



Delivering the Purple Promise by Pedal Power

A sustainable and innovative solution for last mile deliveries

The Bullitt Project

FedEx[®]
Express

Delivering the Purple Promise by Pedal Power



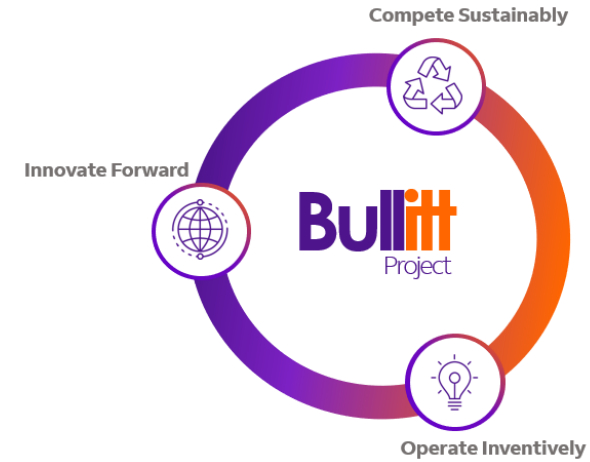
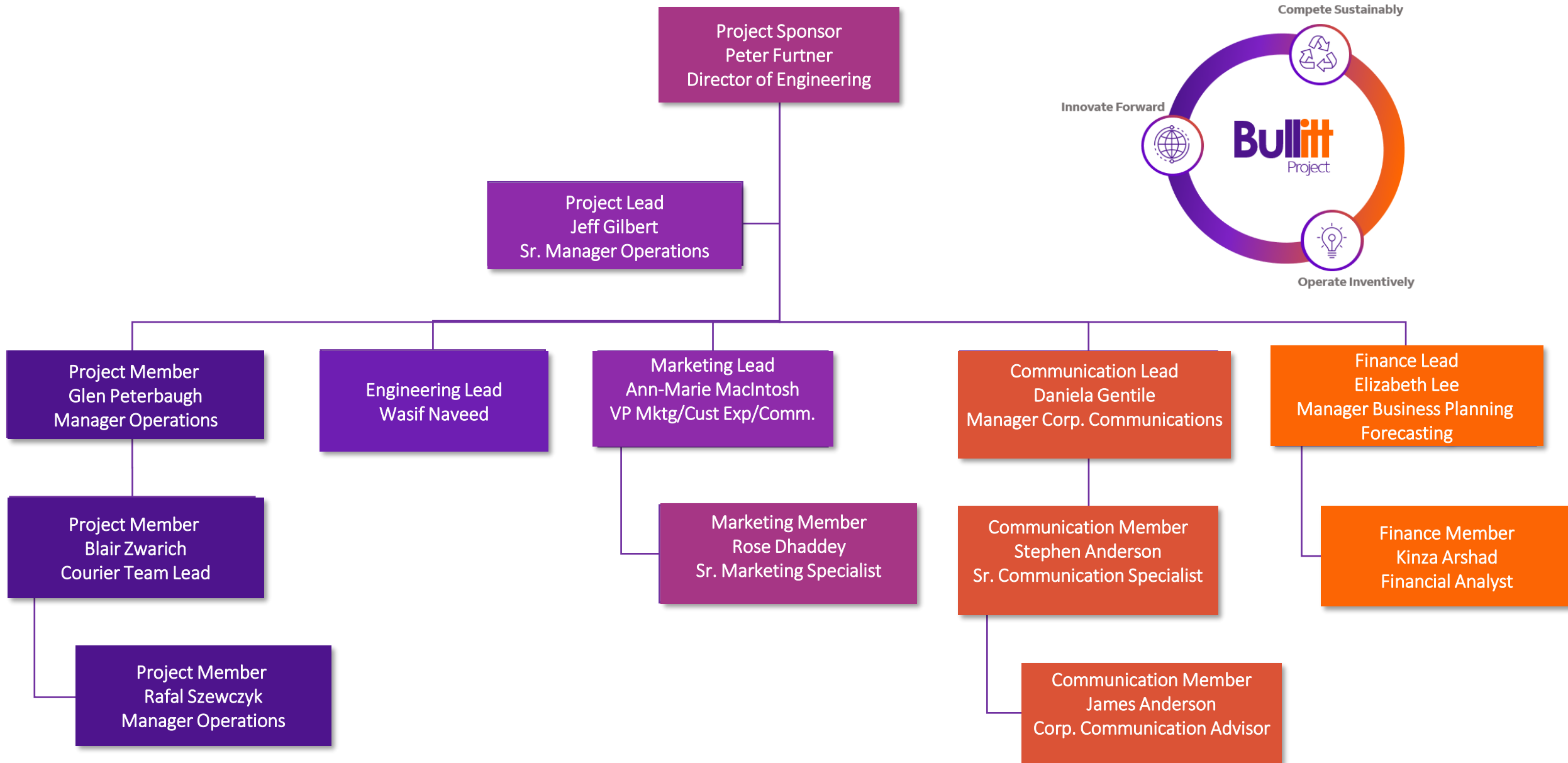
“We knew we were on to something when customers asked if all their deliveries could be done exclusively by the bikes.”



