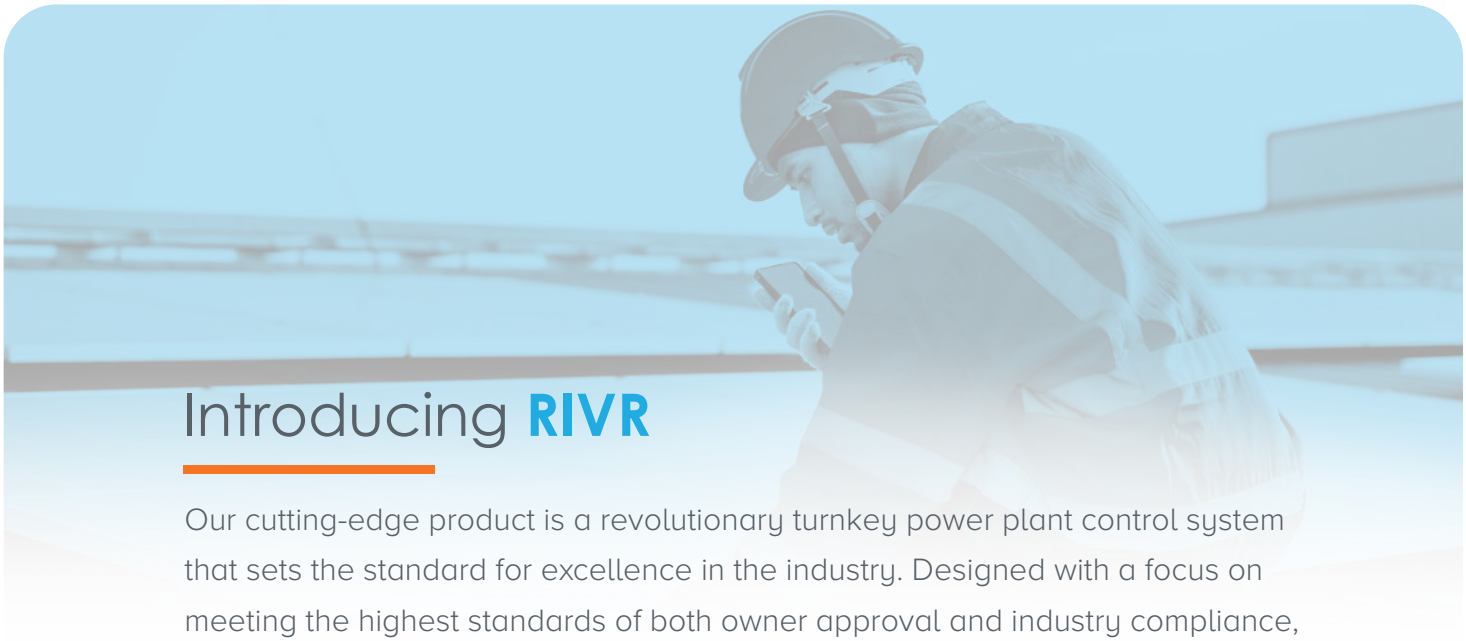
RIVR® SCADA & EMS Systems

EXPERIENCE MATTERS

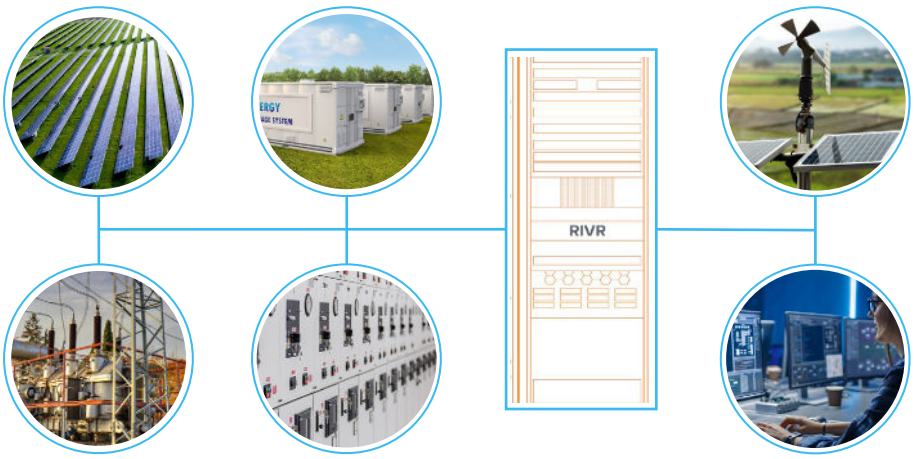
RIVR



Introducing **RIVR**

Our cutting-edge product is a revolutionary turnkey power plant control system that sets the standard for excellence in the industry. Designed with a focus on meeting the highest standards of both owner approval and industry compliance, this system ensures seamless integration into diverse power plant environments.

What sets RIVR apart is its commitment to openness and accessibility – being an open-source and non-proprietary solution. Emphasizing vendor agnosticism, our control system provides unparalleled flexibility and compatibility, allowing users to choose and integrate components without being tied to a specific vendor. This innovative solution represents a leap forward in power plant management, offering a dynamic and adaptable approach to control and monitoring.



Maximize Production - Reduce Costs – Increase Revenue

RIVR® SCADA & EMS Systems:

Seamless and Intuitive View of Renewable Operations

- Owner Approved, Industry Compliant
- Open-Source, Non-Proprietary, Vendor Agnostic
- Turnkey Power Plant Control System

