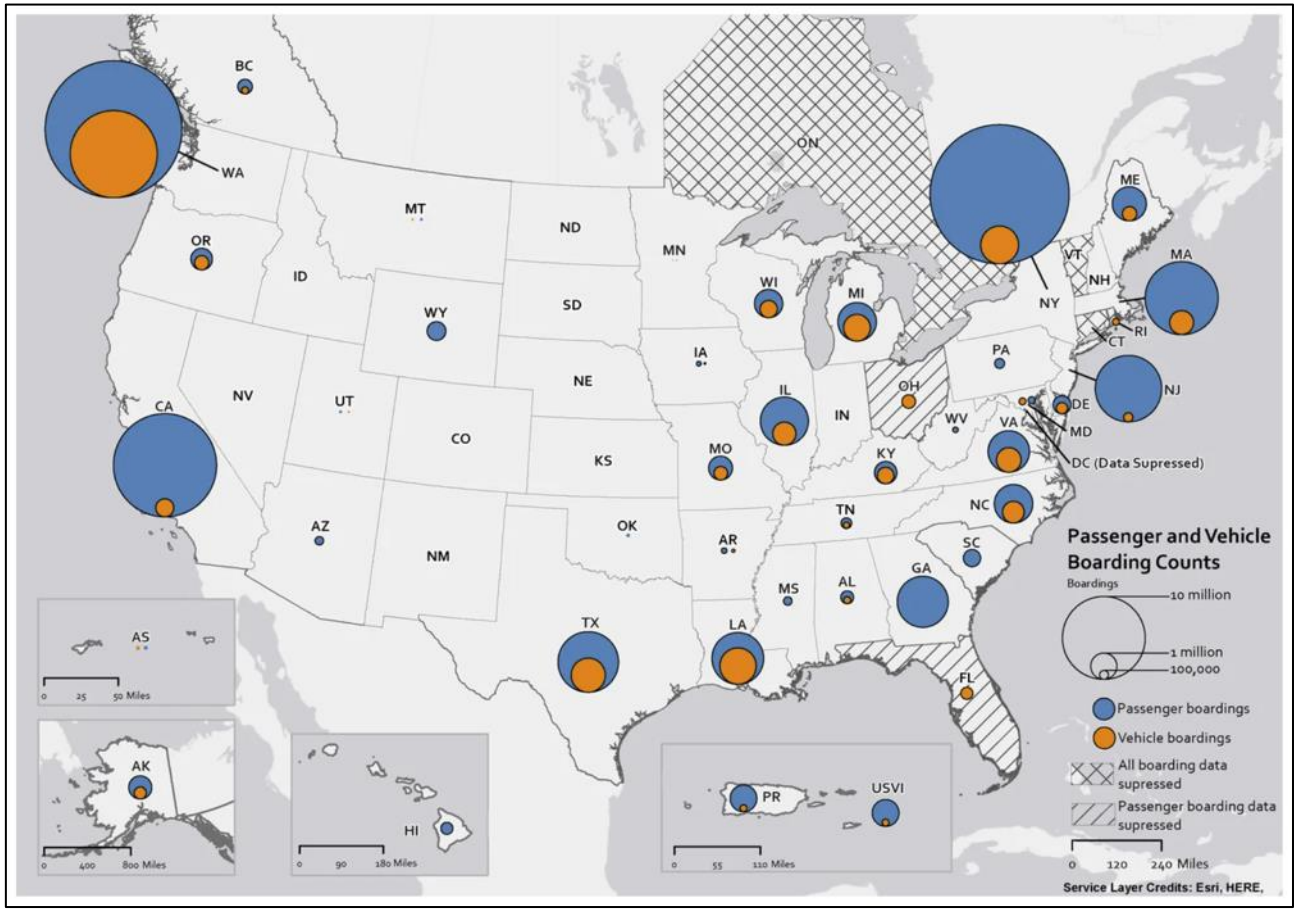
FUEL SUPPLY CHAIN PHASES

	Near Term	Medium Term	Long Term
Supply	**Existing Production**	**Dedicated Production** *(Small Scale Unit)*	**Dedicated Production** *(Large Scale)*
Distribution	**Truck to Ship** *(Single Truck)*	**Shore to Ship** *(Multiple Trucks or onsite production)*	**Fuel Barge to Ship** *(Onsite production or marine H2 transport)*
Volumes	~200 kgs	~1,000 kgs	~10,000 kgs +

WHY FERRIES?

Ferries are an ideal starting point for zero-carbon vessels as they are characterized by lower capital costs, relatively short routes, consistent fueling locations, and an aging, carbon-intensive fleet that is ripe for renewal.

- **FLEET SIZE:** According to the National Census of Ferry Operators (NCFO) there were 739 unique vessels in the U.S. ferry fleet in 2017.
- **CRITICAL TRANSPORTATION INFRASTRUCTURE:** Ferries carry 126 million passengers and 27 million vehicles per year according to the NCFO.
- **AGING, CARBON-INTENSIVE FLEET:** The average age of the U.S. ferry fleet is 27 years old, with fleet renewal expected to accelerate.
- **CRUCIAL OPPORTUNITY:** There exists a window of opportunity for replacement of the existing diesel-powered fleet to prevent another generation of ferries from being built and producing CO2 emissions for another 30 years.



Thank you