It was during the Cities Taking Freight Action conference in Toronto in March 2020 that the impetus for development and deployment of cargo e-Bikes for FedEx in Canada was born. Through our association with organizations like the Pembina Institute, we began working on our e-Bike strategy to provide a last mile delivery solution that complements changing municipal planning methods across Canada while meeting our sustainability, operational, and customer needs in a time of surging e-commerce volumes.

Cargo e-Bikes are a perfect fit for the **innovation**, **agility**, and **sustainability** that the public expects with last mile deliveries and the logistics involved. This has become a necessity across many cities in Canada and across all FedEx regions.

Bullitt Project Team Members





Toronto, CA

Amsterdam, NL

London, UK

Mexico City, MX

Pittsburgh, USA

Frankfurt, DE

Bogota, CO

Mumbai, IN

These Places Have Bikes Too

Our collaboration and conversations with these other regions helped the Toronto team benchmark from their learnings.

We Can Make This Work

Employing innovation to contend with adversity

How Things Started Off

By the summer of 2019, the Toronto bicycle lane infrastructure growth was affecting traditional curbside management practices. Associated costs and service impacts were primarily felt in the downtown core and peripheral neighbourhoods. A different approach to **Last Mile Deliveries** was needed. Attendance by FedEx Express Canada at the Cities Taking Freight Action conference in March 2020 provided impetus for the development and deployment of cargo e-Bikes beginning at the YBZ station in Toronto.



We asked ourselves, “could we take an idea that is completely the opposite of what we’ve believed would work and make it viable?”



How We'd Like to See Things Turn Out

The same substantial growth in the Toronto bicycle lane infrastructure will provide the framework for dedicated cargo e-Bikes.

This innovative, sustainable Last Mile Delivery solution will be supported by the same growing network that was impeding traditional, outmoded delivery methods.

The goal of the project is to take full advantage of that infrastructure to decrease travel time by avoiding traffic congestion, and in doing so the result will be an increase in stops per hour.

The application of cargo e-Bikes will see decreased costs associated with traditional delivery vehicles and will provide new solutions to the collective concerns around urban population growth, the higher demand and increases in curbside management, parking ticket costs, and GHG emissions.

Dwell Time is Increasing at E-commerce Stops

Why?

“Less curbside availability”

Why?

“Less parking due to creation of more bike lanes”

Why?

“It is the direction of municipal legislation to establish more bike lanes”

Why?

“Local public expectation is trending towards more urban bike lanes”

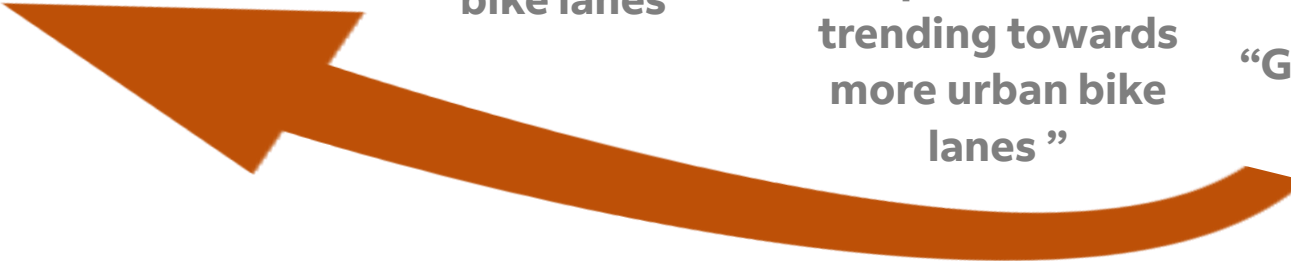
Why?

“Global urban planning is emphasizing heightened bike acceptance”

Countermeasure:
Look for Sustainable
Cost-Efficient Solution:



**The Bullitt
Cargo e-Bike**



Will it be a Truck or a Bike?

Will what we've always used be all we'll ever use?





e-Bike Capital Costs	
e-Bike	\$8,100.00
Convoy Box	\$2,000.00
Board	\$340.00
Internal Gears	\$200.00
Depreciation	\$99.00
Total Purchase Price	\$10,739.00
Shipping Costs	\$1,064.00
Annual Maintenance	\$1,213.00
Total Capital Costs	\$13,016.00
Vehicle Costs--W700	
W700	\$116,313.00
Fuel	\$4,762.00
Maintenace	\$5,055.00
Depriciation	\$6,118.00
Parking Tickets	\$7,000.00
Total Capital Costs	\$139,248.00

Cost Benefit of e-Bike	
Benefit	Cost of Vehicle--W700
Cost	Cost of Cargo e-Bike
	\$ 139,248.00
	\$ 13,016.00
	10.7:1

