

EVA by **TUM** CREATE

Electric Taxi for Tropical Megacities



EVA

EVA is an electric car explicitly designed as taxi for tropical megacities.

TUM CREATE in Singapore employs a team of 120 scientists, engineers, and designers from 20 countries. As a key output, EVA is the first electric vehicle specifically designed as a taxi for tropical megacities. This is the result of a successful collaboration between Singapore's Nanyang Technological University and the Technische Universität München (TUM) with strong support from Singapore's National Research Foundation. These partners built EVA from the ground up, going from concept to prototype in just two years.

Developing the electric taxi in Singapore was a feat in itself, given the country's small automobile industry.

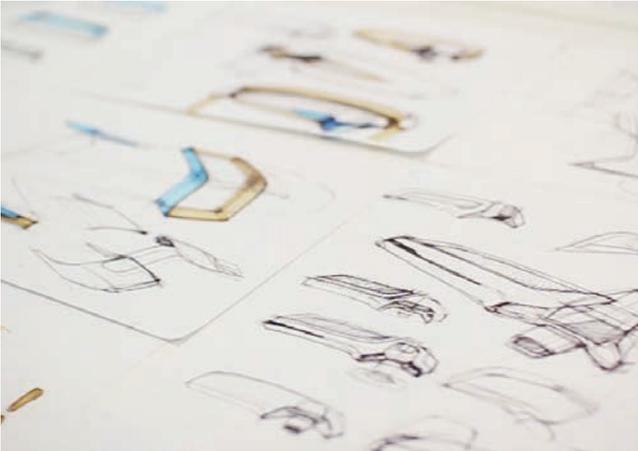
The ideal concept for Singapore

By replacing fuel-burning vehicles with electric-powered ones, carbon emissions as well as local noise and hydrocarbon emissions can be reduced. The impact that taxis can make is far greater than private passenger cars due to their leveraging effect. In Singapore, taxis make up less than 3% of the vehicle population. Despite their small numbers, they account for 15% of the total distance covered by all vehicles in Singapore. Many taxis run on two-shift rotation for up to 24 hours every day, covering an average of 520 km each.

In addition, transportation companies around the world typically re-purpose passenger cars as taxis. However, the challenge of current electric vehicles is the extremely limited range and long recharge times (up to 8 hours), making them unsuitable as taxis. The heat and humidity in tropical megacities also pose unique challenges, including passenger cooling and battery pack heat management, which are specific for this part of the world. Our engineers and scientists have tackled these challenges by seeking solutions for a more sustainable future in mobility.



EVA





EVA





Super Fast Charging

The situation today

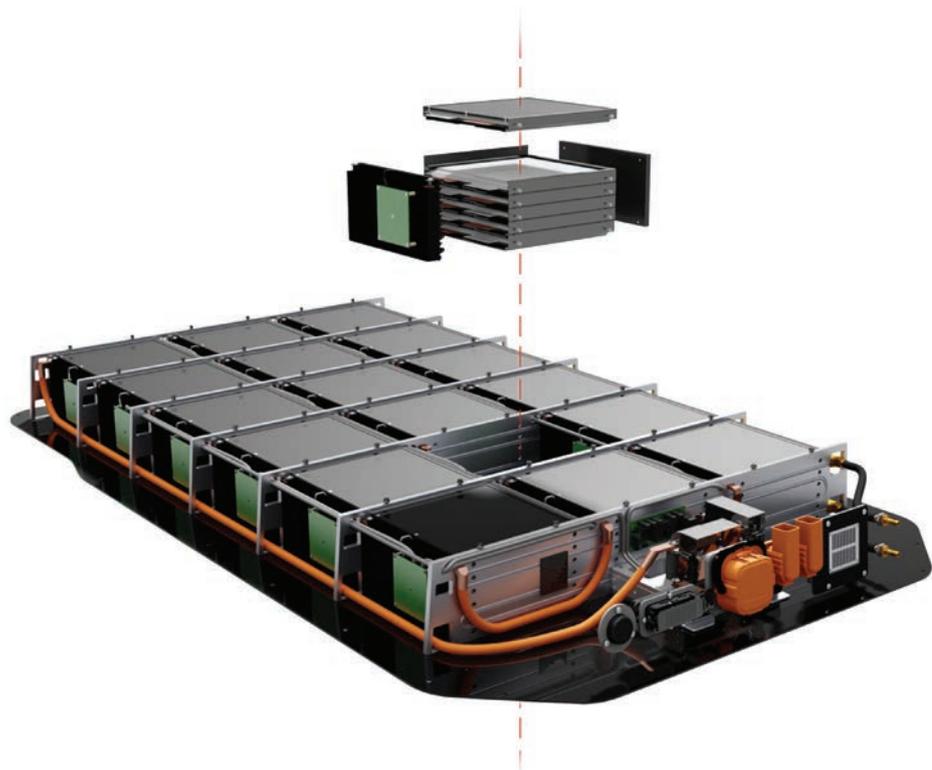
Current EVs are typically charged in several hours, but this only covers a limited range of around 100 km. Due to long recharge times, EV drivers have to contend with extended downtime, making EV ineffective candidates for taxis.

