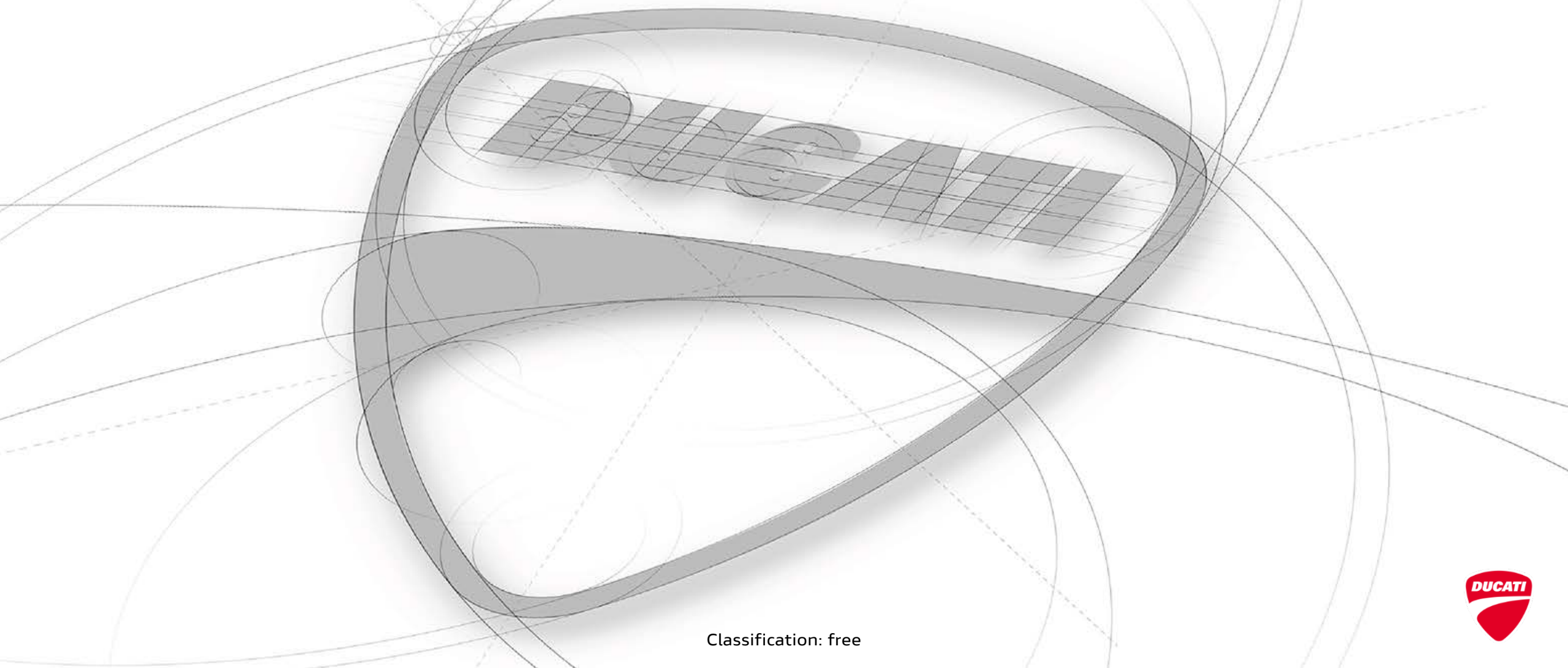
Ducati: Prospettive nel settore E-Mobility