The cost benefit ratio is 10.7:1 for the e-Bike

The Bullitt Gets the Checkered Flag

In the Selection Matrix the Bullitt was the best choice by far

Criteria	Bike Lane Capable	Payload	Range	Components	Build Quality	Cost	Score
Rytle 	-5	+5 2000L/200KG	+0 60km	-5 Pedelec 250W	-5 Interchangeable Cargo Bin Bolted Delta Trike	-5 \$15,000+	-15
Centaur 	-5	+5 850L/100KG	+0 60km	+0 Yamaha Mid-Drive motor	+0 Fibreglass Bin Tadpole Steering	+0 \$12,500	0
Urban Arrow 	+5	+0 300L/100KG	+5 80km	+0 BOSCH 75NM/w 500W motor	+0 Bolted Frame UA4.1 Aluminum	+0 \$11,000	10
Bullitt 	+5	+0 316L/100KG	+5 100km	+5 Shimano 65NM/w 504W motor	+5 Welded Frame T6 Grade Aluminum	+0 \$12,000	20

Bullitt Points

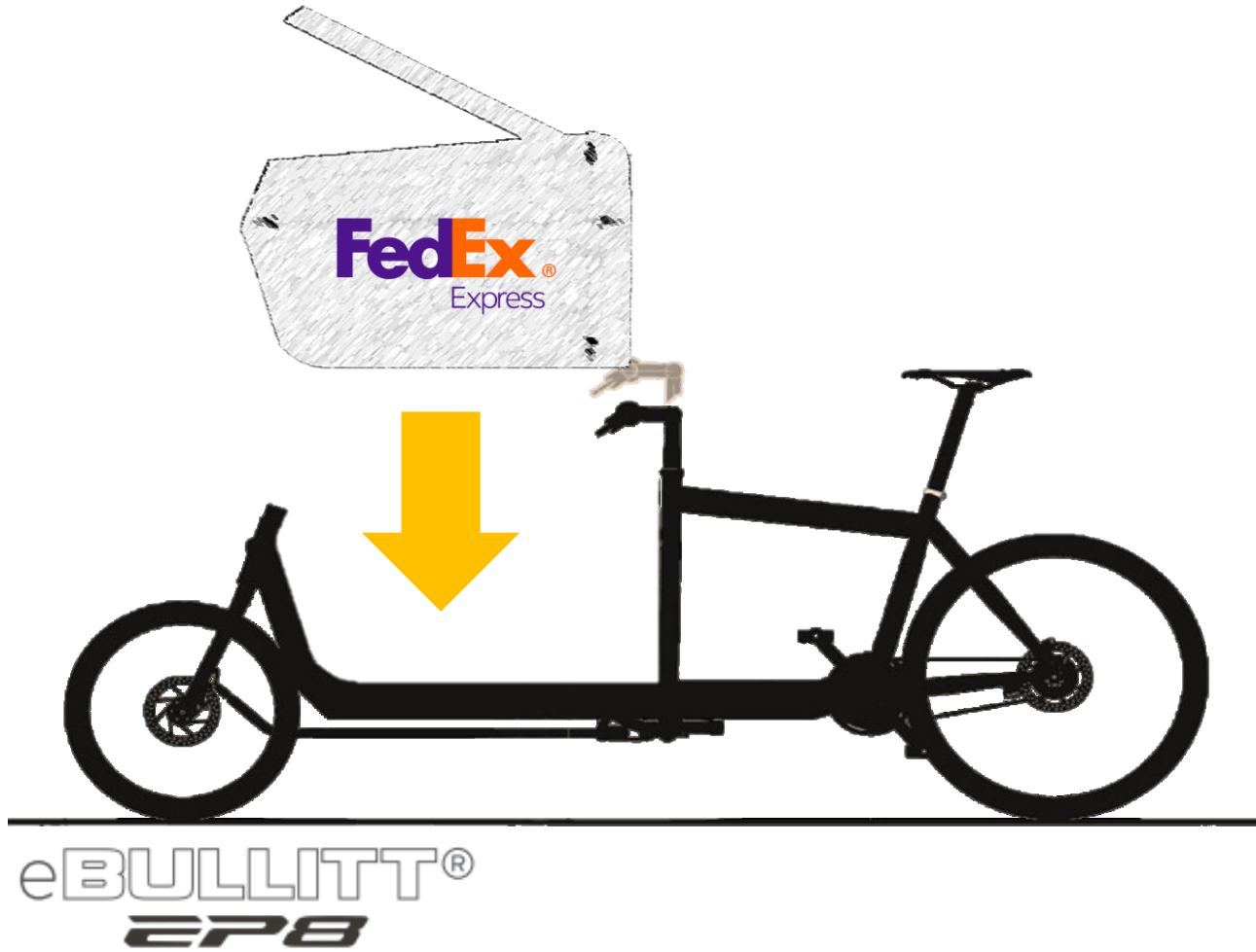
- Designed and built in Copenhagen
- Automatic shifting
- 100+km range on a single battery charge
- Multi-functional onboard computer
- Carbon belt drive (no chain)

This Doesn't Look Like Your Old Bike

It doesn't work like it either...it works better

SHIMANO
STEPS

Shimano Total Electric Power System.