Shorter downtime to maximize range

EVA sets to solve this limitation by only requiring 15 minutes of recharge to cover a realistic 200 km range based on Singaporean driving patterns. With short, rapid recharge times, taxi drivers can now quickly recharge for the next part of their shifts during a break.

Technical challenges

The challenges surrounding fast charging include the high electric currents needed and the heat that is consequently generated in the battery pack during the recharging process. Our engineers have designed an innovative concept for more effective thermal management of the battery cells that targets to extend the pack's lifespan.





EVA





Unique Features

Lightweight CFRP body

EVA's monocoque structure is made entirely of carbon fibre reinforced polymer (CFRP) and is one of the largest that has been made of this material. This translates to a lightweight body (150 kg less than steel) without compromising on torsional stiffness and strength.



Luggage space

Despite being compact and lightweight to reduce energy consumption, EVA has a large storage compartment in the rear for bulky items such as luggage, strollers or golf clubs. This is an advantage especially for a purpose-built taxi.



Innovative child seat

Many parents do not bring their own child seats when travelling in taxis with their young ones. EVA features an integrated child seat in the back of the front seat, which means the children between 9 months and 3 years of age can now travel more safely with greater convenience to their parents.



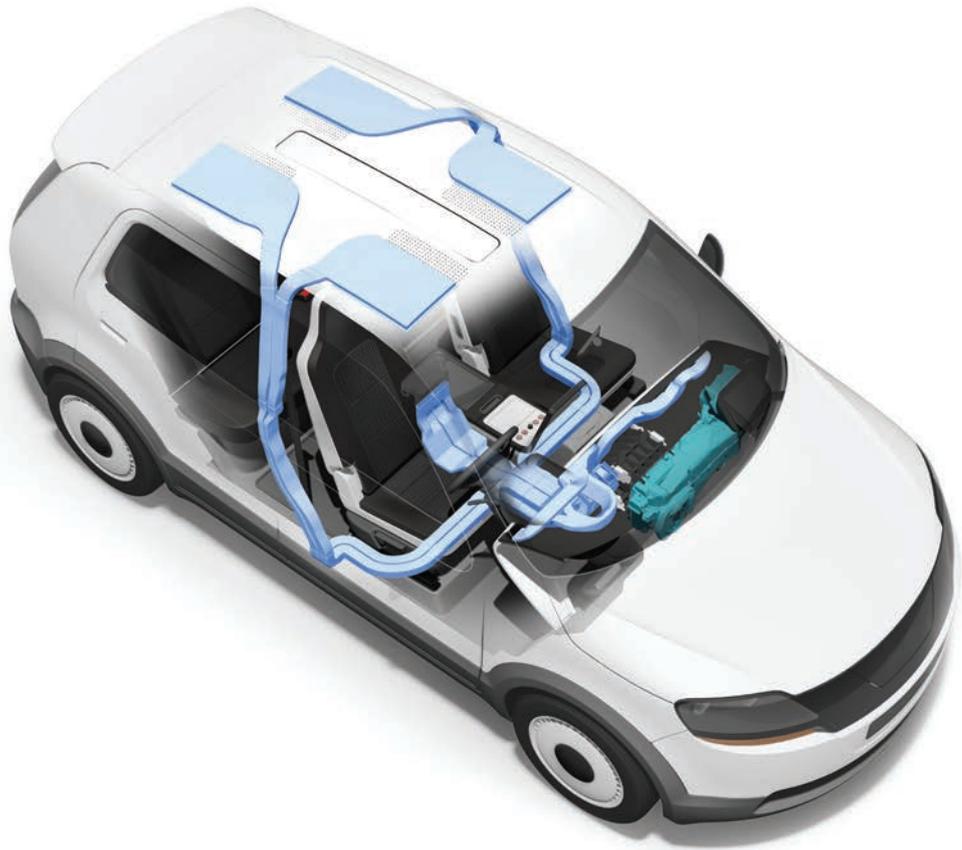
Infotainment system

Climate controls and in-car entertainment are linked via the infotainment system that allows passengers to control air-conditioning and audio settings wirelessly from their personal mobile devices. Similarly, the central control panel and driver's instrument cluster are also connected to the on-board systems, and are able to provide driving statistics and power-saving tips to the driver.