Roberto Canè e-Mobility Project Director

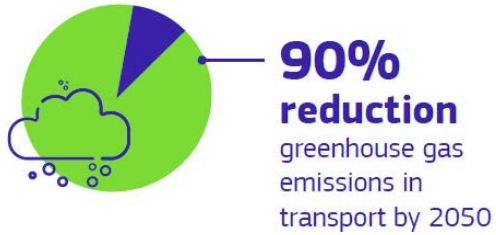
Bi-Rex – 18/11/2020

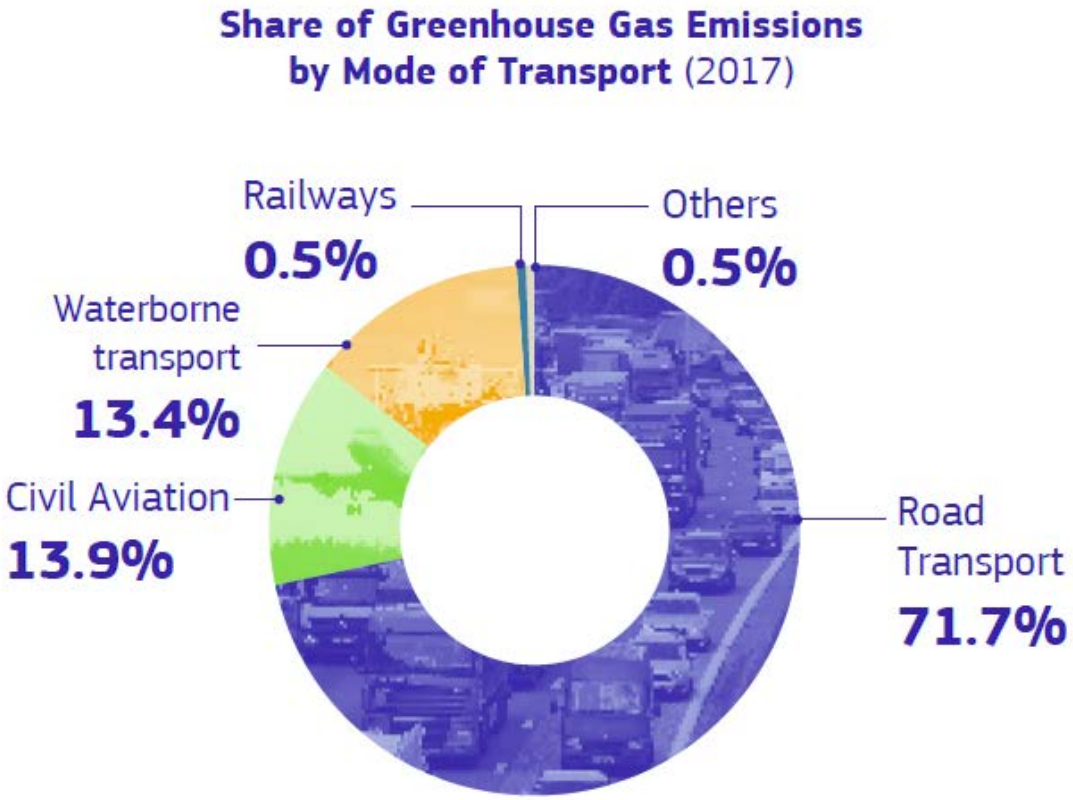


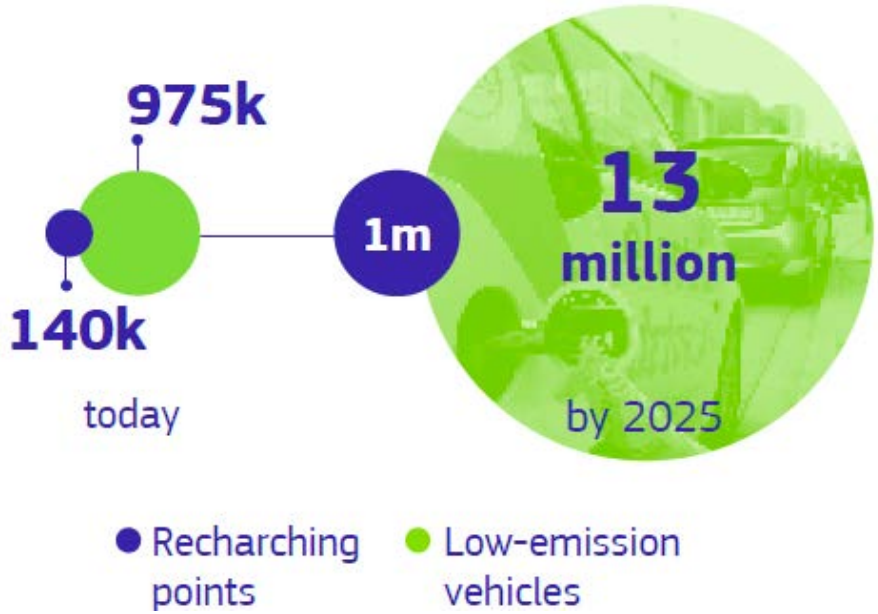
Ducati e-Mobility

EU Green Deal

› European Commission "Sustainable mobility – The European Green Deal“







Ducati e-Mobility

EU Green Deal

EU funds €3bn for batteries R&D

› The EU has approved a €3.2bn fund to promote the research and development of batteries

› National and regional granted funds

› **Ducati Battery/Electrification initiatives:**

- **Bi-Rex**

  "Progetto IPPSAL - Integrazione Processo Prodotto Servizio per Accumulatori al Litio"

  - Industry and university consortium
  - Big-data and battery systems advanced technologies

- **University of Bologna**
  - Moto Student
    - Our first significant experience
  - Electrification research & test
    - Advanced cells tests (LEMAD)
    - Know-how!!!

Ducati e-Mobility

MotoStudent

MotoStudent championship

› MotorLand Aragón FIM Circuit, 4 – 7 October 2018.

- **MotoStudent electric** category (100% electric propulsion system)
  - Podium: 3rd overall in Electric category
  - Best Rookie 2018 in Electric category
  - Best Acceleration time
    - (0-150m 6.28'', 0-100km/h 3.85'')
  - Best Gymkhana time

› **Ducati support**

- Fondazione Ducati sponsorship
- Ducati involved during design phase
- Some vehicle parts provided

ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

UNIVERSITY OF BOLOGNA
RACING TEAM

Next championship

› MotorLand Aragón FIM Circuit, 17 – 21 March 2021

› New bike

- Updated BMS and battery pack
- New vehicle lighter parts
- Special cooling system