Combining the Convoy 316L all aluminum lockable cargo box with the Bullitt pedelec e-Bike creates the combination of power, capacity and sustainability needed to provide efficient and innovative last mile delivery solutions in high density urban settings.

The Technology is Cutting Edge

There's more here than just a pedal and chain

Internal gearing

- Fewer drive parts for better reliability

Carbon drive belt

- Constructed from carbon Kevlar incredibly strong, maintenance free and does not require lubrication

Brakes

- Four piston brakes and 180mm rotors on all Bullitt models, stopping quickly and effectively under load

Frame design

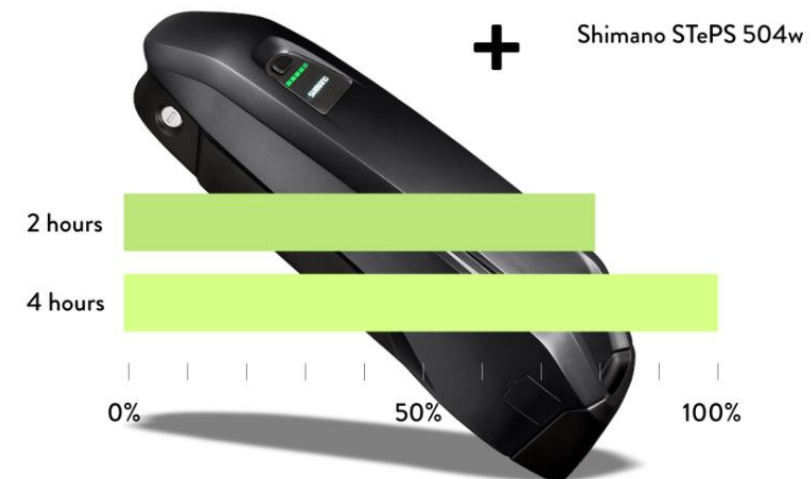
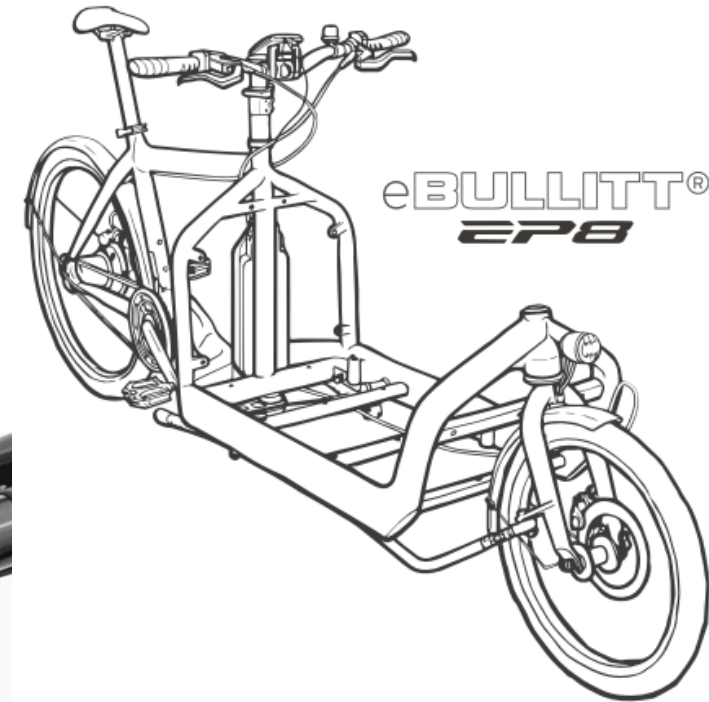
- The Bullitt frame has been tested to the very highest standards available and is the benchmark in cargo bike construction

The Motor

- 85 Nm of Torque
- Motor Assistance up to 32 kmph

Interchangeable & rechargeable battery

- The battery can be removed and charged within 1 hour to 50%, 2 hours to 80% and 4 hours 100%.
- Up to 100 km in Eco mode



Is a Bike With a Motor Still Just a Bike?

No, it's an e-Bike and that technology is exploding

- The Bullitt cargo e-Bike is equipped with a Shimano STePS E8000 **pedelec motor**
- The term **pedelec** is shortened from pedal electric cycle
- This version of **e-Bike** requires the rider to pedal to engage the motor. Rather than engaging the motor with a throttle, the turning of the pedals engages the motor



