

# THE WORLD'S LARGEST FLEET RETROFIT ELECTRIFICATION PROJECT



# About Zoomlion Ghana Limited



Zoomlion Ghana Limited is a wholly Ghanaian owned company that focuses on delivering quality waste management and scientific cleaning services. It is the provider of an integrated waste management solution from waste collection, through haulage, transfer and sorting to recycling and disposal. It is a member of the Environmental Services Providers Association (ESPA) of Ghana and a Silver member of the International Solid Waste Management Association (ISWMA, USA)

## QUICK FACTS

<b>Name</b>	Zoomlion Ghana Limited
<b>Year</b>	Established 2006
<b>Business Type</b>	Environmental Service Provider (Waste Management)
<b>Office Location</b>	Nmai Djorm near Ayensu River Estates, Accra.
<b>Address</b>	P.MB 117, Madina, Accra
<b>Country</b>	Ghana, West Africa
<b>Number of Employees</b>	Core Staff 3,000 and Project Staff 85,000
<b>National Coverage</b>	All 216 Metropolitan, Municipal and Districts
<b>Foreign Operations</b>	5 African Countries

## EXECUTIVE MANAGEMENT

<b>Executive Chairman</b>	Dr. Joseph Siaw Agyepong
<b>Managing Director</b>	Gloria Anti
<b>Director of Finance</b>	Mr Adokarley Okpoti-Paulo
<b>Director of Administration</b>	Mr. Emmanuel O. Okomen

# About Zoomlion Ghana Limited



# Jospong Group (Parent Company)



The Journey Began in 1995



Employ over **6,000** core staff and **55,000** other staff



Ghana's most diversified business group with 60+ subsidiaries



Operates In 14 Sectors of the Ghanaian economy and some African countries

**US\$1.1BN**  
Total Assets

**57%**  
5-Years Average  
Annual Revenue  
Growth

## SECTORS OF OPERATIONS



Waste Management



Logistics



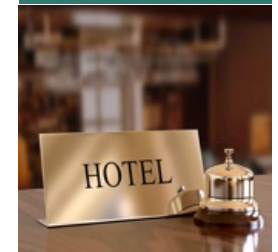
ICT



Banking & Insurance



Agribusiness



Commercial Services





FASTCOMPANY



World  
Changing  
Ideas  
2022

**World Changing Ideas  
Honoree 2022**  
*Fast Company*



**Green Technology  
Solutions Award 2023**  
*Ghanaian Government*

**\$155MM contract to  
electrify 1,000 refuse  
trucks for Jospong**



**FASTCOMPANY**

**WE MADE  
THE LIST!**

**WORLD CHANGING  
IDEAS 2022**

# Zoomlion Refuse Truck Conversion Process



## Internal Combustion Engine

- ✗ Diesel Engine\*
- ✗ Fuel Tanks
- ✗ Exhaust System
- ✗ Oil, Air Filters & Liquids
- ✗ Original Radiator



## Electrification

- |                                    |                           |
|------------------------------------|---------------------------|
| ✓ Battery Modularity System        | ✓ Cables & Wiring Harness |
| ✓ Battery Management Systems (BMS) | ✓ External DC Charging    |
| ✓ Power Distribution Unit (PDU)    | ✓ Motors                  |
|                                    | ✓ Motor Controllers       |
|                                    | ✓ Telematics              |
|                                    | ✓ Vehicle Control Unit    |

*\*Diesel engines to be recycled and decommissioned for rebate by the Josping Group of Companies.*

## Cost Benefit Analysis - Summary



**Jospong expected to achieve ~\$335MM+ cost savings and  
~470,000 metric tons of CO2 reduction over 5 years with a fleet of 1,000**

### Cost Benefit Analysis - Summary

	Total Maintenance Cost	Total Fuel/Electricity Cost	Total CO2 Emissions	Measure
Electric	\$ 41,061,825	\$ 43,243,200	138,937,951	Kg
Diesel	\$ 175,000,000	\$ 244,127,520	610,318,800	Kg
Maintenance and Energy Savings Over 5 years	\$ 334,822,495			
Return on investment in years	2.33	Years		
Total Metric Tons of CO2 Reduced over 5 years	471,381	Metric Tons		
Total CO2 Emission Reduction over 5 years	471,380,849	Kg		
Total Equivalent Mature Trees Planted over 5 years	14,964,471	Mature Trees		

