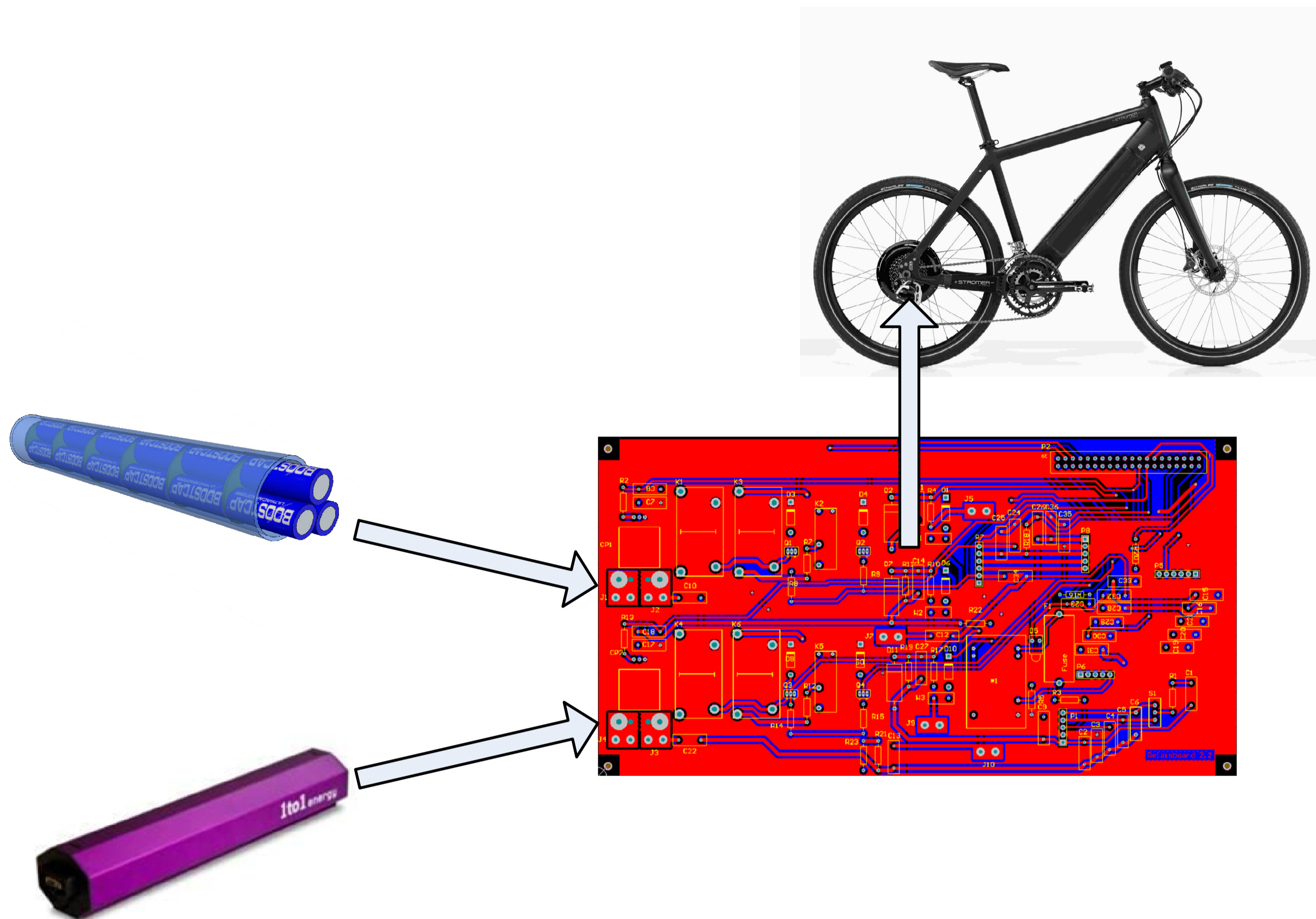




CA A1: Systems and Components