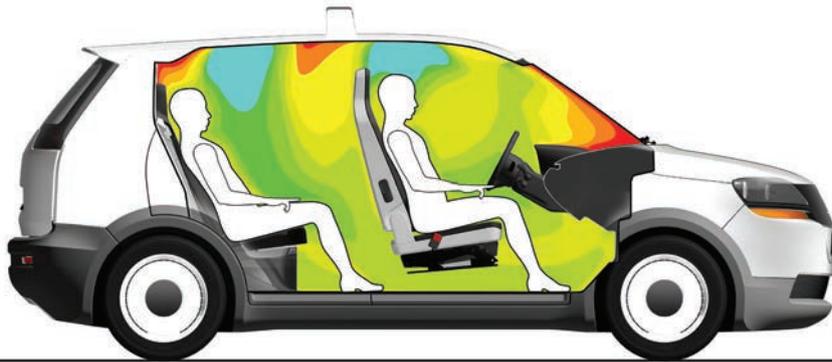
Comfort and Efficiency

EVA is designed with several features to reduce the energy needed to ensure a comfortable ride for driver and passengers. Climate control is an essential part of the cabin, especially in tropical climates. It is one of the most energy consuming systems on any vehicle and reducing the cooling power will in turn reduce energy usage.



Overhead air conditioning

Ergonomics studies have shown that localized cooling to the upper body contributes to the overall thermal comfort. To reduce the power needed for climate control, individualized overhead air-condition outlets target these areas without having to cool down the entire cabin and unoccupied zones can also be switched off. This system also reduces the exposure of air-borne particles or germs from being blown from zone to another.



Seat Cooling

The innovative seats increase the thermal comfort for passengers, as air and moisture are drawn away from their bodies when they are seated. This helps keep them cool and reduces the reliance on the air-conditioner.



Technical Data

Body

Segment / Type	C-Segment / Compact Car
Number of Doors	5
Number of Seats	4
Length	4316 mm
Height (excluding taxi signage)	1679 mm
Width (excluding wing mirrors)	1794 mm
Wheelbase	2602 mm
Curb Weight (including battery)	1500 kg
Max permissible	1900 kg
Air resistance (Cd x A)	0.34 x 2.8 m ²

Performance

Max. Power	60 kW*
Max. Torque	223 Nm
Top Speed	111 km/h
0 – 100 km/h	10 seconds*
Range (15 minutes Super Fast Charging)	200 km (Daily driving pattern) 330 km (U.S. FTP 72 standards)

