



Mark* IV to Mark* VIe Migration

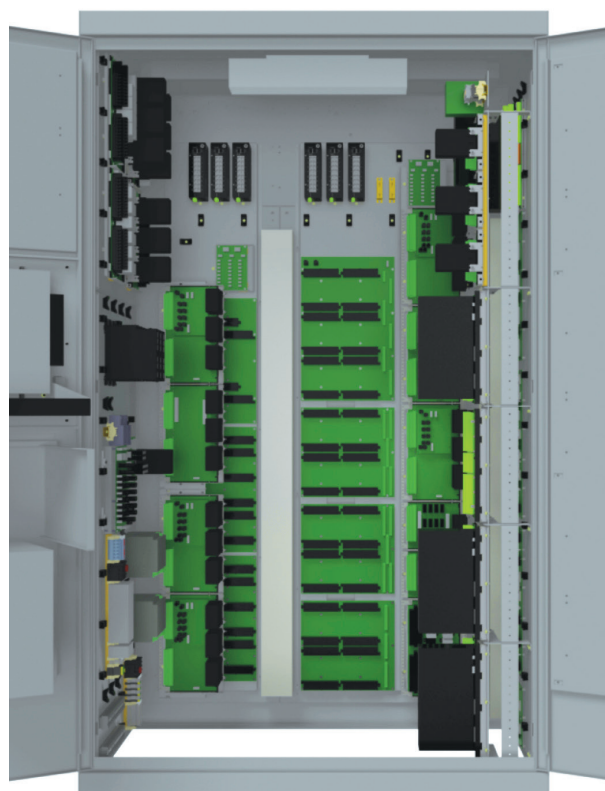
Overview

The Mark IV to VIe migration delivers significant performance enhancements and an improved control system lifecycle for your operation. GE migration solutions provide the latest proven technology of the Mark VIe—enabling increased performance, flexibility and maintainability without impact to your current control system footprint, field wiring, or turbine devices. Our expertise stems from more than 50 years in control and turbine design and results in an unmatched knowledge of your entire system. With a migration from GE, you'll experience a reduced outage timeline and support options throughout the life of your control system.

“e” Technology 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** – draws upon years of GE OEM experience so that safety-related software updates are delivered while also retaining the majority of the existing control system customization.
- **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 HMIs within a segmented network.



Hardware Features

The Mark IV to VI 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 10 days with 7 outage days¹ 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.
- **I/O flexibility** – supports single or TMR I/O as well as shared I/O based on your system needs.
- **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 VIe boards and the existing Mark IV components not replaced during the migration process assume the lifecycle and support of the Mark VIe control system.

Operator Interface

The HMI for the Mark VIe 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.

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Cyber Security

Upgrading to the Mark VIe 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 VIe 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.

OpFlex* Software Enhancement Modules

GE's OpFlex software enhancement modules add significant new performance enhancements to your Mark VIe 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 VIe control system.

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

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 the 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.

¹ Depending on site conditions and hours worked per day.

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