Electric Systems – Simplified and standardized engineering for sophisticated automotive electric/electronics

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The success of future vehicle generations is closely linked to the consistent focus on even safer, innovative and sustainable technologies. The radical change can be seen in the transition to smarter, connected and autonomous vehicles. Volkswagen is consistently tackling the major issues of the future. Technical development plays a key role - technological leadership, high development speed and robust processes are essential for achieving the goals. The focus is also on the vehicle architecture with a holistic E/E process: simplified, standardized, scalable and future-proof. A wide variety of customer requirements, functions, safety and energy distribution are taken into the challenges of quality, cost, complexity and sustainability. In a nutshell: It is about redesigning the areas of focus - "keep it up" is not an option. The limitation of manufacturability in existing production facilities, rising product costs without customer added value and an unmanageable effort for development documentation and analysis are not acceptable.

From the perspective of the wiring system, fields of action and solutions for the next generation "NEW BORDNETZ" are evolved. This includes consistently developed and tested electrical systems that are fully documented in their modular design. The fields of action can be summarized in five key statements:

- **Scalable architecture**: The enabler is a zonal vehicle architecture and must be adapted to the requirements of the vehicle safety, automated driving and power distribution systems. All electrical systems have to be considered, even a high innovative scalable sound system. As an indicator, Volkswagen is heading for a core wiring system with less than 100 meter cable length.

- **Safety and power distribution**: Safety and energy distribution requirements (according to ISO26262) request a roadmap for combustion- and electric vehicles. For this purpose, there are good initiatives for the interpretation of the requirements and implementation proposals, e.g. the initiatives from VDA and DIN. Implementations in
electrical components, software and control units are required. For this purpose, the requirements, key figures and transient behavior must be documented in a standardized format. Our goal is to enable consistent process-supported development in concept design, implementation, documentation and validation with intelligent software tools across the entire supply chain.

- **Automated production:** The complex product "physical wiring system", which is significantly increased in its number of functions, needs a sustainable roadmap for implementation to ensure manufacturability, documentation, logistics and quality. Good approaches of many partners already exist today. Activities, e.g. in the VDA/DIN enable standardization, with which the implementation in the volume segment is made possible. Today’s manual processes ensuring a fully monitored production as well as manual work preparation and production must be replaced. Furthermore the total security workflow must be ensured. Thesis: In the future, it’s all about automated production at the manufacturer and OEM. Good approaches must be brought from the concept phase into series.

- **Sustainability:** Reducing our CO₂ footprint and securing the future of individual mobility is our mission. By 2030, in line with the Paris Climate Agreement, we will reduce the CO₂ balance per vehicle by 30 percent over the entire life cycle. The targets and objectives are clearly communicated, and our partners also offer strategies, concepts, materials and products to achieve them. In the development process, the OEM must follow and comply with the implementation even down to the smallest component. Reducing complexity is a key factor. Clear specifications such as the renunciation of additional tin-plated cables, the consistent use of plastic recyclates and material mix reductions in plastics are necessary in order to optimize the recycling phase of the vehicles in the sense of the circular economy.

- **Processes and continuous integration:** The enabler for this challenge is an end-to-end process without manual intervention, which also enables fast and parallel changes. Key figures and evaluations are provided on demand. Analyses and optimization suggestions are possible via standardized interfaces with existing and future tools. All mentioned requirements are already supported and can be experienced today by the Volkswagen Group tool called VOBES2025. This tool will enable Volkswagen and its partners to develop up to 30 percent more efficiently and will also enable further
optimizations for e.g. weight and costs. For this, the reduction potential is up to 10 percent.

The evolution towards new electrical systems places clear demands and is not a continuous further development – it is a generational leap. The foundation is a development process that has been developed in recent years. The NEW BORDNETZ is part of the Volkswagen strategy.