Ducati e-Mobility

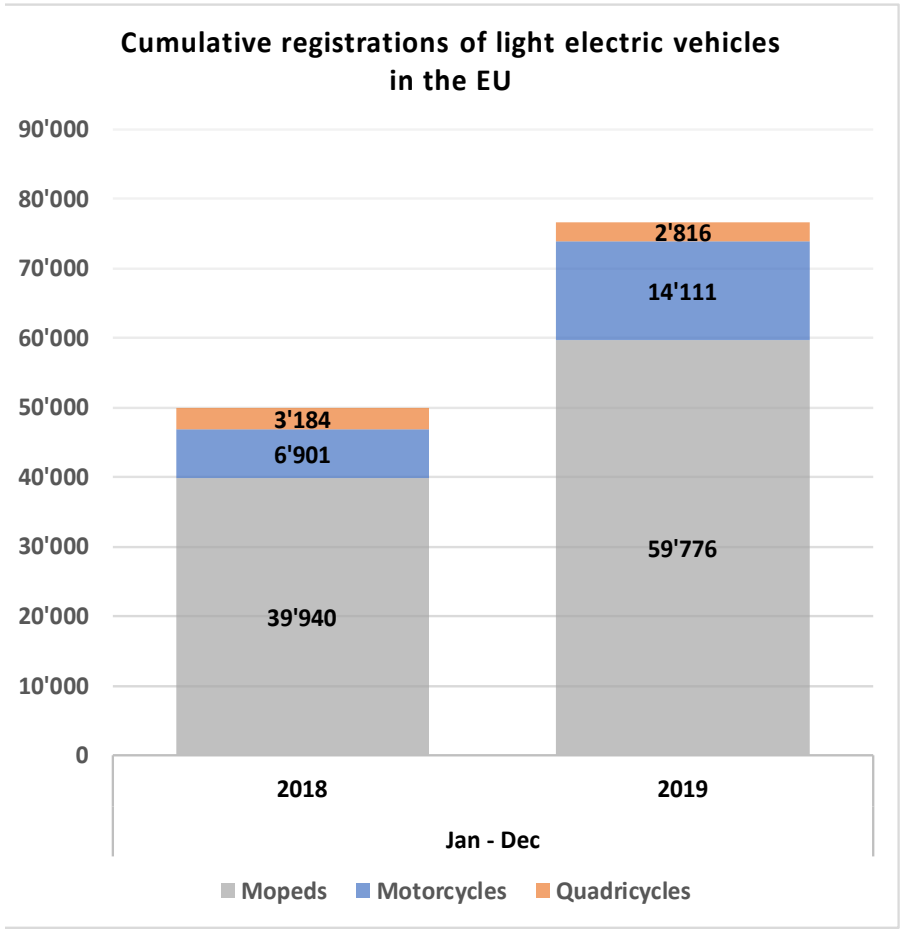
Ducati reference market

Why Ducati isn't entering the big-size electric motorcycles market?

- **A very limited market, still**
  - Electric vehicles only 1.3% of total motorcycles
    - Mainly mopeds/scooters
  - Small companies struggle to grow
  - Big players are in trouble too
- **High costs, small revenues**
  - ICE powertrain is far more cheap than an EV battery pack
- **High technical barriers**
  - EV user experience still not able to overcome the EV limitations
    - Battery …

CHART - REGISTRATIONS OF MOPEDS, MOTORCYCLES AND QUADRICYCLES IN THE EU
ONLY ELECTRIC VEHICLES
January - December 2019

Period	Year	Mopeds	Motorcycles	Quadricycles
Jan - Dec	2018	39'940	6'901	3'184
	2019	59'776	14'111	2'816



