



COMMERCIAL ELECTRIC & FUEL CELL VEHICLE MULTI-CLIENT STUDY

POWER UP

2021-2040 GLOBAL BEV & FCEV FORECAST & ANALYSIS



POWER UP – Global BEV & FCEV Study

ACT and **KGP** collaborative effort to develop a **global BEV and FCEV commercial vehicle forecast and analysis**.

Our methodology works with study participants and engages them in **informed discussions**, incorporating **feedback and findings** into the research, analysis and TCO model. It is a **fully interactive process** that helps to shape and define the study findings resulting in a **credible and reliable forecast**.

“The study will provide the most complete, independent and systematic view of the benefits, costs, enablers and barriers for all stakeholders”

“The combined expertise of ACT and KGP ensures access to data, facts, and industry sources that is unparalleled and unique in the commercial vehicle market”



Why Electric Now?



TECHNOLOGY

- Battery energy density
- Battery costs
- Fast charging capabilities



REGULATORY

- CO2 / GHG
- Diesel NOx / PM
- ZEV Quotas
- ICE Bans

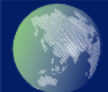


FLEETS / CONSUMERS

- Carbon neutral CO2 goals
- ESG – Sustainability goals

FAVORABLE TCO = MARKET PUSH

SOCIETAL GOALS = MARKET PULL



Key Considerations



UTILITIES / INFRASTRUCTURE

- Will there be enough electrical generating capacity?
- Will local utilities be able to support specific demand?
- Public charging infrastructure?



MATERIAL SUPPLY

- Will there be enough:
 - Lithium
 - Nickel
 - Cobalt
 - Processing capacity
- Recycling



VEHICLE AVAILABILITY

- 334 models launching 2019 – 2024
- 281 BEV / 53 FCEV
- 100+ OEMs
~30% New Entrants



CV applications – high EV adoption potential

DUTY CYCLE ENABLERS

- Low-speed, frequent stops
- “Intermediate” daily mileage
- Return-to-base daily
- Overnight charging
- Lower cost charging infrastructure needs



HI POTENTIAL APPLICATIONS

- MD Low Cab Forward
- MD Step Van
- L-MD Low Cab Forward
- Terminal Tractor
- Transit/City Bus
- School Bus



Fuel cells – Will they prove better than BEV?

- Promising potential ZEV solution
- Can FCEV win in competition over BEV and ICE?
- Issues:
 - Costs of technology for the vehicle
 - Achieving practical scale; breaking out of niche markets
 - Costs of infrastructure build-out
 - “Green” Hydrogen feasibility: cost, scale & timing



Forecast based on TCO economics

CEV adoption rates driven by TCO savings and payback periods

TCO Definition: **ALL** vehicle related costs over full vehicle lifetime

Key Elements:

- Purchase price
- Battery replacement
- Road use tax (eventually)
- Maintenance
- Charging infrastructure
- Insurance
- Fuel
- Taxes/Tolls
- Weight penalty/Function factor

Key Future Trends:

- Falling battery costs, based on experience and scale
- Rising diesel powertrain costs to meet emission regulations
- Improving powertrain efficiency, both ICE (CO2/GHG regs) and CEV
- Increasing battery pack energy density
- ZECV sales mandates
- ICE/diesel bans



Scope of Study - Deliverables

Economic & Market Overview

detailed by each Region

Propulsion Systems Technology

Battery Technology

Fuel Cell Technology

Regulations

detailed by each Region

Electricity Supply & Charging Infrastructure

detailed by each Region

Hydrogen Supply & Fueling Infrastructure

detailed by each Region

Total Cost of Ownership

detailed by each Region and by each Segment/Application

Regions

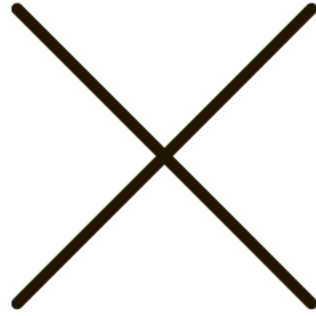
- **ASIA PACIFIC**
 - China, Japan, Korea, India
- **EUROPE**
 - Germany, France, UK, Poland, Italy, Spain, Turkey, Netherlands, Scandinavia, Baltic
- **S AMERICA**
 - Brazil
- **N AMERICA**
 - United States, Canada



List of deliverables for *Power Up* clients

- Analytical narrative of CV electrification & fuel cell
- Executive summary via PowerPoint slides
- Base case model in Excel (TCO driven adoption forecast)
- Alternative case scenarios
 - High adoption path
 - Low adoption path





LEADER IN COMMERCIAL VEHICLE
INDUSTRY DATA, MARKET ANALYSIS,
FORECASTING SERVICES FOR THE
NORTH AMERICAN MARKETS.

LEADER IN GLOBAL COMMERCIAL
VEHICLE ON & OFF-HIGHWAY
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FORECASTING.

WINNER OF THE 2019 LAWRENCE R. KLEIN
BLUE CHIP FORECASTING AWARD



THANK YOU



Alex Woodrow, Managing Director KGP
alexwoodrow@kgpauto.com



Ian McGriff, VP Marketing, Business Development ACT Research
imcgriff@actresearch.net