for E-Mobility

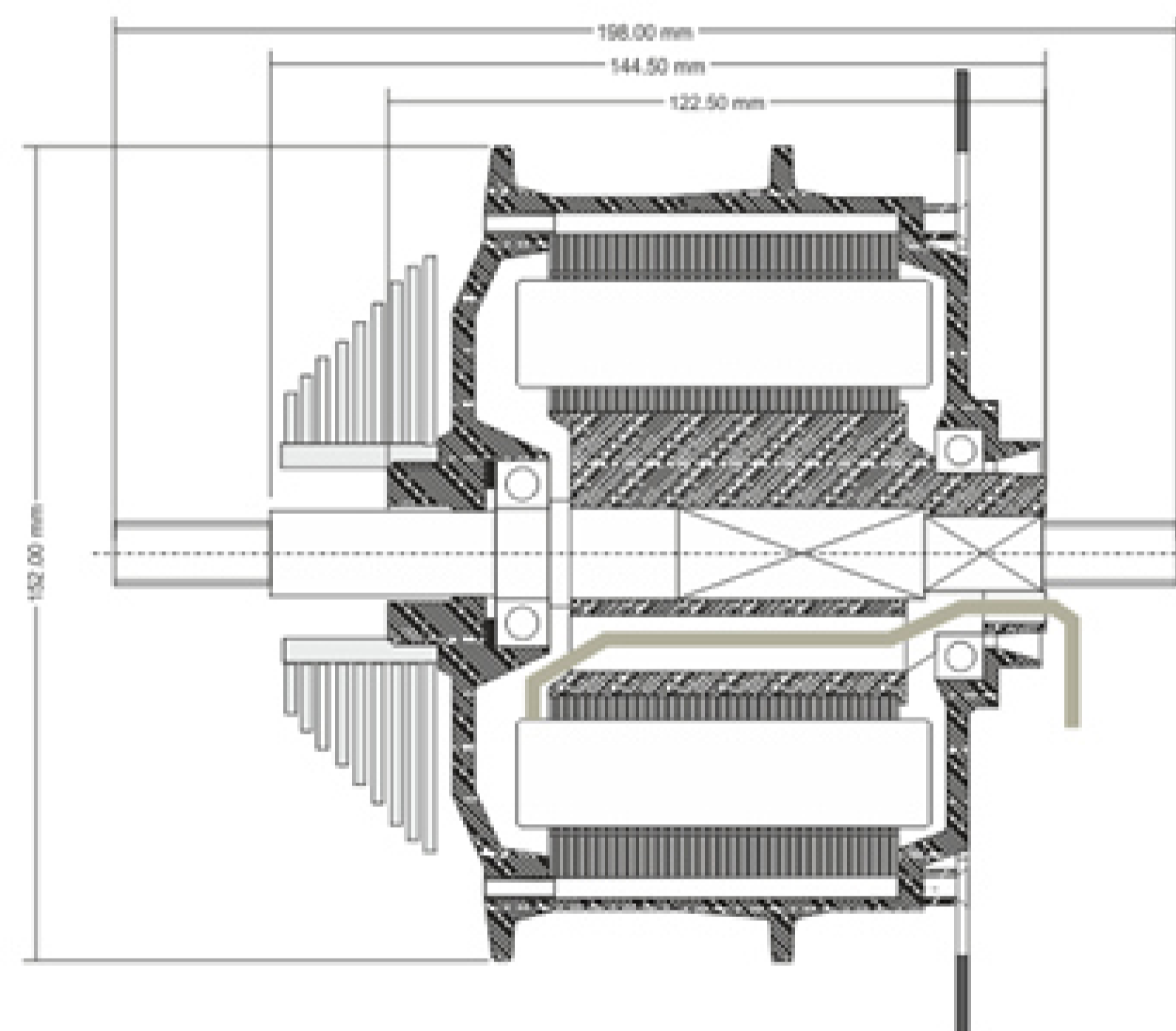