Renewable asset portfolios range from simple to complex. **RIVR simplifies operation and monitoring** of your assets in a single platform regardless of the number of manufacturers, or the types of automation technologies provided by vendors. RIVR easily solves this integration hurdle and provides robust data access to improve effective and timely decision-making.

Utilizing **RIVR SCADA** can provide a unified view of operations to improve efficiency and manage overall costs.

Manage all Types of Assets, **Solar, Wind, Battery, or any combination from a Single Platform that Provides:**

- A clear, intuitive view of fleet operations
- Access to all system data
- Support for single or multiple sites
- Supports all equipment manufacturers and vintages
- Cybersecurity including NERC compliance

Make your investment safer – from the initial startup phase until the end of operation. Add additional safety with redundant network architecture where practical.

Comprehensive real-time control of all devices and assets to maximize uptime and production with industry-leading HMI interface.

Ease of scalability – easily adapt your network to future changes, retrofits, and expansions.

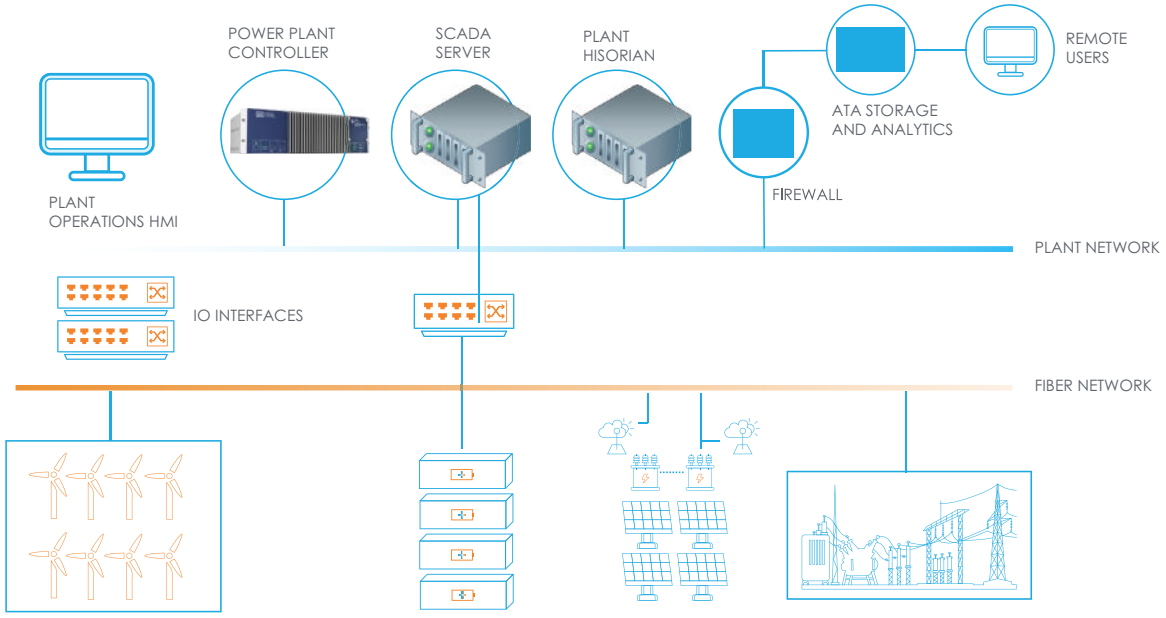
Automation – Develop automated strategies for control and response for system upsets or mis-operating components.