It Was Important to Look at These Numbers

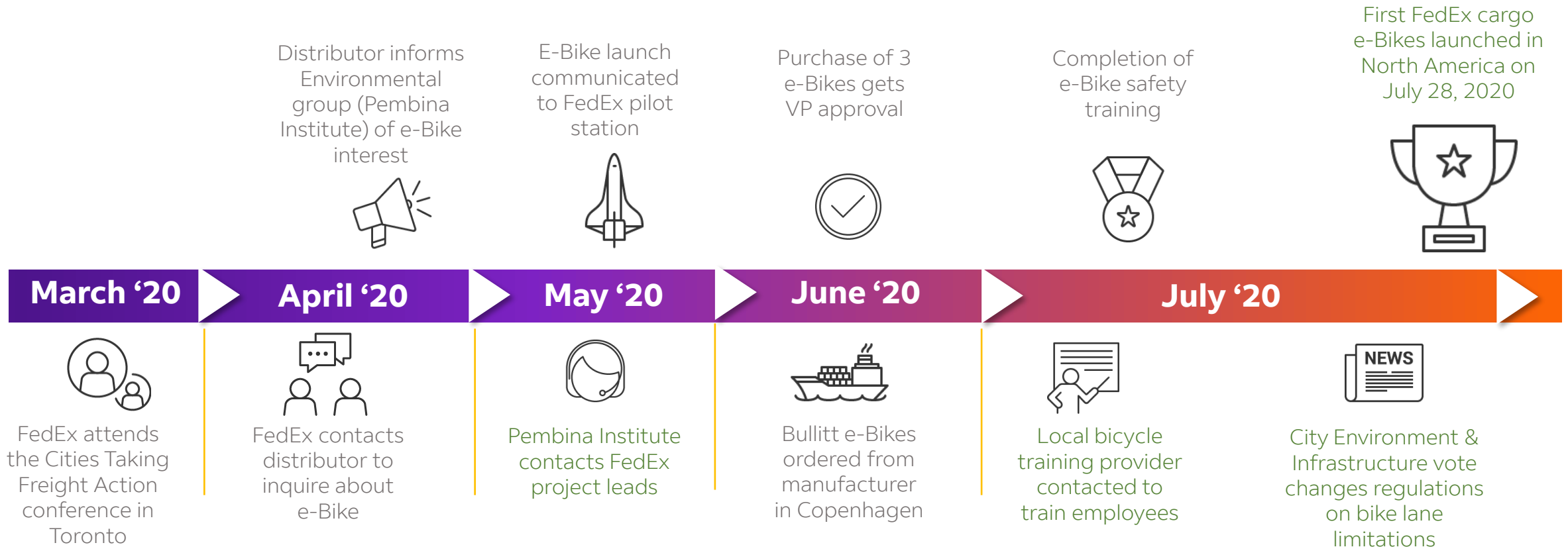
The data collected would validate the success of the e-Bike