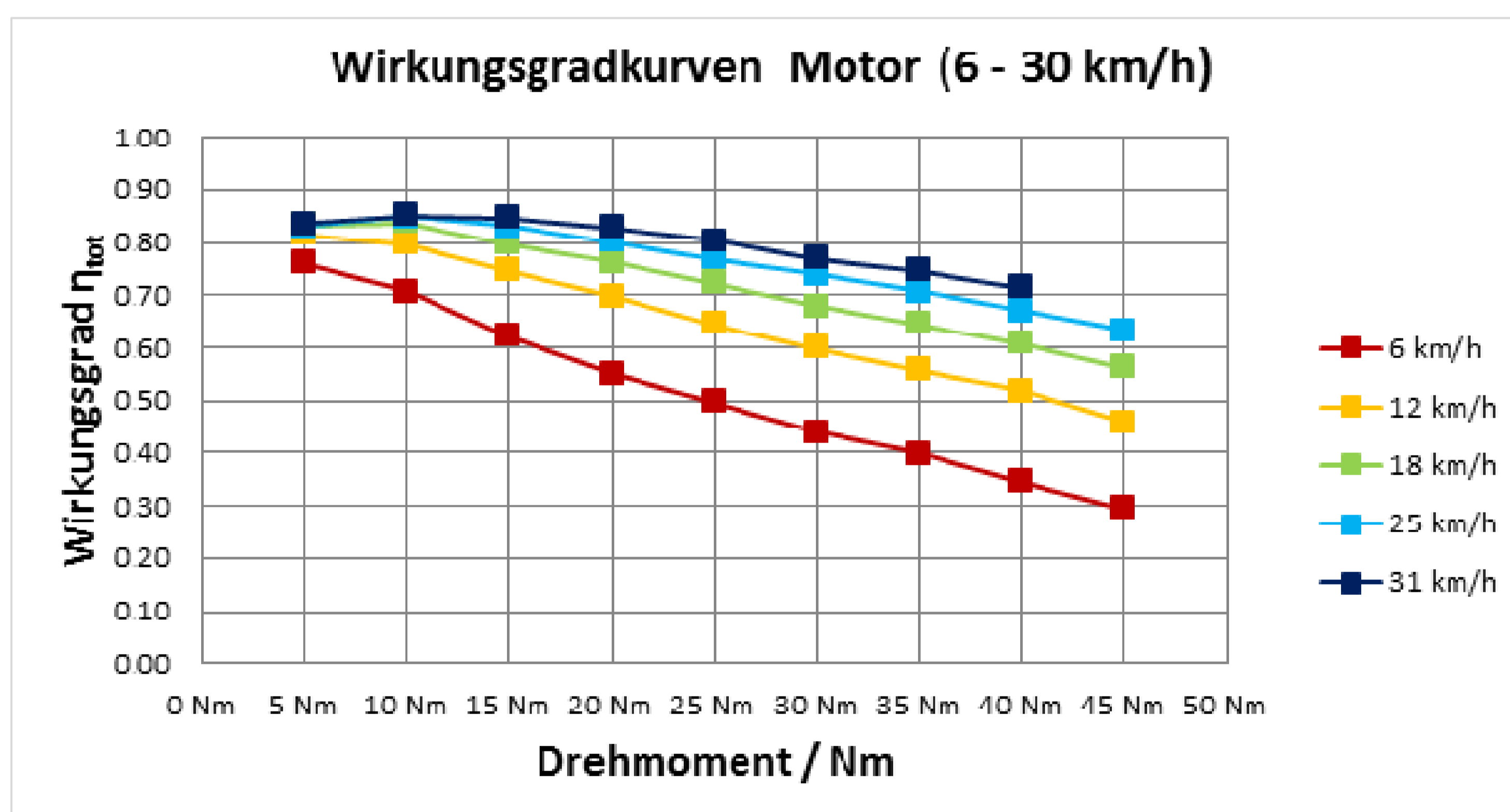
Autors:
Prof. V. Härrri and P. Habermacher