Powerful reporting – choose your preference for local or cloud-based solutions for data acquisition and management.

Smart alarm management – configure custom alarms and/or reporting for system faults, performance, or any other events.

Open architecture – Stay vendor and version/vintage independent to simplify support and performance for your long-term Solar, Wind, and BSS investments. Non-proprietary solutions provide unrestricted access to HMI and PLC software for clients.

Custom Training – Customized, site-specific training is available to get your Operations and Maintenance teams performing optimally from day one.



Unleashing Performance Potential with **Advanced Technology**

- Ability to self-maintain control strategies
- High-quality data acquisition
- Third-party system integration
- Data analysis, trends, and high-performance historians
- Event analysis tools
- Detailed hardware diagnostics

Reliable Support and Service from **Trusted Experts**

- Comprehensive support before, during, and after your projects go into production
- Network of field and product engineers readily available
- Cybersecurity for NERC CIP compliance and industry best practices
- Educational Services and Training
- Site-Specific Detailed Operating and Maintenance Procedures

Outstanding Warranty Service

The **Platform:**

The **RIVR SCADA** and **EMS platform** is designed to meet the most challenging Grid Code and use cases for all your **Wind, Solar, Storage, and PV + Storage**. **The RIVR platform is open architecture and hardware independent**, allowing you to tailor the system to your preferences.

All of our products support several types of communication media and can communicate with any device. Thanks to our experiences with devices from almost all known vendors and our pledge for standard protocols, we can ensure the seamless integration of our products with any third-party devices.

Achieve flexibility during operation and maintenance while being fully compliant with NERC CIP requirements. **RRC** is a full-service energy engineering firm, allowing our **SCADA** engineers to work closely with other departments to ensure an integrated design and the most value.

- Owner-approved, industry compliant
- Open architecture, non-proprietary, vendor-agnostic
- Turnkey control systems
- Network and equipment flexibility

SCADA **Solutions:**

The **RIVR SCADA team** has an extensive, proven track record of success in implementing renewable energy solutions.

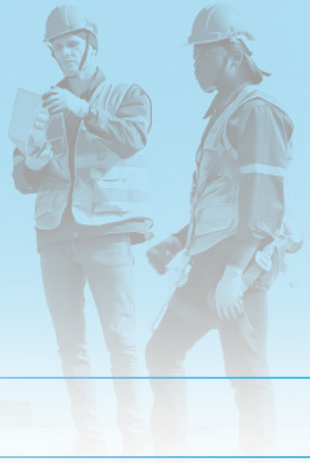
Revolutionize your facility's performance with our **SCADA solution**, designed for flawless integration with battery storage systems. Experience the perfect blend of advanced automation and energy management, empowering your business to thrive in a dynamic and sustainable landscape. The system seamlessly integrates with wind, and solar to support the grid with the following:

Ancillary services to the market

Planning for generation needs

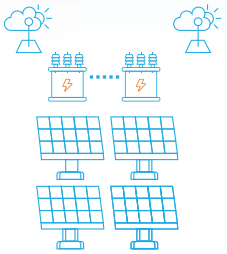
Seamless energy shifting

RRC offers **SCADA** for storage and solar/wind + storage systems that are fully compatible with your choice of power system vendors. This allows you to choose from a variety of **BESS** manufacturers for your specific project and needs. **RRC** implements our controls to be fully compliant with the **MESA** standard and **IEC 61131-3** to ensure standardization across platforms and save operators, engineers, and technicians' time.



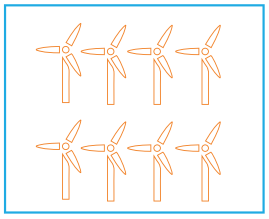
Solar Plant **SCADA**

- Collector Communication Network Design
- Power Plant Controller & HMI Design
- **SCADA** Communication Enclosure Design and Supply
- **MET** Stations Design and Supply



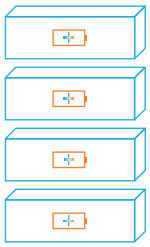
Wind **BOP SCADA**

- Site Communication Network Design
- Project HMI Design/Implement
- Coordination between WTG PPC and Substation RTU



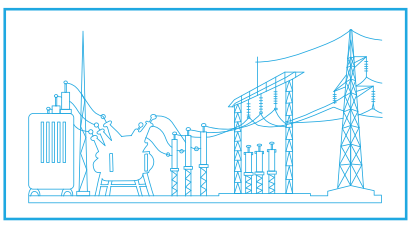
Battery Storage **SCADA/EMS**

- Collector Communication Network Design
- Power Plant Controller & HMI Design
- SCADA Communication Enclosure Design and Supply



Generation Asset **SCADA + Battery Storage**

- Collector Communication Network Design
- Power Plant Controller & HMI Design
- SCADA Communication Enclosure Design and Supply



BESS/Generation
Control Modes

Reactive Power

- PF Following
- Constant VARs
- Fixed Power Factor
- Volt-VAR Control
- Voltage Droop

Active Power

- Peak Power Limiting
- Active Power Limit
- Active Power Response
- Automatic Generation Control
- Active Power Smoothing
- Solar Smoothing
- Fast Frequency Response
- Frequency Droop

Features

- Stand Alone
- Hybrid
- Microgrid
- Cap Bank/Switchyard Control
- ISO/QSE Interface

PPC Grid
Control Capabilities

- Curtailment
- Voltage Control
- Freq Droop
- Ramp Rate Control
- L/H VRT
- L/H FRT
- CapBank Control
- Line Drop Compensation
- Load Shedding
- Microgrid
- ISO Ancillary Services, ADS, AGC

World Class **Software and HMI**

Scalable, Sustainable & Flexible:

The **RRC system** is built on the **SEL RTAC** and **Inductive Automation Ignition platform** which provides the end user the ability to modify the configuration of the **PPC**. **RRC's MESA** architecture for **BESS** and high-performance **PV control** can increase revenue. These features, combined with SEL's renowned reliability ensure lower operation costs for the lifetime of the project.

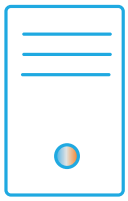
What Is **Ignition?**

Ignition **SCADA** by **Inductive Automation@** combines an unlimited licensing model, with instant web-based deployment, and the industry-leading toolset for supervisory control and data acquisition (SCADA) — all on one open and scalable universal platform. Ignition is The New SCADA because it solves all the major pain points of old SCADA. Ignition empowers your business to easily control your processes, and track, display, and analyze all your data, without limits. Ignition is designed from the ground up to be approachable and easy to get started with while it is flexible and capable of scaling up to the largest projects. Ignition tag count is unlimited, so for the low cost of one server license, you can seamlessly connect all your data, design any kind of industrial application with ease, and instantly web-deploy unlimited clients to anyone, anywhere — all from one universal platform for industrial automation.

