



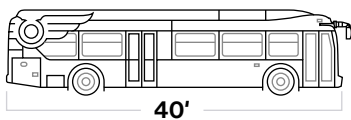
xcelstor *CHARGE FC*[™]

Our next generation, fuel cell-electric,
zero-emission transit bus.

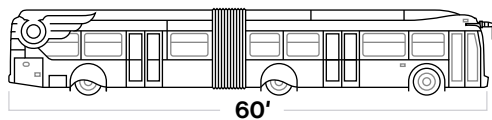


Xcelstor CHARGE FC[™] delivers longer range, better energy recovery and is smart city capable – making it the most advanced hydrogen fuel cell-electric bus in North America.

Available in 2 Lengths



40'



60'

Four distinct technology advancements to deliver a high-performance bus.



High-Power Batteries

The newest high-power, rapid-charge batteries.



Battery Packaging

Advanced protective battery packaging designed for easy installation and streamlined maintenance.



Fuel Cell Power Module

A new high-performing fuel cell power module that is simpler, more robust, and has a lower lifecycle cost.



Traction Propulsion System

A new lightweight electric traction propulsion system with up to 90% energy recovery.

Technology advancements.

1 Fuel cell power module.

FCmove™-HD+ is Ballard Power Systems' next generation heavy-duty fuel cell power module for zero-emission vehicle applications that introduces a more compact and robust design with substantial lifecycle cost reductions.

Reduced lifecycle cost is achieved through lower maintenance requirements, higher reliability, and fewer parts.

Simplified System Integration

- ✓ All subsystems are integrated into one enclosure.
- ✓ Easier to service and takes up less space on the bus.

Increased Reliability

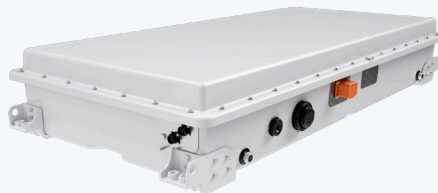
- ✓ Delivers >97% fuel cell power availability while in service.
- ✓ More robust components.
- ✓ With an IP69K rating, the module is 100% protected from intrusion of dust and water particles.

More Efficient

- ✓ Wide operating range across temperatures of -30°C (-22°F) to +50°C (122°F).
- ✓ Freeze start to -25°C (-13°F) without external energy or use of special start procedures.

2 Battery packaging.

A standardized waterproof battery enclosure is mounted on the rooftop using a "plug and play" approach, lending simplicity and efficiency in design, install, maintenance and manufacturing.



Rooftop application uses a modular approach with a simplified mounting system comprised of two rails running the length of the bus.

Simpler

- ✓ One simple and standardized approach for better quality, consistency, and accuracy.
- ✓ If a battery needs to be replaced, the module can be removed and replaced with a new/backup module. The module needing troubleshooting can be serviced in the shop while the bus with the new/backup module onboard returns to service.
- ✓ With every battery having the same enclosure, service manuals are the same for every single bus model and length.
- ✓ Service parts are reduced by 90% going from 250 to less than 50 parts.

Waterproof

- ✓ With an ingress protection rating of IP67, the battery enclosure is 100% waterproof if submerged in water, which greatly reduces the likelihood of water leaking into the battery enclosure.
- ✓ With an ingress protection rating of IP69K for dust, high temperatures, and high-pressure washing, there is 100% protection from intrusion of dust or water particles. This is ideal for demanding operating conditions, and situations where sanitization and rigorous cleaning is undertaken.

More Efficient

- ✓ Modules are better insulated resulting in better management of battery temperature for optimal performance.

Easier to Service

- ✓ The casings are built using a reinforced composite fiber that is non-conductive.
- ✓ Service technicians can simply and safely plug in or unplug the battery module with less exposure to high-voltage electricity.

Lighter

- ✓ The standardized battery enclosure is lighter in weight.

3 The newest high-power batteries.

The batteries are made of world-class energy storage systems (ESS), engineered for safe, robust, and reliable use in transit.

The battery chemistry is Lithium Nickel Manganese Cobalt (NMC), providing the best balance of energy, power, safety, and life.

More Energy

- ✓ 40% more energy available
- ✓ Greater capture of regenerative energy (during braking at top state of charge).

Extended Range

Range at highway speeds is extended by 44% without compromising quality.

More Efficient

Better controlled and more consistent cell temperature in high-demand applications.