*Electronically limited

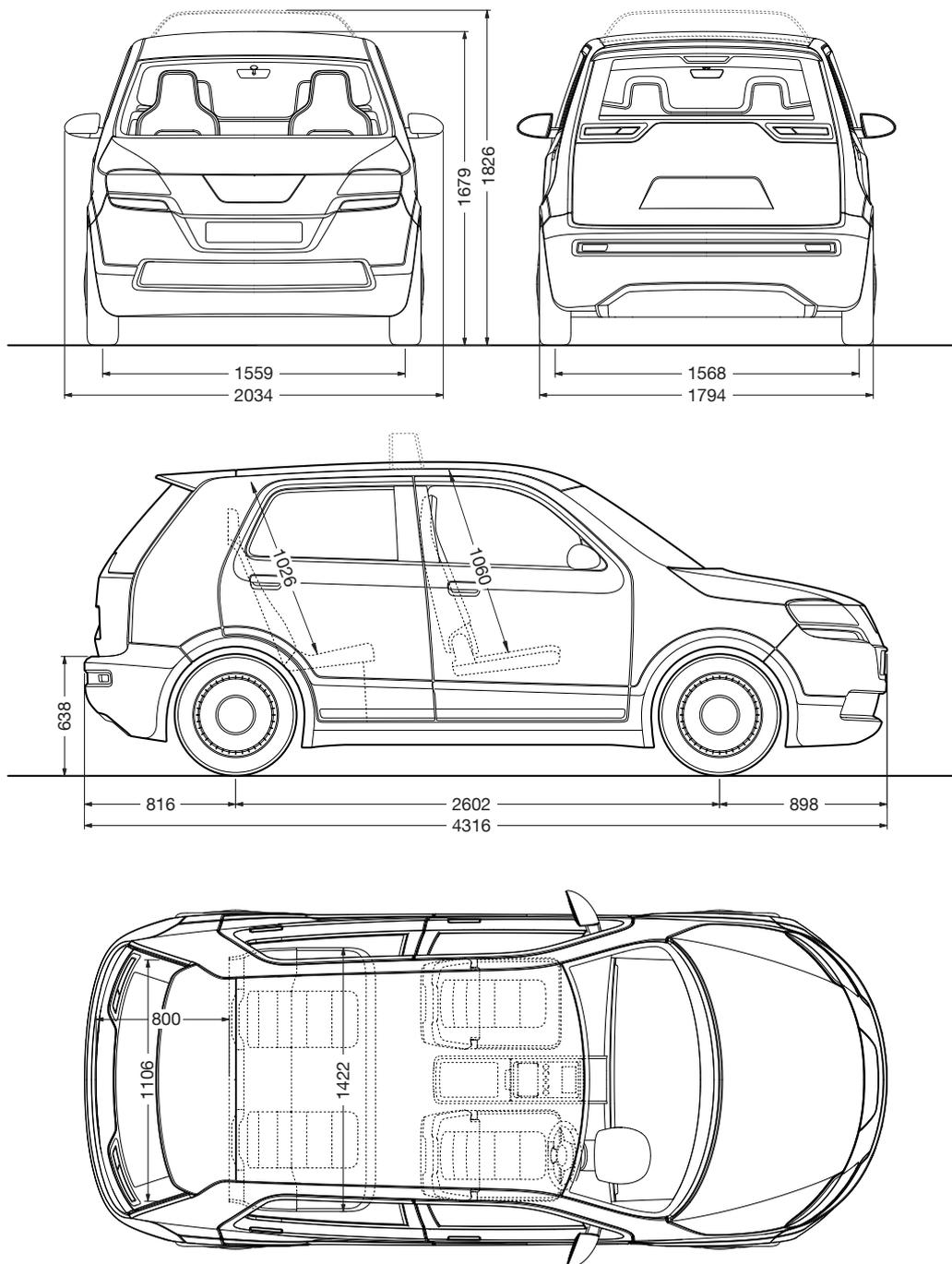
Drivetrain

Driven Wheels	Front
Motor Type	Synchronous
Transmission	1:10.2 (1 gear)

Battery System

Cell Type	Lithium Polymer
Number of Cells	216
Cell Capacity	63 Ah
Energy Content	50 kWh
Max. Voltage	450 V
Max. Current	360 A

Dimensions



Project by

TUM CREATE Ltd

Academic Partners

Technische Universität München
Nanyang Technological University

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Project Partner

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TUM CREATE

TUM CREATE is a joint venture launched by Nanyang Technological University and Technische Universität München and funded by Singapore's National Research Foundation as part of the Campus for Research Excellence And Technological Enterprise (CREATE) program.

It employs in Singapore a team of 120 scientists, engineers, and designers from 20 countries. As a key output, EVA is the first electric vehicle specifically designed as a taxi for tropical megacities. Beyond the innovations, the project also reflects the knowledge, capabilities and strong partnership between Technische Universität München and Nanyang Technological University.

Nanyang Technological University

Young and research-intensive, Nanyang Technological University (NTU) is a global university on a rapid rise. Ranked 41st in the world in 2013 and 2nd globally among young elite universities, NTU has about 33,000 students in the colleges of engineering, science, business, education, humanities, arts, social sciences. Its medical school is set up jointly with Imperial College London. A melting pot of international award-winning scientists, young talents and eminent global partners, NTU is also home to several world-class research institutes that builds on its strengths in interdisciplinary research.

Technische Universität München

Technische Universität München (TUM) is one of Europe's leading universities and rated as Germany's top institution in the three latest international Shanghai Ranking. It is committed to excellence in research and teaching, interdisciplinary education and the active promotion of promising young scientists. TUM's portfolio of subjects ranges from engineering and the natural sciences to the life sciences and medicine, from business studies to research in education.

The university forges strong links with companies and scientific institutions across the world. In 2003, TUM became the first German university to venture beyond its shores by establishing its first international campus, TUM Asia, in Singapore.

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