

Toyota bZ4X

Benchmark program



benchmarking@fev.com



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FEV



Tech Nuggets

TECH-NUGGETS – Toyota bZ4X

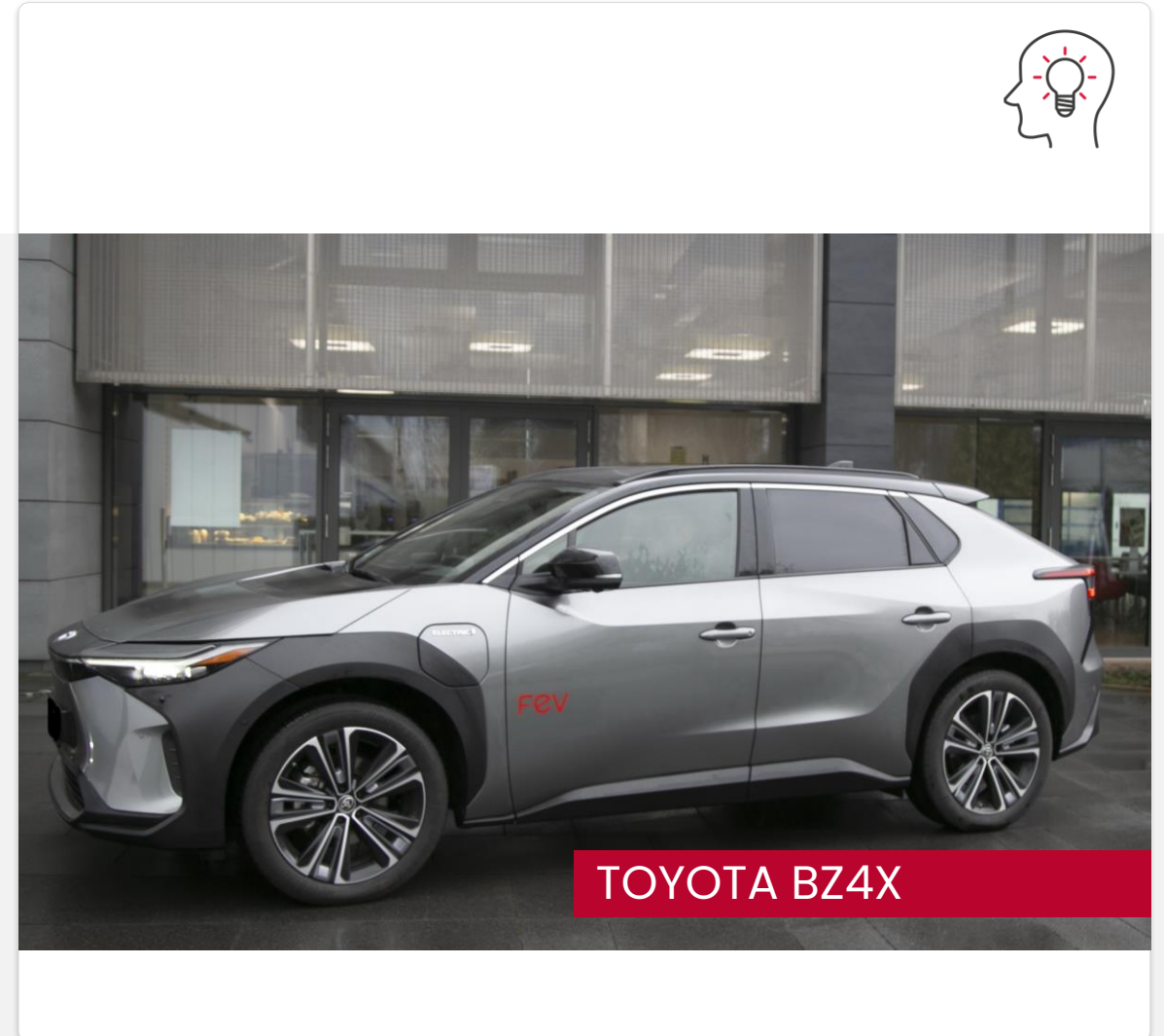
TOYOTA BZ4X– BENCHMARKING PROGRAM

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INSIGHTS

- ▶ The bZ4X is Toyota's first battery electric vehicle based on the e-TNGA platform which was jointly developed with Subaru
- ▶ Depending on the market and powertrain type, different battery pack variants are installed
 - ▶ 72.8 kWh (assumed supplier: CATL)
 - ▶ 71.4 kWh¹⁾ (assumed supplier: Prime Planet Energy & Solutions)
- ▶ The electric drive units (e-motor, inverter & gearbox) for the vehicle are developed and produced by BluE Nexus, a joint venture by AISIN and DENSO
 - ▶ Front-wheel drive: 1 x 150 kW
 - ▶ All-wheel drive: 2 x 80 kW¹⁾
- ▶ On-board charger, 12 V DC/DC converter and other HV functions are combined in an electricity supply unit provided by DENSO