Ignition has a core focused on everything you need and nothing that you don't.

Server Based

One computer controls everything in Ignition. That means you only install it in one place and connect everything else to that server. No separate install for the Designer. You can have as many Clients (runtimes) as you want, with no additional installation for expansion necessary.



Simple Licensing

One license for the server gives you unlimited access, such as unlimited Clients, unlimited Tags, and unlimited projects. With unlimited run-time clients at no additional cost, you can get your important data and analytics to your entire team, across your whole company. Ignition allows you to create and use as many tags as you need for devices, OPC servers, and anything else, without limits.

Web-based Deployment

Ignition is installed, deployed, and managed using standard web technologies. Connect and change settings, update projects, and create new Tags, all from any computer on the network.

Web-launched Designer and Clients

Ignition's Designer tool and runtime clients and sessions are launched using the web. Run a large number of clients across your enterprise at the same time. In initial benchmark testing, Ignition Perspective can simultaneously launch 200 clients with ease.

Built-in Security

Security is built into every aspect of Ignition. You can manage users, edit screen permissions down to the individual Tag or component level, and even secure certain assets in your projects.

Scalable Modular Architecture

Create a scalable and centrally managed SCADA system using Ignition's web-based server architecture. Do more with unlimited connections to PLCs, databases, web-based deployment, and web-launched clients. Leam more about Ignition's System Architectures. Projects can be made small and expanded out indefinitely as your business grows, or you can have smaller installations connected to and interacting with other larger systems.

Cross Platform

Ignition works with any major operating system, even iOS and Android. Ignition is built on Java, which means you can install and run it on any modern operating system. Ignition will run on Windows, Mac OS X, and Linux. Backups of your system are even cross-platform, you can load a backup from any system.

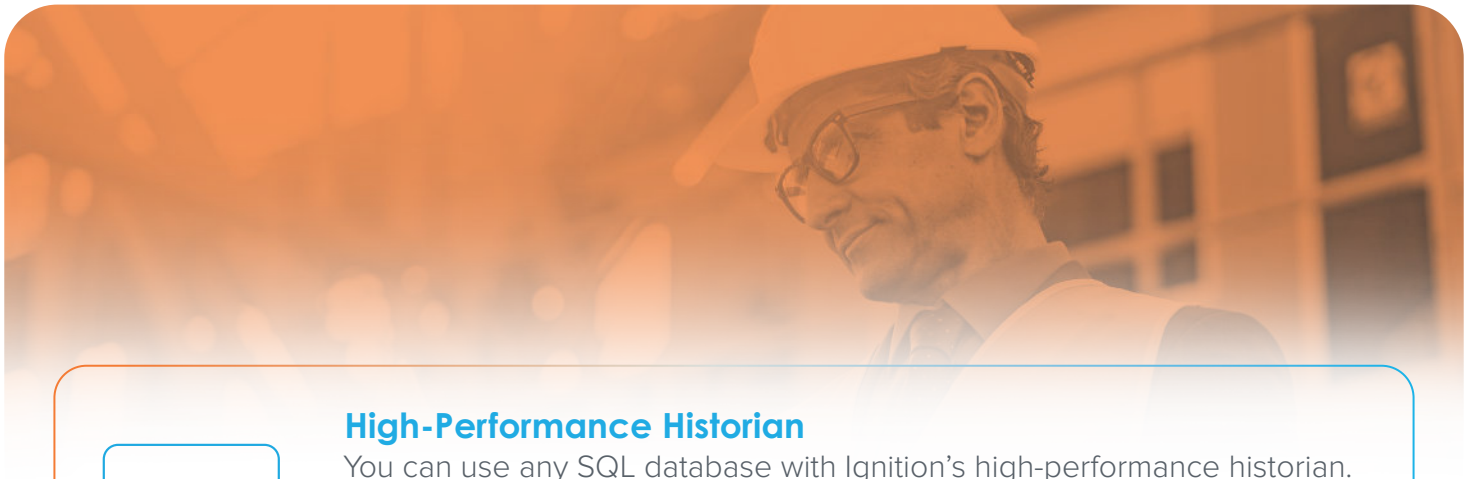
What Can It Do?