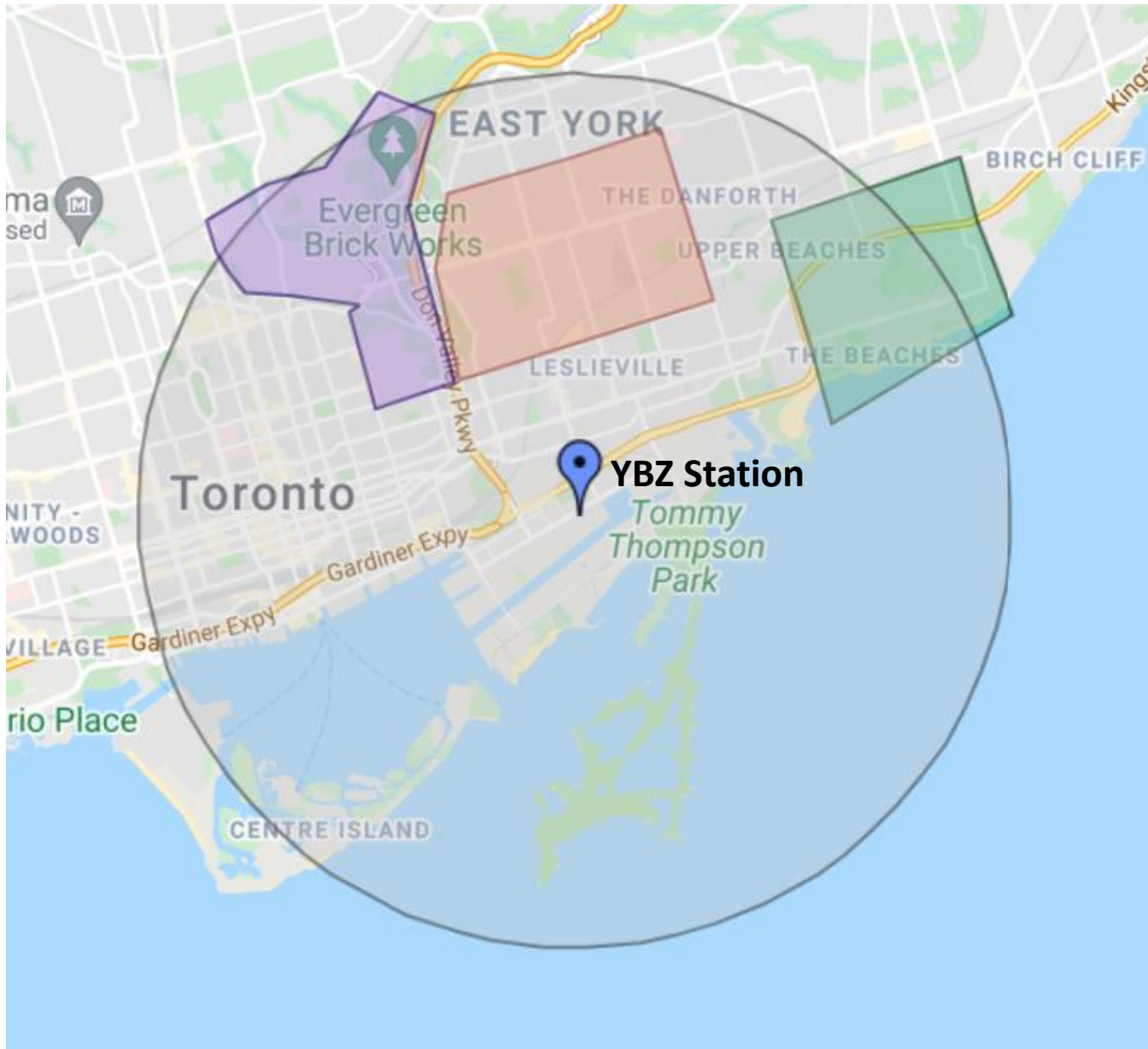
Data Collection Plan

Metric	Source	Operational Definition	Collection Method	Who
Stops per hour OR	Engineering	Sum of Delivery and Pickup Stops Divided by Sum of On-Road Hours	FWR	Wasif Naveed
Stops per hours OA	Engineering	On Area Stops Per Hour	FWR	Wasif Naveed
Delivery Stops	Engineering	The Number of Delivery Stops in a Day	FWR	Wasif Naveed
KM travelled	Operations	Total KMs traveled each day	Route4Me	Blair Zwarich
Hours on road	Engineering	Total Number of Hours Completed in a Day	FWR	Wasif Naveed
Packages Delivered	Engineering	The Number of Packages Delivered in a Day	FWR	Wasif Naveed

T-Minus 135 Days

From March 15 to July 28 – It took just over 4 months to launch the Bullitt





e-Bike Deployment

By utilizing a 5 km radius from the Toronto YBZ station, access could be gained to prime density areas while maintaining an achievable stem time for the riders

By using bike lanes and corridors, traffic congestion could be bypassed, and route areas accessed quickly

By employing this distance method, e-Bikes can be launched from satellite locations or even from trucks and penetrate farther neighbourhoods

The Launch Process

Making sure everything needed was accounted for



Progression Checklist

Line Item	Date
e-Bikes Socialized	4/10/2020
e-Bikes Arrive	7/3/2020
e-Bikes Branded	July 6-9, 2020
Route Selection Completed	6/26/2020
Employee Training	7/17/2020
Rider Gear Ordered	6/10/2020
Final Arrival of Branded e-Bikes	7/10/2020
PDI completed	7/21/2020
e-Bikes Launched for First Time in North America	7/28/2020

In the Right Setting, e-Bikes will Achieve Greater Stops/Hour Productivity than a Vehicle in a Similar Environment

High Density (<0.01 Km/Stop)

- Requires frequent restocking of the e-Bike
- A truck's higher capacity makes it more viable here

Optimal Density (0.01 – 0.6 Km/Stop)

- The e-Bikes exceed a truck's productivity in this range due to virtually no dwell time and zero parking constraints, also...
- The lower cost structure provides a favorable cost per package in this range

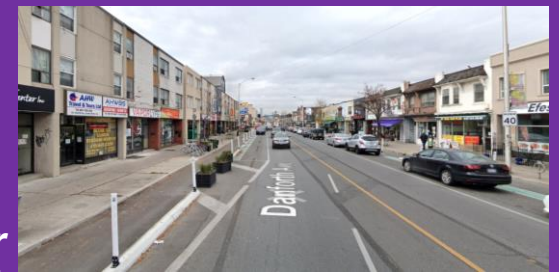
Low Density (>0.61 km/Stop)

- Distance between stops makes travel speed more important
- A truck's higher top speed here makes it more viable