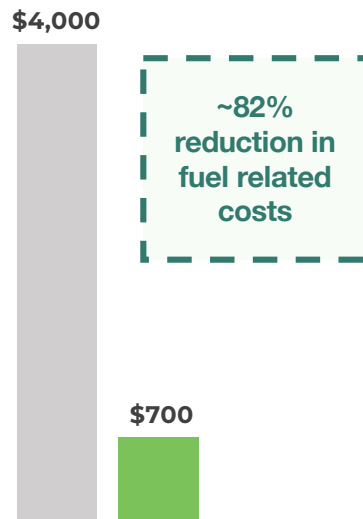
*\*With estimated total investment of \$156,000,000*

# Refuse truck electrification project benefits



## Fuel Costs (\$K)

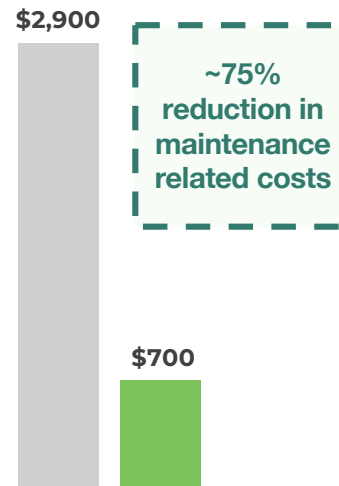
Monthly Fuel Costs per Truck



■ Internal Combustion Engine ■ ZeroNox

## Maintenance Costs (\$K)

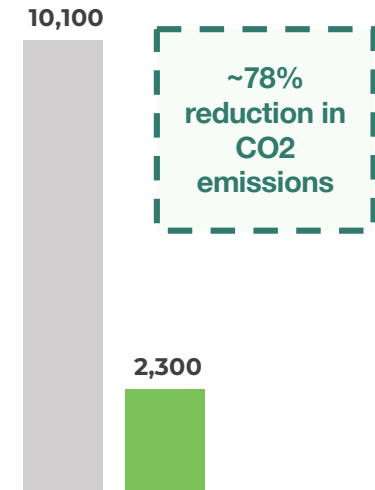
Monthly Maintenance Costs Per Truck



■ Internal Combustion Engine ■ ZeroNox

## CO2 Emissions (Kg)

Monthly CO2 Emissions



■ Internal Combustion Engine ■ ZeroNox

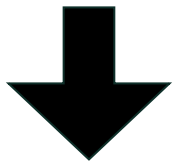
Jospong expected to achieve ~\$335MM+ cost savings and ~470,000 metric tons of CO2 reduction over 5 years with a fleet of 1,000



# Jospong Retrofit Project Inputs

## Product Requirements

- Number of Vehicles
- Work Schedule
- Fuel Consumption
- Route Distance Traveled
- Maintenance Cost



**Zeronox Electric Powertrain  
Platform (ZEPP)  
Architecture**



# Inputs - Jospong



## Inputs - Client

Vehicle		
Refuse Trucks	1,000	Trucks
Schedule		
Work Days per Week	6	
Weeks per Year	52	
Work Days per Month	26	days
Work Days per Year	312	days
Distance Traveled per Work Day per vehicle	210	km
Distance Traveled per Month per vehicle	5,460	km
Distance Traveled per Year per vehicle	65,520	km
Fuel		
Fuel Burn per km	0.60	L/km
Fuel Cost per L	\$ 1.080	USD
Fuel Efficiency	85%	percent
Maintenance - ICE vehicle		
Maintenance Cost per Month per vehicle	\$ 2,917	USD
Maintenance Cost per Year per vehicle	\$ 35,000	USD

# Inputs - Zeronox



## Inputs - ZeroNox

Battery		
Battery Size - HD per vehicle	283	kWhrs
Daily Battery Use	74%	percent
Battery Round-Trip Efficiency	90%	percent
Electricity Cost per kWhr	\$ 0.120	USD
Conversion		
Conversion Kit Cost - HD (DDP) per vehicle	\$ 140,499	USD
EVSE Cost per Port (DDP)	\$ 14,687	USD
Telematics Software Sub / Fleet Monitoring	\$ 35	USD
Maintenance - Electric vehicle		
Reduction in maintenance for EV truck	45.83%	percent
Increase in maintenance cost for diesel truck with age	67.00%	percent
Maintenance cost saving	76.54%	percent
EV Truck Maintenance Per Year	\$ 8,212.37	USD
Training		
EV Retrofit Curriculum Cost per Mechanic	\$ 175	USD
Mechanics to be Upskilled	1200	
Oversight On-Site FTE Cost per Year	\$ 80,000	USD
On-Site FTEs	4	FTE
E-Recycle		
Spare Parts - ICE - per vehicle	\$ 200	
Truck Resale - ICE - per vehicle		
Truck Resale - Electric - per vehicle		