1) Covered in the FEV benchmarking program

TECH-NUGGETS – HV Battery

TOYOTA BZ4X – BENCHMARKING PROGRAM

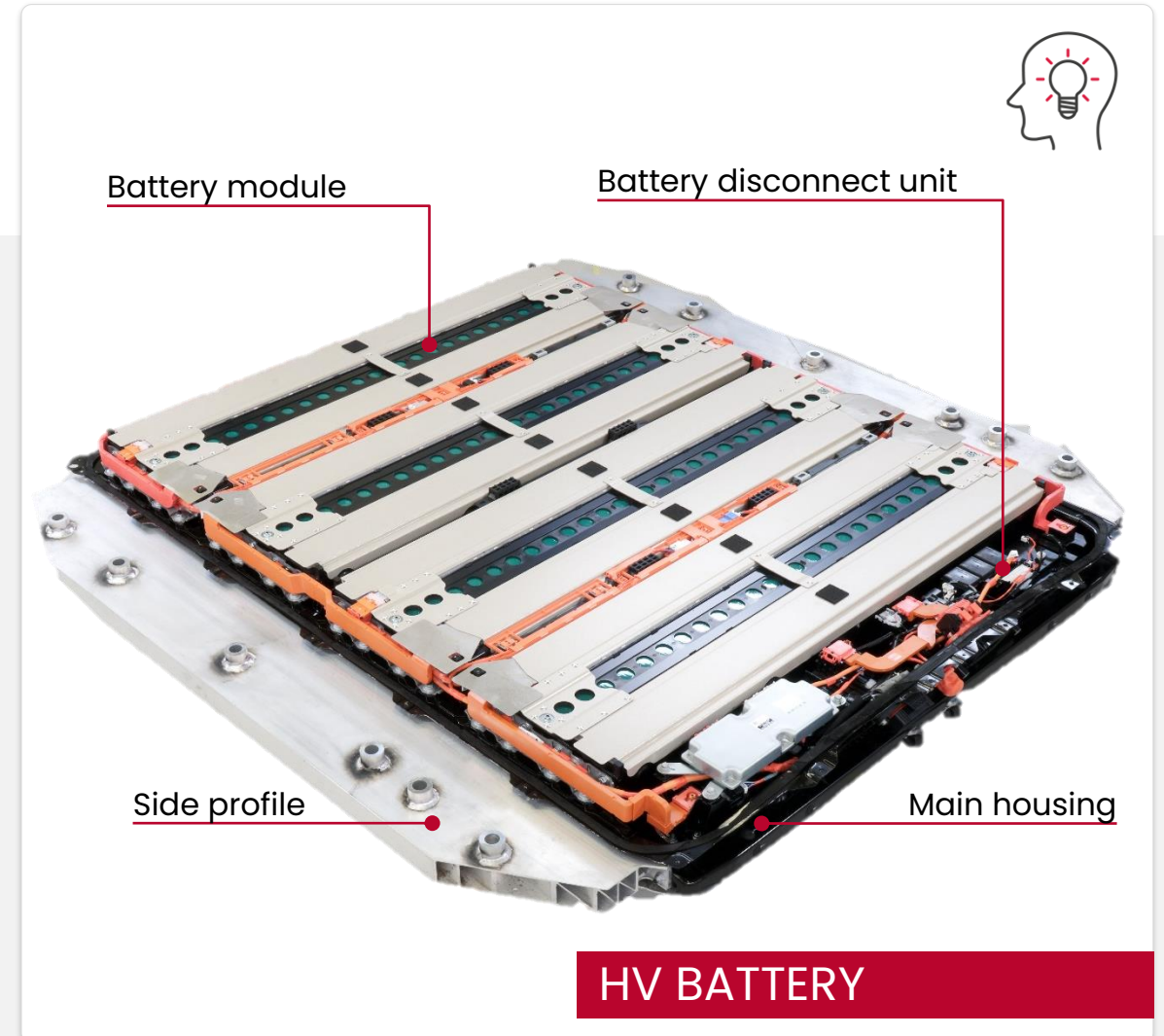
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INSIGHTS

- The bZ4X is Toyota's first battery electric vehicle based on the e-TNGA platform which was jointly developed with Subaru
- Subject of the benchmark is the 71.4 kWh lithium-ion battery pack providing a WLTP driving range of 415–513 km¹⁾
- Assumed cell supplier is Prime Planet Energy & Solutions (PPES), a joint venture between Panasonic and Toyota
- In total 96 prismatic cells are equally distributed among 4 battery modules and connected in series to deliver the nominal voltage level of 355 volts
- The battery cells are liquid cooled (water-glycol mixture) using a separate cooling plate
- Main housing components are made of steel sheet metal (main housing & cover) and aluminum (extruded side profiles & underbody protection plate)



