Battery management systems bucharest

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LSG Romania started the construction works for a 7 MW Battery Energy Storage System, the first and biggest storage system in Romania used for automatic Frequency Restoration Reserve (short form aFRR, a form of grid balancing).

Battery Energy Storage Systems (short from BESS) will become more and more important in the coming years, especially in the context of massive new investments in renewable energy production in the next decade. Lithium-ion battery energy storage systems can help achieve grid stability which is vital for a reliable electricity network.

The contract was signed already in November 2021 and after finishing the basic design works early this year the construction permit was obtained in March 2022. The location was chosen to be near to a grid operator substation close to Bucharest and is owned by the beneficiary Megalodon Storage SRL. The construction works will be finished already in June and followed by extensive testing works and the qualification process with the TSO Transelectrica.

The storage system operates a NMC-type lithium-ion battery with a capacity of 6 MWh, produced in Romania and a total output power of 7 MW using 2 central battery inverters from SMA to inject directly into the medium voltage grid of the local grid operator ENEL Distributie Muntenia. The investor Megalodon Storage SRL plans to double the installed power to 14 MW in a phase 2 development after the successful energization and start of operation of the first phase of the project.

The technical and commercial operation and maintenance will be done by our specialized in-house team from Green Source Energy Management SRL, the dispatching service between the storage system and the national dispatcher from Transelectrica will be performed by the LSG owned company SC&DC SRL (System Control & Dispatching Company SRL).

Estimating battery state of charge (SoC) is difficult and complex because of the non-linear character of the batteries and the internal environment assessments. Neural networks and NXP"s model-based design toolbox (MBDT) help simplify the development of a battery SoC estimation algorithm.

Modern battery management systems (BMS) ensure cell packs" safe and efficient operation in various solutions within electric vehicles, power supplies, smartphones, MP3 players and most battery-driven equipment. Calculating the battery state of charge (SoC) is one of the most critical roles of BMS, an estimation the system assesses -like the battery percentage displayed in a phone. An accurate estimation of SOC protects the battery, prevents discharge/overcharge and improves its life; it also lets the solution perform control strategies for energy-saving.

Traditionally, an engineer would need to build a very accurate battery model to get reasonable estimations, but that is often hard to characterize. This problem fueled the search for an alternative in which artificial intelligence brought its contributions. Battery power management developers started to use adaptive systems, like neural networks (rather simple ones), to create data-driven models of the cell and use them to get a very accurate SoC estimation by evaluating the history of voltage, current and ambient temperature.

Using the MBD viewpoint helps compensate for the increased complexity of modern applications. It also takes advantage of the software abstraction layers commonly used for embedded designs development (hardware optimized device drivers, plus middleware and libraries that implement specific functionalities) while enhancing drivers" code optimization and reusability.

Compared to a typical development workflow, which implies writing the (C code) application algorithm and integrating it with specific hardware function calls, code is automatically generated from the model in the MBD development. Furthermore, it can work together with necessary hardware-specific software, transforming the programming into block parameters configuration.

Also, we provide the S32 Design Studio IDE where programming is executed with build, debug and configuration embedded tools (allowing setting and initializing drivers, middleware, and libraries used inside the design in a graphical manner). Besides the classical debugger options, we also offer FreeMASTER, our data visualization tool enabling real-time application debugging for validating the system behavior for imposed performances. FreeMASTER features options like writing and reading variables, memory locations, and monitoring desired signals on the embedded target.

MBD applications can be verified and validated inside the Simulink ecosystem using its simulation functionalities, while test and verification can be performed starting from the requirements definition phase. Simple models can be designed and simulated to validate the algorithm"s high-level behavior. After that, certain functionalities and subsystems of the design can be modeled, tested and simulated independently at a more detailed level; also, results can be displayed and analyzed -- all in a PC-enabled environment to check the feasibility of the ideas.