# Fleet Calculations



Fleet Calculations		
<b>Fuel</b>		
Fuel Burn per Year for fleet	45,208,800	L
Fuel Cost per Month for fleet	\$ 4,068,792	USD
Fuel Cost per Year for fleet	\$ 48,825,504	USD
Fuel Cost per Mission	\$ 156	USD
<b>Electricity</b>		
Energy Use per Year for fleet	72,072,000	kWhrs
Electricity Cost per Month (100% Grid)	\$ 720,720	USD
Electricity Cost per Year (100% Grid)	\$ 8,648,640	USD
Energy Use per Work Day	231,000	kWhrs
Energy Cost per Mission	\$ 28	USD
<b>Conversion</b>		
Conversion Cost for fleet	\$ 140,499,000	USD
<b>Charging Infrastructure</b>		
EVSE Cost for fleet	\$ 14,687,000	USD
<b>Maintenance</b>		
Diesel Maint. Cost Per Year for fleet	\$ 35,000,000	USD
Diesel Maint. Cost Per Month for fleet	\$ 2,916,667	USD
Elec. Maint. Cost Per Year for fleet	\$ 8,212,365	USD
Electric Main. Cost Per Month for fleet	\$ 684,364	USD
<b>ROI</b>		
Total E-Kit Upfront Cost	\$ 155,186,000	USD
Spare Parts - Diesel - E-Recycle	\$ 200,000	USD
Net Upfront E-Kit Investment for fleet	\$ 154,986,000	USD
Training/Service (over first 3 years) for fleet	\$ 1,170,000	USD
Total Cost of EVSE	\$ 14,687,000	USD
Total Savings per Month - Energy (100% Grid)	\$ 3,348,072	USD
Total Savings per Year - Energy (100% Grid)	\$ 40,176,864	USD
Total Savings per Month - Maintenance	\$ 2,232,303	USD
Total Savings per Year - Maintenance	\$ 26,787,635	USD
Total Energy + Maintenance Savings per Month	\$ 5,580,375	USD
Total Energy + Maintenance Savings per Year for fleet	\$ 66,964,499	USD

DIESEL FUEL COST  
PER MISSION\*

**\$156 USD**  
of diesel fuel per  
mission\*

ELECTRIC ENERGY COST  
PER MISSION\*

**\$28 USD**  
of energy costs per  
mission\*

\*A mission is defined as one 210 km duty cycle.



# Jospong Technician Training Curriculum



## ROLES

### **ELECTRIC VEHICLE (EV) TECHNICIAN –**

*Diagnose and repair EV applications.*

### **ELECTRIC VEHICLE (EV) ADVANCED TECHNICIAN –**

*Diagnose, troubleshoot, repair EV controller and physical applications. Integrate new technologies into existing applications.*

## JOSPONG GROUP | ENVIRONMENTAL BENEFIT



**470,000 CO<sub>2</sub>**  
**METRIC TONS**



**15,000,000**  
**MATURE TREES**

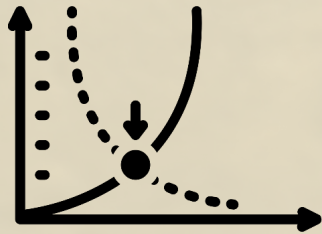
**Equivalent over 5 years for Fleet of 1000**

## JOSPONG GROUP | ECONOMIC BENEFIT



**\$335,000,000**

**SAVINGS OVER 5 YEARS  
FOR FLEET OF 1000\***



**2.3 YEARS**

**PAYBACK PERIOD**



\*With estimated total investment of \$156,000,000

\*\*Assuming discount rate of 21.94% (5Y average return of S&P 500)



# JOSPONG GROUP | SOCIAL IMPACT



## UPSKILLING OF EXISTING MECHANICS

Growth Opportunities from Technical Training



## WORKFORCE DEVELOPMENT

Partnership with Jospong Academy to Create EV Curriculum



# Refuse truck validation testing results

TARGET DISTANCE

**80**

km range

ACTUAL RESULTS

**81**

km range

BATTERY USED

**41%**

energy use

ESTIMATED BATTERY RANGE

**120**

km range

PAYLOAD (LOADED BIN)

**4,589**

kg

LOADED DISTANCE %

**37%**

Loaded dist. traveled

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**THANK YOU**

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