Integrating SCAP-Storages for E-Bikes



- Supplement of the lithium-ion battery with a super capacitor pack which is connected by simply DC-Link circuit
- System which switch the motor controller to one of the storage systems instead of the parallel circuit
- With this solution it is possible to regenerate more braking energy with a smaller super capacitor pack
- Verification of the potential of a two-storage solution, measurements under real conditions will be made
- Innovation Check at the CTI: Ebike storage system for stepless regeneration in combination with an additional SCAP-Storage in work

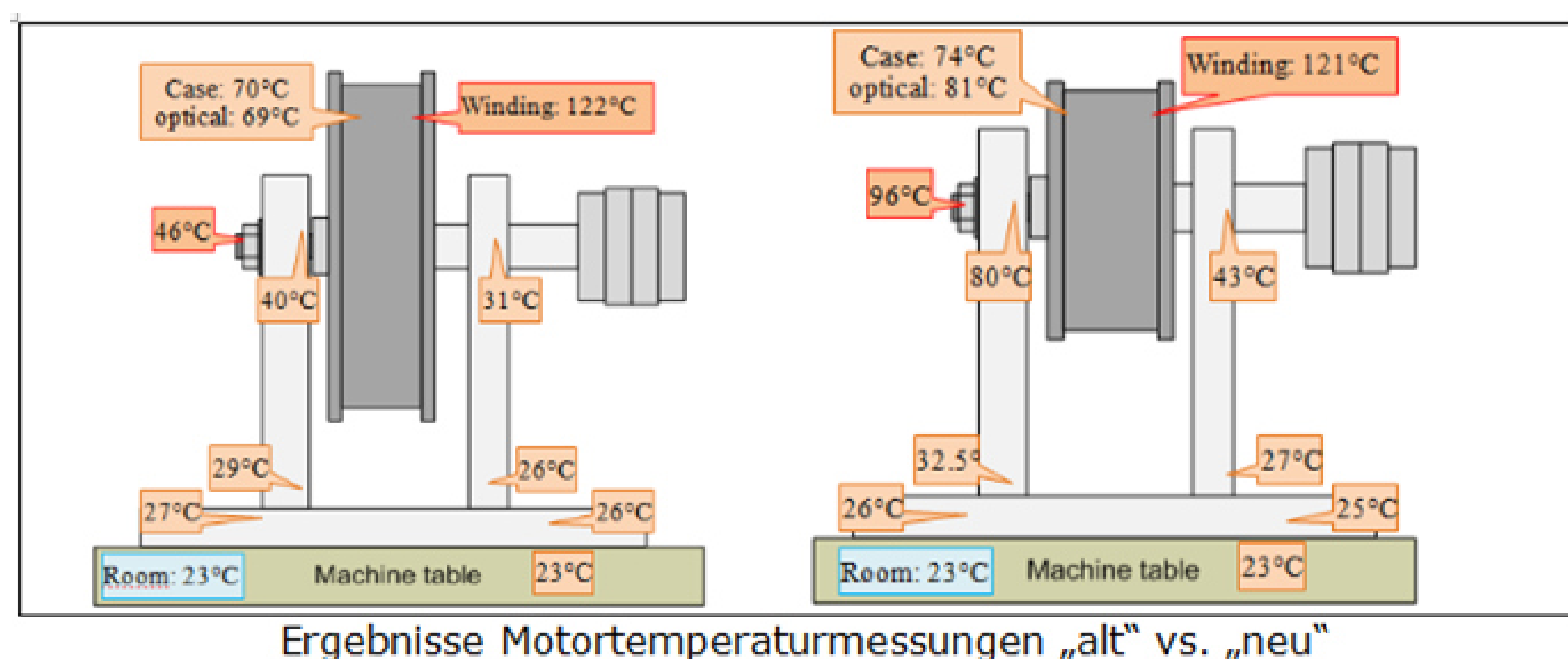
Interior Permanent Magnet Synchronous Motor for a High End E-Bike Drive Chain



Main characteristics

- Nominal power: 500 [W]
- Max. torque: 47 [Nm]
- Max. speed: 49 [km/h]
- Best efficiency: 86% @ 43km/h, 20 Nm

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A Novel Interior Permanent Synchronous Motor for a High End Ebike Drive Chain

Vinzenz V. Haerri, Senior Member IEEE, Markus Lindegger, Member IEEE, Manuel Neumaier, Member IEEE
Competence Center IIEE (Integral, Intelligent & Efficient Energy Systems)
Lucerne University of Applied Sciences and Arts
Technikumstrasse 21, 6048 Horw, Switzerland
vinzenz.haerri@hslu.ch, markus.lindegger@hslu.ch, manuel.neumaier@hslu.ch

Abstract — This paper presents technical and economical improvements of a newly developed interior permanent magnet synchronous motor (IPMSM) for a high end ebike and compares the improvements with the currently used drive motor. The new external rotor motor was optimized for hilly districts 10-15km/h and flat areas 25-30km/h which represent the main application scope for ebike drivers. Thanks to the varying number of poles and better use of the winding space, the efficiency could be enhanced for all observed operating points for both, motor mode and generator mode. The driver is now able to use the nominal torque of 30Nm for 21min, more than twice as long as with the current motor due to an improved thermal design which uses the bike frame as a huge cooling fin. In addition, not only in motor mode, but also in generator mode, the overall efficiency is higher in all cases than the existing motor. Besides the technical improvements, the visual integration was also improved using a smaller motor with better technical features. Thanks to a partly automated, special test bench, which was developed at the same time, the production of the new machine can be done more rapidly. Thus, the new IPMSM will be mass produced as soon as possible.