Because of its modular nature, Ignition can do a lot or a little and be completely customized to your needs. A lot of the basic functionality is shared between modules and stored in the Gateway to make everything as smooth and seamless as possible. Some of these basic functionalities include database connections, device connections, Tags, Security profiles, and Alarms. Because these are all shared resources, you don't have to worry about managing multiple connections for the different modules in Ignition: it just works. You can build database applications using Ignition. You can create POS, CRM, and inventory tracking systems. You can bring in data from any SQL database in your plant and interact with other existing ERP and Access systems.

Modules provide the core functionality for Ignition where the Gateway provides the backbone of shared resources. There are no limitations to Ignition, here are just a few of the things Ignition can do for you:

Web-Based HMI and SCADA Applications Deployment

Using web technologies, you can access PLCs and connect to SQL databases on any platform. Ignition provides the common HMI/SCADA capabilities but more easily and efficiently. Create runtime clients and sessions that show current or past data, interact with your other systems and devices, and create displays and controls for anything wired into your system. See and manage your entire system from one place.



High-Performance Historian

You can use any SQL database with Ignition's high-performance historian. It's simple to set up and Ignition will monitor and control the data for you. The Historian includes partitioning and uses compression algorithms for fast data storage and retrieval.

Reporting Engine

You can create dynamic PDF reports that users can see and change on the fly. Give users the ability to change date ranges or select past reports without any changes to the system. Create schedules to email or save compliance reports when you need them.

Alarming

You can use Ignition's state-of-the-art alarming engine to create alarms for any condition you can imagine. Alarms can be recorded, acknowledged, or dealt with by sending out notifications. Email, SMS, and voice messages can be sent to individuals or whole lists of users based on any logic you need.

- **Smart Alarming**
  - Hierarchy alarm configuration to avoid overwhelming alerts
  - Configurable alarm notification
  - Seamless integration of alarm data from multiple systems
- **Ad Hoc Alarm Generation and Configuration**
  - Adding/Update alarms in seconds without going through Ignition- designer software
  - Alarm muting during maintenance

Communications Hub

You can use Ignition as an effective communication hub in your network You can use some or all of these features to make Ignition move data back and forth throughout your facility. Connect everything with:

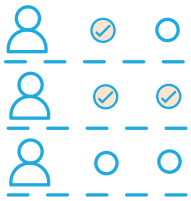
- OPC-based and communicates with virtually any OPC server.
- SQL-based (JDBC) and connects to any number of Databases.
- Built-in PLC drivers and connects to any PLC (Allen-Bradley, Siemens, Modbus, etc.) through OPC.
- Supports any web services and launches anywhere.
- Connects with other enterprise systems (ERP).
- Connects to devices such as barcode scanners, scales, and sensors.
- Connects to any mobile device such as wireless smartphones and tablets.
- Connects to any touch panel screen.

Security

The **RIVR system cyber security** is built from the ground up and can easily meet all current and future **NERC CIP** requirements. **RRC** can provide the networking hardware and expertise or work with your networking experts. RRC simplifies integration by not requiring a connection to the cloud.