¹⁾ Toyota also uses another battery variant (72.8 kWh; assumed cell supplier: CATL) which is not part of the benchmarking program

TECH-NUGGETS – Electric Drive Units



TOYOTA BZ4X – BENCHMARKING PROGRAM

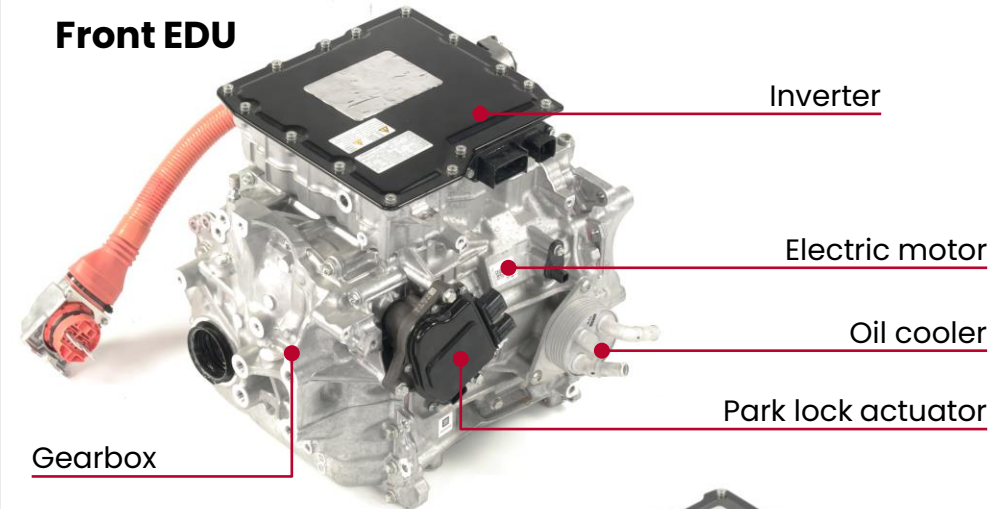
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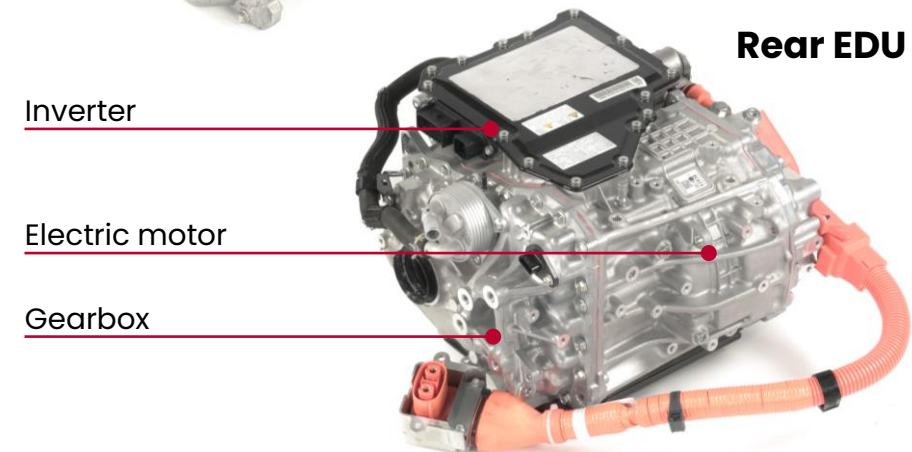
INSIGHTS

- ▶ The Toyota bZ4X is available in two variants:
 - Front-wheel drive: 150 kW
 - All-wheel drive: 2 x 80 kW (focus of FEV benchmark study)
- ▶ The electric drive units (EDUs) were developed by BluE Nexus, a joint venture of Aisin and Denso
- ▶ Each EDU includes:
 - Integrated inverter using Denso semiconductors
 - Oil-cooled PMSM motor with hairpin windings
 - 1-speed reducer gearbox
- ▶ To realize economies of scale, several identical parts are used for front and rear EDU
- ▶ A park lock is included in the front EDU, park lock gear and intermediate gear are realized as one component

Front EDU



Rear EDU



ELECTRIC DRIVE UNITS

TECH-NUGGETS – Electricity Supply Unit

TOYOTA BZ4X – BENCHMARKING PROGRAM

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INSIGHTS

- The Toyota bZ4X is equipped with an Electricity Supply Unit (ESU) provided by Denso that combines several power electronics functions:
 - Power distribution to the electric drive units, HV battery, cabin heater and A/C compressor
 - 12 V DC/DC converter
 - On-board charger
- Two cast housings are used to integrate the functions: Power distribution in the upper housing, DC/DC converter & on-board charger in the lower housing
- Liquid cooling (water glycol mixture) is only applied to the components located in the lower housing