The ebike market increases very much (Fig. 2). In addition, the design of the transportation vehicle plays an essential role. For this purpose for a Swiss ebike, primarily used in the range of agglomeration and small distance transportation, a highly efficient electrical motor had to be developed.

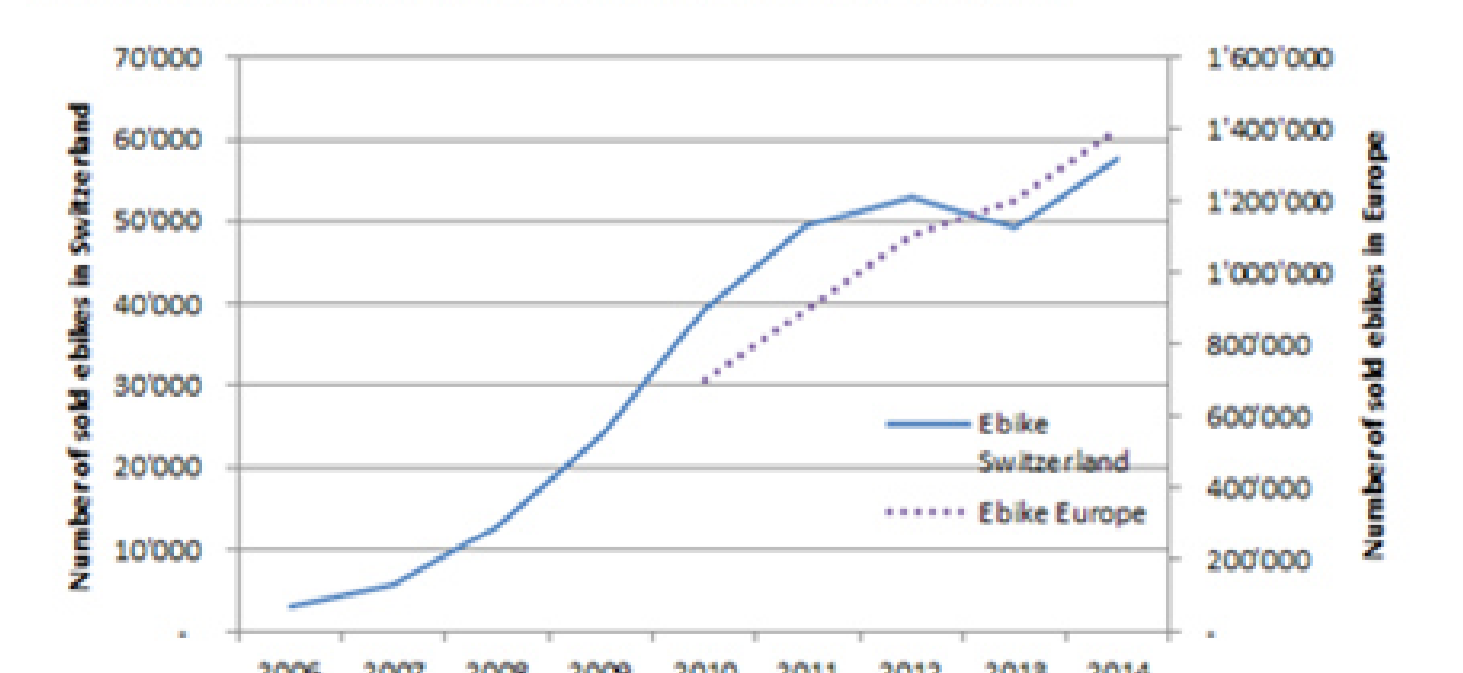


Fig. 2. Ebike market Switzerland/Europe in pieces (velosuisse/ZIV)¹