Integrate with Corporate Network Security
Using Microsoft Active Directory

Trusted Identity Management
Ignition integrates with trusted federated identity technologies



Control User Access
Easily control user access to system areas for different users with the click of a button

The Operator Interface – Ignition HMI

Ultimately, **Ignition provides a SCADA HMI that makes the operators' job easier**, allowing them to catch errors and resolve them immediately, which can save money and reduce lost productivity. Our partners at Ignition believe in designing the UI with ease of use for the operator first in mind. Usability combined with sound design principles leads to an intuitive and valuable tool that benefits all.

Using a next generation approach our design achieves the following goals:

- Early engagement with problems by bringing the most important information to the operators' attention
- Faster response times through the intuitive use of designed workflow and navigation
- Engaging, positive experience with SCADA tools that are easy to use and uncluttered

Ignition uses excellent software design to enhance your high-performance SCADA system, minimize time-wasting traps, and increase overall plant profitability by applying 7 essential SCADA design elements.

1. Color

Color (and specifically contrast) is so powerful because it often communicates before all other visual factors like text are considered. As designers, we use this to convey instant meaning to objects, to draw attention to specific places that may need focus, and to distinguish items from each other. Color and its meanings are learned over a lifetime, which when used properly, provides a lifetime of training to a user.

2. Layout and Layering

With software, layout refers to how buttons, diagrams, and other elements are laid out on the screen in an organized fashion. By taking what we know of human nature, we can design control screens in a logical, easily readable arrangement.

3. Navigation

SCADA software needs well-designed navigation to give users access to critical information quickly and basic rules of thumb include:

- A hierarchy should be consistent
- The navigation bar should be in the same place on all screens
- A process overview should provide quick access to any part of the system

4. Typography, Iconography, and Imagery

Typography refers to the use of fonts, font sizes, and font styling to convey meaning. A style guideline should be created to keep a clean and consistent look for any text UI. Good use of typography can be used to emphasize and de-emphasize content. As for imagery, intuitive icons and shapes are preferred. A good icon should be simple, easy to read at different sizes, and clear in meaning.

5. Feedback

Speed or response time connects the operator's decision with a subsequent action. If the feedback is too slow, people assume it did not function, and thus the spinning hourglass, progress bar, and process loading ring were invented. The longer people wait for feedback, the less influence that action has on future decisions. Measurability gives operators information about the results of their actions. For example, a simple message could show them "The setpoint has been changed to 20MW or "Done".

Context provides operators further understanding of what their actions did or might do. What does a setpoint of 20MW mean? Contextual feedback should be provided to the operator to frame the setpoint entry in terms of normal or acceptable. This can be informational only ("Setpoint should be between 15-30 psi") or for more critical setpoints, values outside of established limits can be prevented. If the latter, the operator must be informed of why his entry is limited.

Motivation encourages operators to keep making good decisions and actions. Sometimes this comes in the form of accountability for their actions by recording their button presses and the values they select. Sometimes it is a simple thanks by their bosses for saving the day.

6. Functional Use

A good SCADA system must of course be functional, not just nice-looking. No point in improving its appearance if the operators can't do their job at the end of the day. The key is to design with user operability in mind while not compromising the required system functionality. Ultimately, the IJI of a SCADA system must fulfill its primary directives of allowing people to monitor and operate equipment, identify, and respond to problems, and meet the functional control specs. While having good UX is desirable for the long-term success and efficiency of a SCADA platform, the immediate parameters that engineers care about most — such as response time, available actions, and feedback — must be addressed. The best industrial automation systems to combine functionality and standards with usability.