4 High-grade Siemens traction system.

ELFA 3 is Siemens' next generation traction system that introduces a more efficient design with compact inverters and embedded drive controllers.

Safer

Easier and safer to maintain with shorter cable runs and touch-safe high voltage connections.

Smaller

Smaller and lighter, taking up less space on the bus.

More Efficient

- ✓ Minimal rack requiring no covers.
- ✓ Shorter cable runs offer decreased risk of issues or faults, improved electromagnetic compatibility (EMC) and greater power efficiency.
- ✓ Delivers up to 90% energy recuperation.
- ✓ Delivers smooth, quiet, emission-free driving (with no engine noise, no idling, and zero local emissions).
- ✓ Better torque accuracy.

Extended range with zero emissions.

New Flyer fuel cell technology is a unique and innovative way to obtain extended-range operation similar to existing transit vehicles using a fully zero-emission solution.



Robust Design

Built on the proven Xcelsior® platform, the Xcelsior CHARGE FC™ utilizes the same robust electric propulsion system as the Xcelsior CHARGE NG™ battery-electric bus, featuring industry-proven Siemens and ZF components.



Eco Friendly

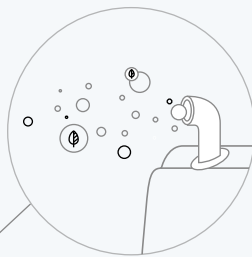
Hydrogen is clean, abundant, and can be reformed into hydrogen from natural gas (methane) or created from renewable sources such as wind or solar energy through electrolysis.

The Xcelsior CHARGE FC™ will save 85-135 tons of greenhouse gases per year from tailpipe emissions compared to a diesel bus.



Extended Range

The Xcelsior CHARGE FC™ can travel 370+ miles on a single refueling and requires no off-board electric recharging.

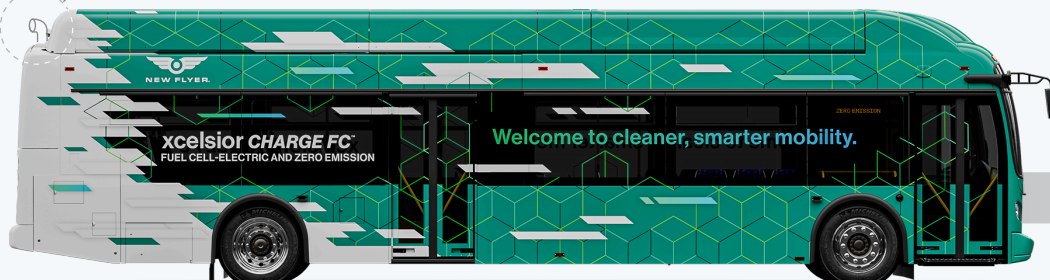


Zero Emissions



Clean

The only output from the tailpipe is water vapor.



370+ miles

How it works.

Xcelsior CHARGE FC™ is an electric vehicle that uses compressed hydrogen as an energy source.



Integration with Battery-Electric Technology



Smart Refueling

BALLARD™

Powered by Ballard Fuel Cells

What is a fuel cell? It is a device that converts chemical energy into electric energy.

A series of chemical reactions splits hydrogen into protons and a current of electrons and then combines them with oxygen, which produces water. The flow of electrons is the electric current. The electric current is used to power the batteries and ultimately power the bus.

Fueling

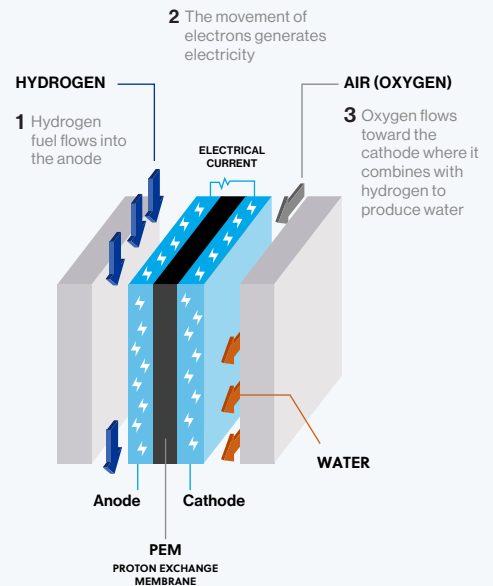
40-foot: 6 - 10 min

60-foot: 12 - 20 min

**depending on operating conditions*

Equipped with either or both TN1 or TN5 fill receptacles or a multi-fill port configuration. Receptacles can also be equipped with IR transmitters or hardwired communication ports to support fast filling at smart fill stations.