Ducati e-Mobility

Energy density comparison

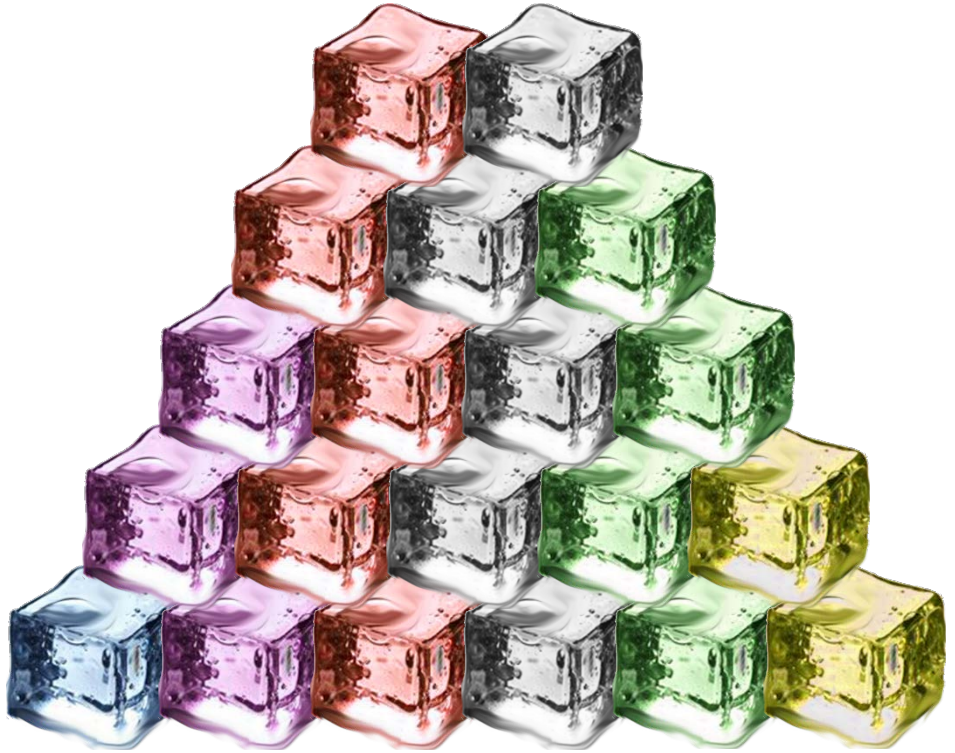
Energy storage

› The battery pack is the “Achilles’ heel” for e-PTW
  - Motorcycles are critical in terms of overall weight, a heavy battery pack is crucial, blocking the development of e-PTW

Gasoline

1 kg

*Gasoline: 12kWh/kg * 33% ICE efficiency = 4 kWh/kg net energy*



Electricity

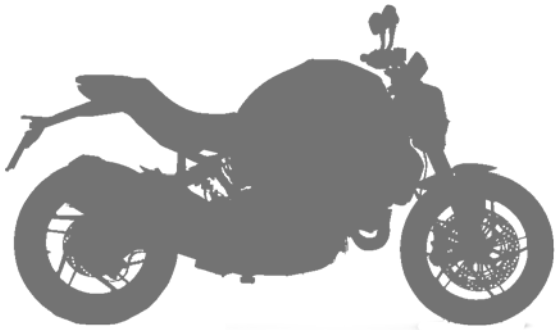
20 kg

Li-Ion cells: less than 250 Wh/kg net energy (2020 automotive cells)

Ducati e-Mobility

Theoretical weight with the same autonomy

Gasoline Monster
2020



206 kg

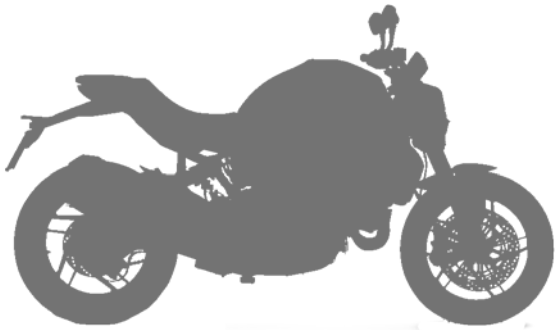
vehicle 134 kg - engine 60kg – fuel 12 kg

*Gasoline: 12kWh/kg * 33% ICE efficiency = 4 kWh/kg net energy*
Li-Ion cells: 250 Wh/kg net energy (2020) up to 300 – 320 Wh/kg in ten years

Ducati e-Mobility

Theoretical weight with the same autonomy

Gasoline Monster
2020



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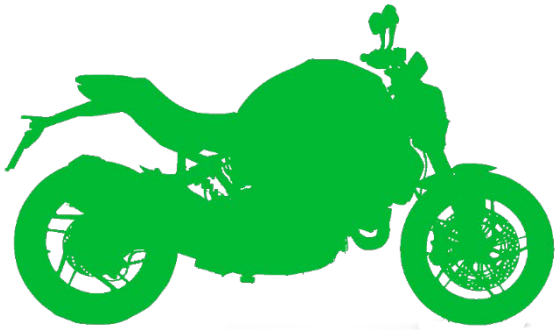
Theoretical Electric Monster
2020



371 kg

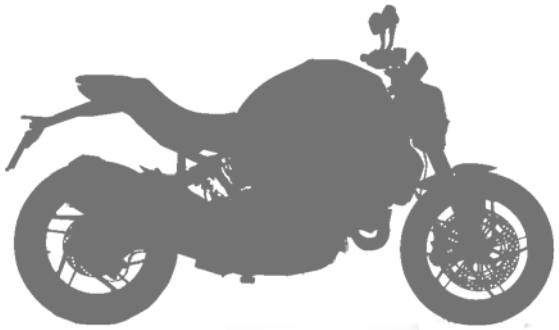
vehicle 134 kg - motor/inverter 31kg – battery + case 206 kg