7. Future Scalability

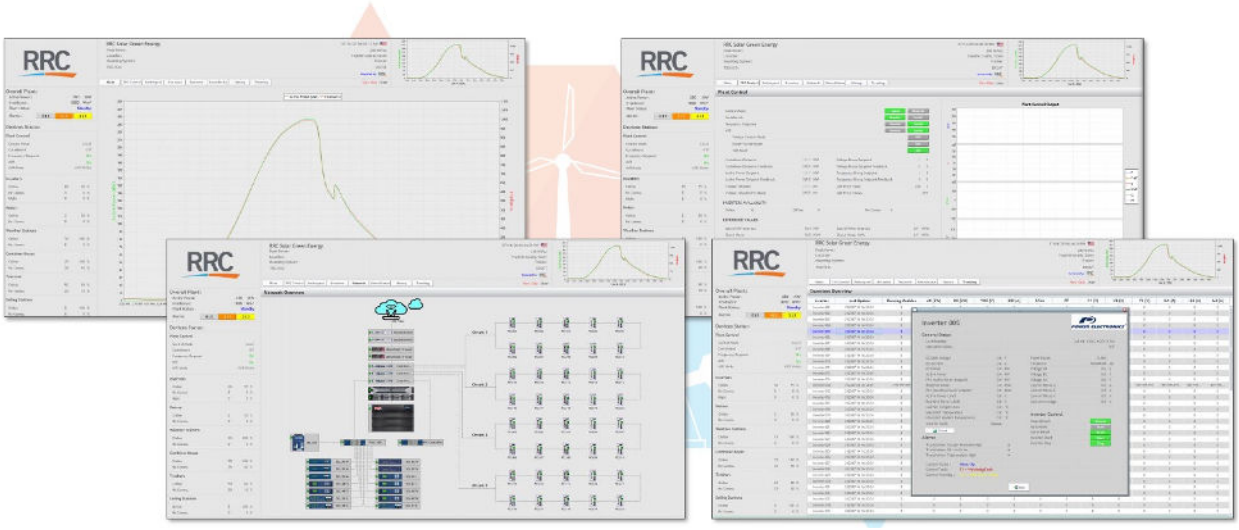
Sometimes companies can unintentionally paint themselves into a corner. When designing a new SCADA system, the list of requirements is laid out and delivered exactly as specified. But what happens at the end of the software's life cycle five to ten years later? What if your organization absorbs another company and two different systems must be combined? The once perfectly designed SCADA platform has no room for expansion. Therefore, most companies choose one of two routes:

1) Rework the entire system from scratch or,
2) Add on an unexpected subsystem.

What if we told you there was a third option? The key is to make the software flexible enough to adapt to future changes because, let's face it, change is inevitable but also somewhat nebulous. When setting up the design specifications, think beyond the current needs.

- What are the next paths for growth for the plant or company that might increase manufacturing loads, performance requirements, workflows, and employee headcount?
- If your budget suddenly increased, what wish-list features and resources would you add?
- Are there any bottlenecks you can predict or have seen in the past?

RRC RIVR SCADA System



Ignition HMI Summary

Good SCADA Design Determines Long-Term Success

The days of accepting poorly designed SCADA screens that inhibit rather than enhance an operator's ability to control the plant are over. Say no to overly complex or visually distracting displays just because "That's the way HMIs have always looked." Instead, it's time to modernize our approach and include the best practices from both inside and outside the industry. Incorporating these seven user-centric design principles in SCADA systemscolor usage, layout and layering, navigation, typography and imagery, feedback, functional use, and scalability — creates software that is easy and intuitive to use. These features tangibly affect the operator's ability to control the process and respond quickly when things go awry. Over time, the engagement and performance of well-designed systems provide positive returns in decision-making speed and accuracy, plant productivity, and reduced training time.

Ignition Platform Specs and Requirements *(as of January 2024)

Supported Operating Systems

Windows Server 2016/2019/2022
Windows 10/11
macOS (10.16+)
Linux (tested with Ubuntu 20.04)

Supported Databases

Microsoft SQL Server
Oracle
MySQL
MariaDB
PostgreSQL
Any database with JDBC driver

Requirements

Dual-core processor
4 GB RAM
10 GB free HD space

Supported Browsers

Chrome
Edge
Firefox
Safari

*(Requirements may vary by usage)

Contact **Us**

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For more information, please visit us at:
https://rrccompanies.com/services/scada

RIVR