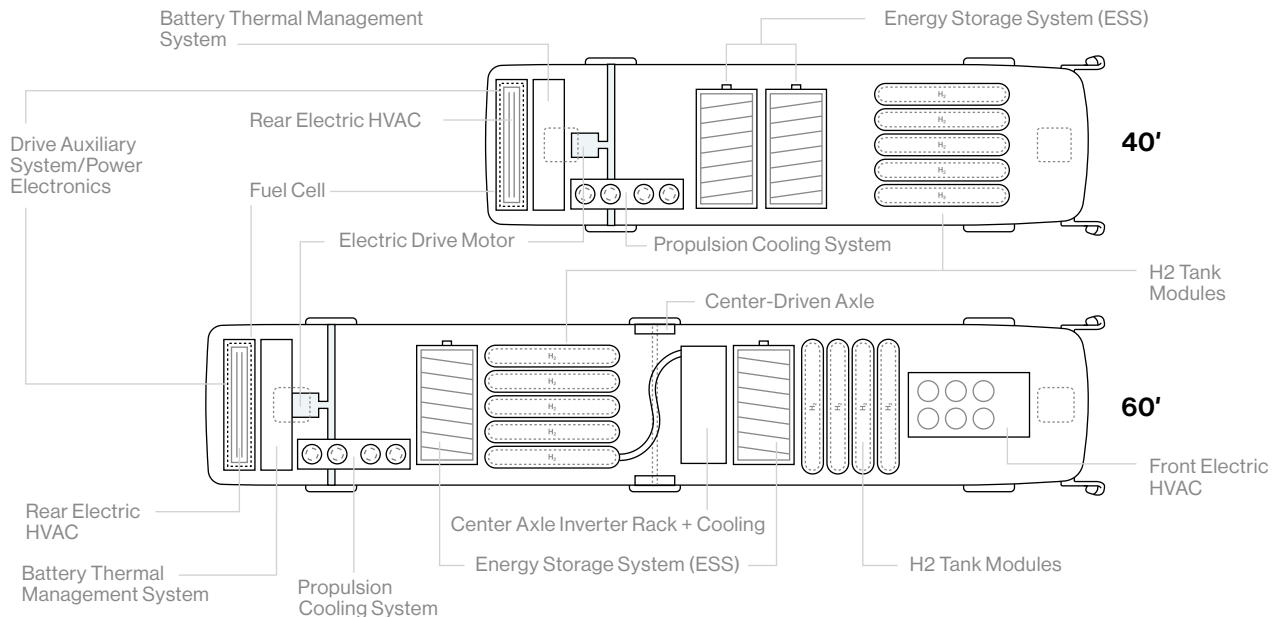
Lightweight Type 4 HGV2 tanks with 95% usable capacity.



Technology

Fuel cell-electric buses combine the best of battery electric bus technology with an on-board power generator (fuel cell).

Fuel cell-electric buses use a battery-dominant hybrid architecture, where the batteries are large enough to handle all vehicle performance needs while the fuel cell acts like a continuous battery charger to extend the range of the vehicle.



Functionality + accessibility.



Kneeling

SmartRider™ enables kneeling to variable heights and minimizes the slope difference between a low-floor ramp and the bus floor.



Self-Leveling

SmartRider™ ramp achieves a 1:6 slope ratio with a self-leveling feature that can withstand up to 1000lbs.



Capacity

Industry-leading passenger carrying capacity with up to 82 total (40 seated and 42 standees).



CONNECT 360™

Connect 360™, operated by NFI Connect™, is a customizable performance dashboard that provides smart analytic reporting to expand insight and intelligence for managing your Xcelsior CHARGE FC™ fuel cell-electric bus.

Connect 360™ is included on every new Xcelsior CHARGE FC™. Learn more at nfigroup.com/connect



Additional range capability with improved driver performance.



