



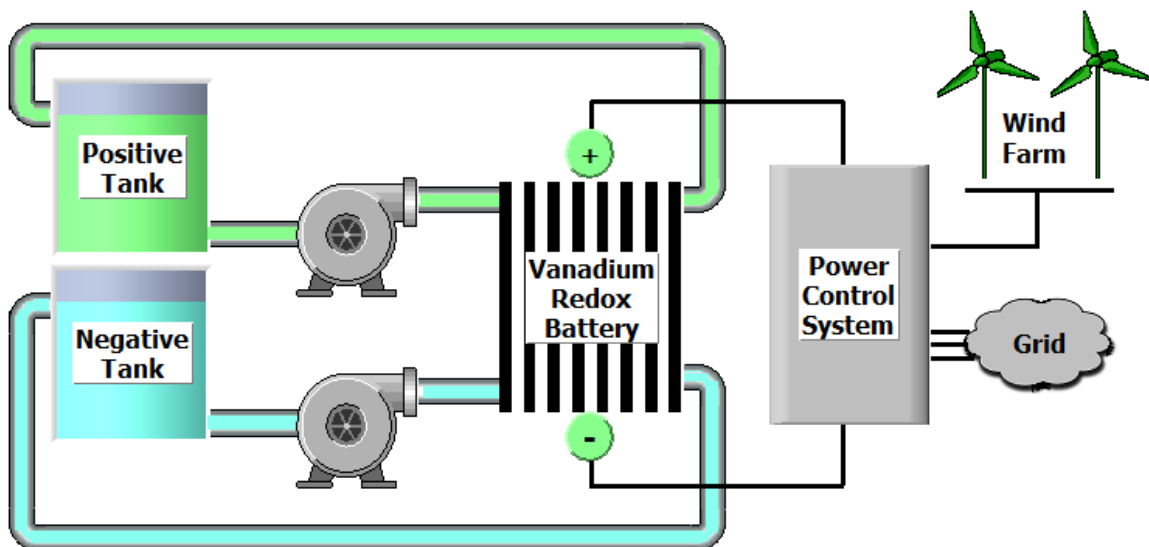
## CompactRIO System Delivers Green Energy Storage Solution

**The Challenge:** Design a high reliability energy storage control system to make continuous power grid delivery possible from intermittent green energy sources.

**The Solution:** National Instruments CompactRIO and LabVIEW RT team up to deliver optimized charge/discharge scheduling that delivers dependable power to the electrical grid.

Power delivery from green energy sources are often poorly matched to the real-time demands of power customers. For example, solar power is only available during daylight hours on sunny days. Similarly, wind power output is poor in the evenings when demand is often highest yet when the wind increases suddenly during the daytime, utilities have difficulty handling the resulting power surges. For this reason, power companies are forced to limit green energy sources to a fraction of their power requirements.

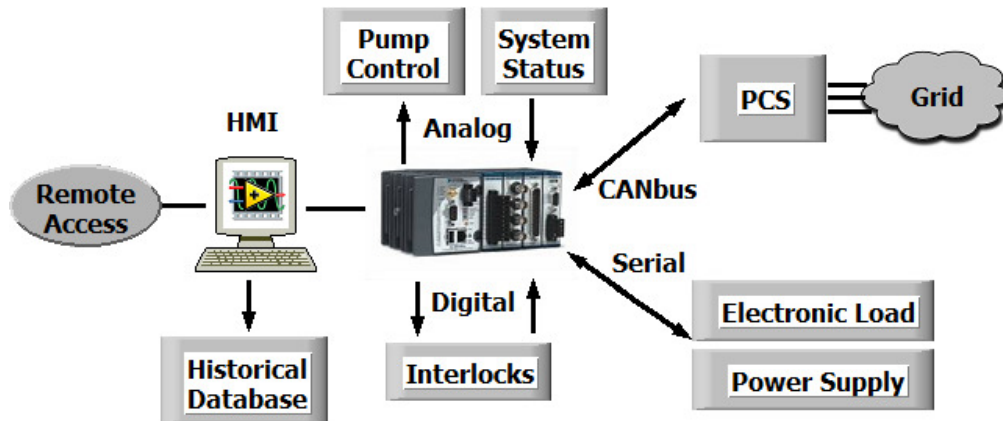
One solution to this problem is to collect green power output in a Vanadium Redox Battery (VRB) energy storage system. In a VRB system, an intermittent green energy source can charge the batteries with an integrated Power Control system (PCS) to manage the constant power availability to the grid. A VRB battery stores its energy in two electrolyte tanks that cycle fluid through the battery. This technology enables customers to easily increase their energy storage capacity by simply installing larger electrolyte tanks. Peak load capability is determined by the size of the VRB battery, which can be scaled up into the megawatt range.



Basic Vanadium Redox Battery Energy Storage System

### From Test Station to Production

The first requirement was for a real-time controller that could reliably provide tight fluid pressure and flow controls to the battery stack as well as keep the critical temperature and electro-chemical parameters within safe ranges. The next requirement was to have a system that could provide an R&D test bed which would then serve as a foundation for a production system. The test system needed to work with various battery sizes and track the performance and system use of each battery while logging alarms to an HMI. An historical database was required to track real-time system performance. Remote access was also needed to debug field trial systems.



The first test systems were setup to read simulated power demand signals through a LabVIEW controlled script which would signal a serial-based electronic power supply and electronic load pair. The third party instrument drivers, available from National Instruments, enabled quick implementation of the serial instrument control. The production system replaced the serial test instrumentation with a CANbus connected PCS and the analog pump controls with RS-485 modbus control. The vendor supplied CANbus arbitration ID addresses were read through the CompactRIO into easily manageable LabVIEW data clusters. Instead of a user determined test script determining the charge/discharge cycles, the production system was now setup to balance power supply and demand automatically from available power sources and the requirements of the power grid.

The LabVIEW based CompactRIO platform proved itself as the best choice for the project requirements due to the flexibility of the LabVIEW software environment and the easy connectivity of the various devices required. Moving from an R&D project to a production system was accomplished while preserving the core control logic learned throughout the development process. This proved to be a great advantage in getting the project completed within the required time and budget.

For more information on this project or if you would like an assessment of your Testing or Machine Automation requirements, please contact Rob Taylor at LightWave Computing.



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