



Mark* V to Mark* VIe Migration

Overview

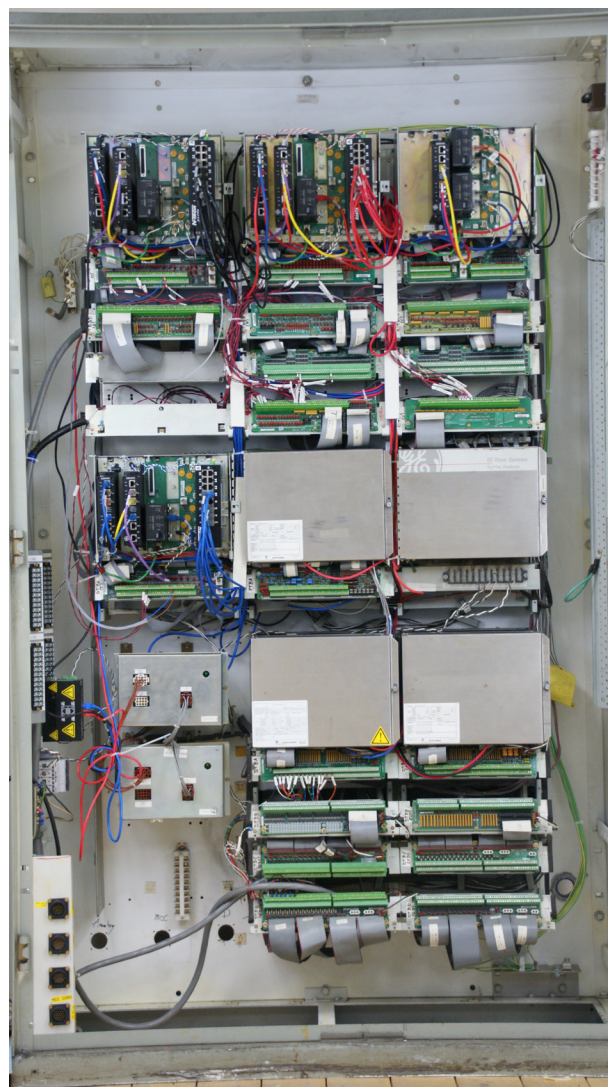
GE is proud to provide controls you can trust from experts you can trust. You can now add significant new performance enhancements to your Mark V control. GE offers a Mark VIe upgrade package with many new features and algorithms for new turbine functions, such as advanced dry low NO_x systems and operational flexibility (OpFlex*) enhancements. The upgrade includes a complete modernization of operator stations and networks to current technology.

- **Improved reliability** – TMR controller redundancy provides 2 out of 3 voting to improve reliability and eliminate single-point communication failures within the control.
- **I/O expandability** – flexible and modular architecture allows for future growth of capabilities and applications.
- **Built with cyber security best practices** – Achilles™ Communications Certification Level 1 Mark VIe Controllers feature hardened network switches and HMI within a segmented network.

eTechnology Benefits

The Mark VIe provides performance, operability and reliability for today's connected plant.

- **Increased computational power** – advanced technology Mark VIe processors provide access to sophisticated software enhancement modules to improve turbine performance, reliability, and operability.
- **Intuitive features** – GE's powerful ToolboxST* software, with modern drag-and-drop type editors, industry leading trender with video type forward-reverse-freeze capability, and code-compare tools.
- **Increased operational productivity** – user-friendly HMI graphics, alarm/event management, and trending leading to improved operator recognition and resolution of system faults.
- **Maintenance efficiency improvements** – reduced engineering time due to a single integrated software tool for configuring networks, processors, and I/O boards, along with editing application software, managing block libraries, and displaying system diagnostics.
- **Latest GE software libraries** – Leverages years of GE OEM experience to ensure safety-related software updates are delivered while also retaining the majority of the existing control system customization.



Hardware Features

The Mark V to Vle migration consists of a streamlined hardware configuration to provide the performance capabilities and reliability to meet the requirements of your operation.

- **Reduced downtime** – a migration can be done in as few as 9 days with 5 outage days using the existing cabinet footprint, with no impact to field wiring or turbine devices. Coordinated installation between the customer and GE reduces migration time and provides on-site education during installation.
- **Ethernet backbone** – provides expandability as well as protection against control system component obsolescence. In other words, obsolescence is now handled “component-by-component” rather than “system-by-system.” Modernized communication conforms to modern IEEE 802.3 standards.
- **Lifecycle maintainability** – the new Mark Vle boards and the existing Mark V components not replaced during the migration process assume the lifecycle and support of the Mark Vle control system.

Operator Interface

The HMI for the Mark Vle uses a Windows™ operating system. With this HMI, your existing operator and maintenance stations will have the latest HMI/SCADA Cimplicity* graphics system featuring easy screen navigation, alarm/event management and trending tools. In addition, Windows™ 7 HMIs use the latest versions of ControlST* and ToolBoxST which will augment your existing Modbus and TCP-IP GSM links to plant controls.

OpFlex Software Enhancement Modules

GE's OpFlex software enhancement modules add significant new performance enhancements to your Mark Vle turbine control to improve reliability, provide system diagnostics, help to prevent trips, and improve operator productivity. There are four packages featuring 20 modules which complement the power of the Mark Vle control system.

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Cyber Security

Upgrading to the Mark Vle control system allows you to take advantage of GE's cyber security solutions, helping reduce your risk. Our cyber security solution provides defense-in-depth protection. The SecurityST* Mark Vle Solution and Commissioning Services is Achilles™ Practice Certified – Bronze, indicating the solution has undergone strict cyber security best practices demonstrating to customers that systems are developed and implemented securely. The Security ST appliance and Cyber Asset Protection Subscription are designed to support the plant operation's compliance to cyber security standards and guidelines including NERC CIP, NEI 08-09 and ISA99/IEC 62443.

Controls LifeCare* Partnership

This comprehensive subscription helps to maintain the health of turbine and plant control, generator control and static starter systems. Subscribers benefit from GE expertise and a true partnership in the maintenance and servicing of control systems with a simple, packaged approach. Controls LifeCare is available in one-, five- and ten-year agreements and is applicable for both new and existing units.

Mechanical Solutions Options

GE's electromechanical solutions are a critical piece of a control system migration or full panel retrofit. Integration considerations need to be made based on the age of control system and the interface with the software and electromechanical components. GE has the expertise and OEM knowledge to evaluate these needs to ensure assets remain reliable. Our solutions have the potential to improve performance, online capability, provide redundancy and fit within the current operations envelope.

Critical components that need to be evaluated include transducers and transmitters, fuel valves and fuel skids, and speed sensing. GE also provides solutions for Trip Manifold Assemblies (TMAs), Hydraulic Power Units (HPUs), and other assets that are important to operations. Our experience includes steam, hydro, and gas turbines as well as balance of plant. We have the application knowledge to make sure that your assets are upgraded correctly.

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GEA14854C (08/2016)