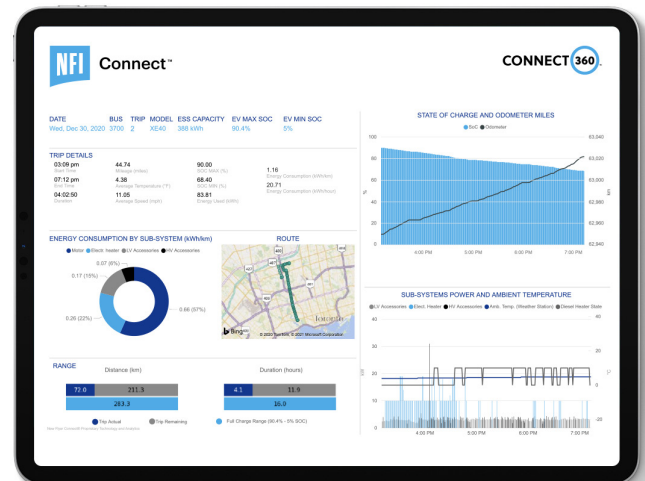
Intelligence on how to preserve battery energy throughout the day.



Decision-making information to optimize charging strategies.



Reduced operating cost and maximum fleet utilization.



NFI Infrastructure Solutions™

NFI Infrastructure Solutions™ is a service dedicated to providing safe, reliable, smart and sustainable charging and mobility solutions.

Learn what Infrastructure Solutions can do for you at nfigroup.com/IS

What our Infrastructure Solutions team provides.

Supports mobility projects from start to finish.

Focuses on energy management optimization.

Provides infrastructure planning and development.

Provides cohesive transition of bus fleets to zero-emission electric technology.

	40' XHE40	60' XHE60
Measurements		
Length	41' 0" (12.50m) over bumpers 40' 2" (12.24m) over body	60' 10" (18.54m) over bumpers 60' 0" (18.29m) over body
Width	102" (2.6m)	102" (2.6m)
Roof Height	11' 1" (3.3m)	11' 1" (3.3m)
Step Height	14" (356mm)	14" (356mm)
Front Step Height (Kneeled)	10" (254mm)	10" (254mm)
Interior Height – Floor to Ceiling	79" (2m) over front and rear axle; 95" (2.4m) mid-coach	79" (2m) over front and rear axle; 95" (2.4m) mid-coach
Tire Size	305/70R22.5	305/70R22.5
Wheelbase	283.75" (7.2m)	229" (5.8m) front / 293" (7.4m) rear

Propulsion		
Motor	Siemens Electric Drive System Optional High Gradeability Motor	Siemens Electric Drive System ZF AVE130 In-Wheel Motor Center Drive Axle Optional High Gradeability Motor
Rated Power	160 kW	320 kW
Rated Torque (*Based on 1:5.67 ratio axle)	1,033 lb-ft	2,066 lb-ft

Passenger Capacity (*Based on 150kWh ESS configuration)		
Seats	Up to 40*	Up to 52 (with one exit door)*
Standees	Up to 42*	Up to 73 (with one exit door)*

Accessibility		
Doors	2	2 or 3 (option for up to 5 doors)
Wheelchair Accessibility	32" (813mm) wide, 1:6 slope Flip out NFIL ramp, front door	32" (813mm) wide, 1:6 slope Flip out NFIL ramp, front door
Wheelchair Locations	2 - front location, rear location also available (other options available)	2 - front location, rear location also available (other options available)

Approach Angle		
Approach/Departure/Breakover Angles	9°/9°/9°	9°/9°/12° (front) 9° (back)

Turning Radius (Body, with aluminum wheels; *varies with wheel type)		
Turning Radius	43.5' (13.3)*	42' (12.8m)*

Main Components		
Floor	Marine Grade Plywood Floor Optional Composite Floor Composite Rear Interior Step Tarabus, Altro, RCA Floor Covering	Marine Grade Plywood Floor Optional Composite Floor Composite Rear Interior Step Tarabus, Altro, RCA Floor Covering
Electrical System	Parker Vansco	Parker Vansco
Cooling System	Electric cooling fans	Electric cooling fans
HVAC	Thermo King TE15 (rear)	Thermo King RLFE (front) TE15 (rear)
Axles	MAN VOK 07 front disc brakes MAN HY-1350 rear disc brakes, single reduction axle	MAN VOK 07 front disc brakes, ZF AVN 132 center disc brake MAN HY-1350 rear disc brakes, single reduction axle

Energy Storage System		
Fuel Cell	Ballard Power Systems FCmove™-HD+	Ballard Power Systems FCmove™-HD+
Equivalent Battery Energy	734 kWh base configuration	Up to 1030 kWh
Hydrogen Storage Capacity	37.5 kg (base)	56 kg
Net Power	100 kW	100 kW



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Learn more about this technology at the Vehicle Innovation Center
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