*Gasoline: 12kWh/kg * 33% ICE efficiency = 4 kWh/kg net energy*
Li-Ion cells: 250 Wh/kg net energy (2020) up to 300 – 320 Wh/kg in ten years

Ducati e-Mobility

Theoretical weight with the same autonomy

Gasoline Monster
2020



206 kg

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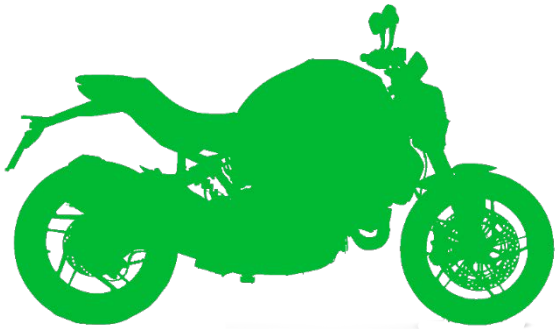
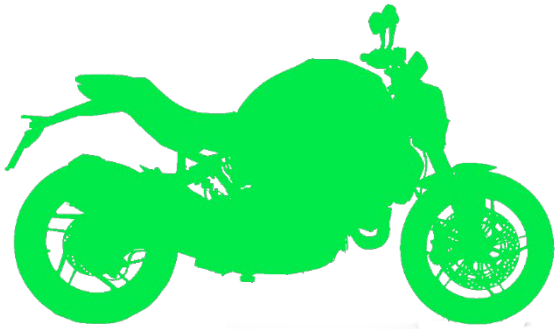
Theoretical Electric Monster
2020



371 kg

vehicle 134 kg - motor/inverter 31kg – battery + case 206 kg

Theoretical Electric Monster
2030



339 kg

vehicle 134 kg - motor/inverter 30kg – battery + case 175 kg

*Gasoline: 12kWh/kg * 33% ICE efficiency = 4 kWh/kg net energy*
Li-Ion cells: 250 Wh/kg net energy (2020) up to 300 – 320 Wh/kg in ten years

Ducati e-Mobility

Saving Opportunity?

Gasoline Motorcycle Fuel Costs (Ducati MTS 1260)

- Petrol, Italy average cost: 1.65€ per liter
  - UK: 1.45€ per liter
  - USA: 0.72€ per liter
- Fuel consumption (urban cycle): 15km per liter
  (worst case)
- Cost for a 1500km trip: **165€** (Italy)
- Refueling
  - Total 100l
    - 5 stops
      Multistrada 20l tank
      Approx. 5 minutes each …

e-Motorcycle Electric Energy Costs (estimated)

- Electricity, Italy: 0.140€/kWh (industrial avg.)
  - UK: 0.14€/kWh
  - USA: 0.12€/kWh
- Battery "consumption" (urban cycle): 10km per kWh
  - Efficiency: 80%
- Cost for a 1500km trip: **21€** (Italy)
  - Almost 8 times cheaper …
- Recharging
  - Battery pack: 11,7kWh
    - 13 full-recharge cycles (home, several hours …)

    or
    - 16 fast-charges (80% charge in 30 - 60 minutes)

Recharge cost less than refuel, but … it's not fun!

Ok for urban mobility!

Ducati e-Mobility

Ducati urban & micromobility

- **Electric bicycles**
  - Collaboration with partners for a whole range of e-MTB and e-bikes

- **Electric kick-scooters**
  - Complete line, constantly growing

Ducati e-Mobility

And so?

Our world is changing at the speed of light!

- **New regulations**
  - Restrictions for cities and countries
  - ICE bans for the upcoming years
- **New mindset**
  - Green approach
  - Young generations
  - Social distancing
- **New technologies**
  - Batteries chemistries
  - Battery pack optimization and cooling
    - Laser welding, an empowering technology?

➔ New opportunity for Ducati!

Performance & Fun

Great design

Functionality without compromise

Range

Stay tuned!!!