*Shorter
Travel*



*Illustrative Examples of
Optimal Stop Density*

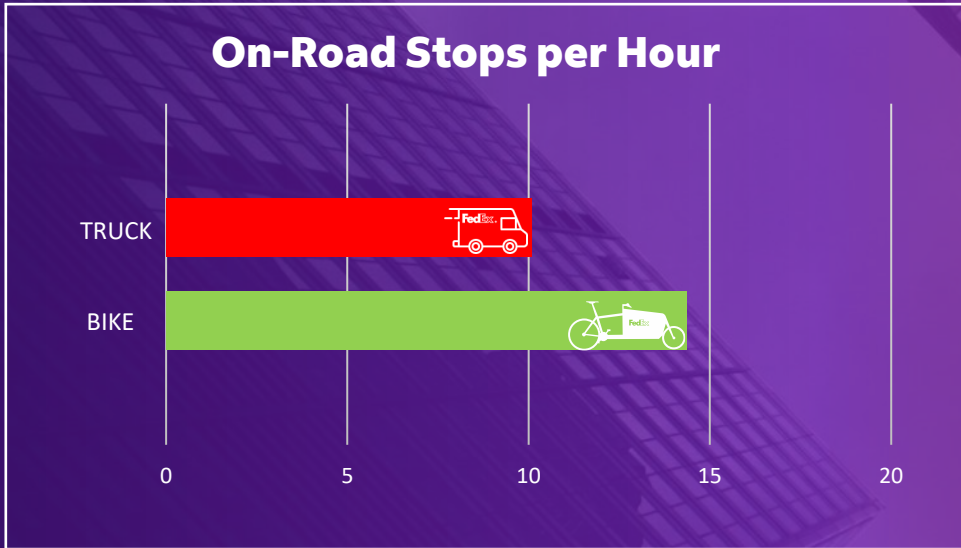


*Longer
Travel*

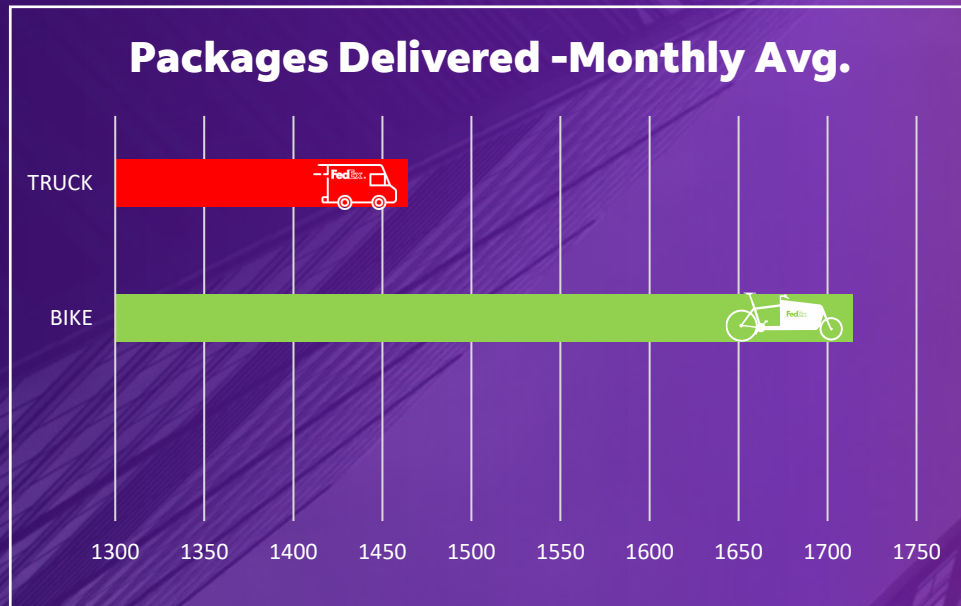
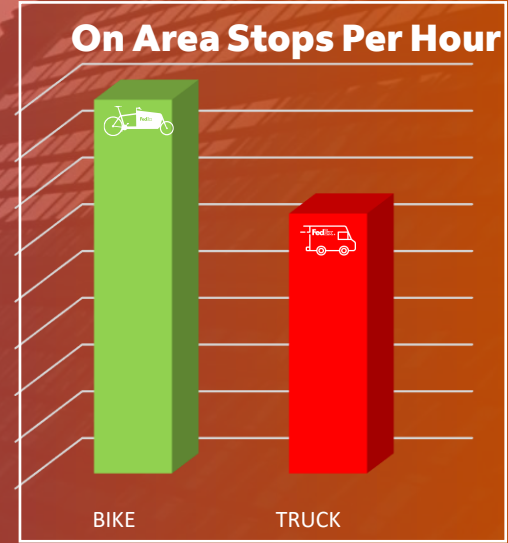
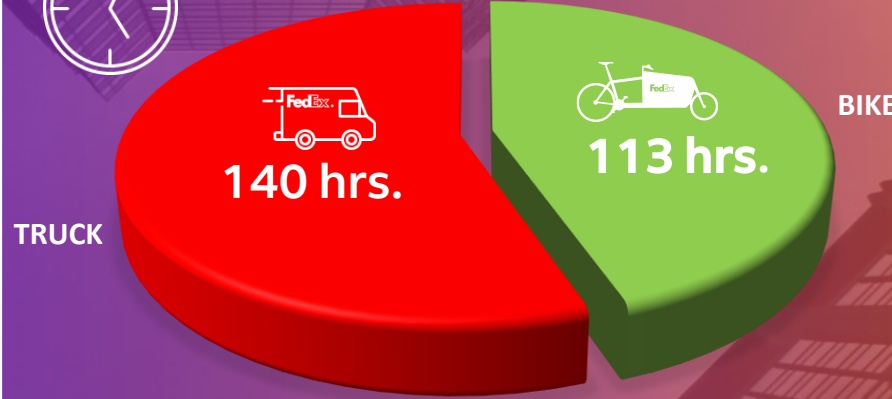
This Performance is Bullitt Proof

When living in its natural habitat the e-Bike is a sure winner

Lower dwell times keep the e-Bike moving



Hours Spent on Road



The Bullitt e-Bike delivered **17%** more packages than the truck and did it in **19%** less hours

Using the e-Bike Makes Sense & Saves Cents (lots of 'em)

The technology here is agile, quick and nimble. That means lower cost

	Cargo e-Bike	W700
Purchase Price	\$ 10,640	\$ 116,313
Depreciation	\$ 222	\$ 1,077
Insurance	\$ 42	\$ 150
Microhub cost	\$ 500	\$ -
Fixed Cost	\$ 763	\$ 1,227
Maintenance	\$ 128	\$ 421
Fuel/ Diesel Charge	\$ 4	\$ 397
Uniform	\$ 24	\$ 19
Parking Tickets	\$ -	\$ 190
Tow	\$ -	\$ 25
Variable Costs	\$ 156	\$ 1,052
Total Costs	\$ 919	\$ 2,278
annual km	8,322	9,508
monthly km	694	792
packages/month	1,714	1,464
CPP	\$ 0.54	\$ 1.56
Monthly Cost	\$ 919	\$ 2,278
Annual Cost	\$ 11,034	\$ 27,342

When delivering with the e-Bike the cost per package is **65.3% less** than with a truck



Annual Savings \$16,308

National Bullitt e-Bike Expansion Cities



Greater Vancouver
YVR, YBY, YAZ



Calgary
YYC



Ottawa
YOW



Greater Montreal
YUT, YUL

Greater Toronto Area
YBZ, YTO, YFH



During the
summer of
2021

40 more

Bullitt e-Bikes
are being
deployed
across Canada

Lessons Learned Here Expanded the e-Bikes Nationwide

The team learned operational, staffing, administrative and collaborative lessons

A stem time of more than 25 mins or 6.5 km is too long for the bike

OPS and station engineering should have regular (informal) evaluations

During initial launch vehicle couriers lost interest as cold months approached leading to the hiring of dedicated e-Bike couriers

Difficulty with brand image and the obtaining of proper bike clothing for adverse weather conditions

Forming associations with the local biking community (Cycle TO, Curbside) along with environmental groups (Pembina Institute) was extremely beneficial

Sharing information with bike programs in Amsterdam, Bogota, London, Mexico City, and Frankfurt was extremely helpful in identifying common issues, difficulties and successes

Developing methods to deploy additional freight to the bikes is key to greater efficiency

Incorporating a GPS tool that coordinates delivery stops was an important benefit

6,250 emissions-free kilometres and counting



14,700 +
delivery stops



15,400 +
packages delivered



6,250 +
kms travelled



1.7 tonnes
of CO₂ saved*

*Emissions savings based on Natural Resources Canada CO₂ emissions information for typical residential delivery vehicle versus zero-emission e-Bikes, from July 2020 to May 2021



Riding Innovation

Reduce, Replace, Revolutionize, & Ride!



With sustainability proven and innovation abound, the Bullitt cargo e-Bikes have done a tremendous job increasing our visibility to customers in a completely different way and putting a spotlight on our FedEx goal of achieving carbon neutral operations by 2040.

Moreover, the project aims to see substantial savings from parking ticket costs as well as the performance improvements contributing to the customer experience.

Cargo e-Bikes are a perfect fit for the **innovation, agility,** and **sustainability** that the public expects with last mile deliveries and the logistics involved. This has become a necessity across many cities in Canada and across all FedEx regions.



Compete Sustainably



Bullitt
Project

Innovate
Forward



Operate Inventively

Media Coverage

Coverage of our e-Bikes to date has included the CBC, Canada's national public broadcaster, which featured the e-Bike pilot in a nationally-televised news show, *The National* ([link](#)), with additional coverage repurposed for several other of its properties, both online and on radio.

Canadian Cycling Magazine also covered the pilot ([link](#)).

Responses from the public have been equally positive. Implementation of the e-Bike fleet has also led to working relationships with local Key Opinion Leaders and think-tanks focused on sustainable transportation, which will be beneficial when FedEx expands its e-Bike program to other Canadian markets.

[Click here](#) for our YouTube video on e-Bikes.



Parcel delivery companies are trading trucks for bikes in some Canadian cities. Here's why



Road-clogging, polluting vehicles found to be less efficient than greener option

Emily Chung, Alice Hopton, Tashauna Reid - CBC News
Posted: Nov 28, 2020 4:00 AM ET | Last Updated: November 28, 2020



FedEx pilots e-cargo bikes to reduce emissions from delivering packages
6 months ago | 2:00

A pilot project in downtown Toronto is testing e-cargo bikes for FedEx deliveries. The idea is to reduce carbon emissions from all those trucks on the road making deliveries for Canadians' online purchases during this pandemic, while also reducing companies' delivery costs. 2:00





Priority Earth:

Our initiative to deliver a more sustainable future

We're working our way toward delivering a more sustainable future with a goal of carbon neutral operations by 2040. Priority Earth is our initiative to get there. And it's our most important delivery yet, because it's to the address we all share.

Cargo e-Bikes are part of our commitment to help meet our global sustainability goal.