

An aerial photograph of a power plant facility. Two massive, grey, hyperboloid cooling towers are the central focus, each emitting a thick plume of white steam that rises into the sky. The plant's infrastructure is visible, including various buildings, piping, and large arrays of solar panels. The facility is situated near a body of water, with a residential area and greenery visible in the background. The overall scene is captured from a high-angle perspective, looking down at the industrial complex.

TECHNOLOGY AND EXPERTISE TRANSFORMING THE POWER INDUSTRY

Honeywell

TODAY'S POWER PLANTS DEMAND TOP PERFORMANCE SAFETY AND EMISSIONS COMPLIANCE

Today, the power industry is on the verge of massive change. The way companies respond will depend on where they operate, their regulatory environment, the structure of their portfolio of assets, evolving customer demands, their economic maturity, and the level of technology adoption they require.

Power plant operators have a critical need for:

- Sustained process performance
- Improved operational uptime
- Increased safety and security
- Enhanced operator and asset effectiveness
- Extended control system lifecycle support
- Optimal power management
- Agile response to dynamic grid situations
- Flexible for cyclic operation
- Compliance with emissions and reporting regulations
- Optimized fuel consumption

Power producers are under pressure to improve their efficiency to achieve not only greater cost competitiveness, but also an outstanding level of safety and environmental performance.



HONEYWELL KNOW-HOW ENABLES OPERATIONAL EXCELLENCE

Honeywell's background in the power industry spans all traditional and emerging areas of power generation technologies, including:

- Pulverized coal-fired plants
- Fluidized Bed Combustion (FBC) boilers
- Biomass/municipal waste to energy
- Combined Cycle Power Plants (CCPPs)
- Integrated Gasification and Combined Cycle (IGCC) power plants
- Geo-thermal energy
- Hydro power facilities
- Wind and solar energy
- Battery energy storage systems

Honeywell has delivered state-of-the-art control systems and services to over 1,000 power generation facilities in more than 50 countries, ensuring the reliable and efficient operation of electric utilities, district heating plants, hydroelectric units, industrial powerhouses, and more.

Level 4

Operations Management, Manufacturing Execution Systems (MES), Enterprise Resource Planning (ERP) Systems and FORGE Sustainability+ for Industrials Emissions Management.

Level 3

Optimization, simulation, data collection, and analytics.

Level 2

Automation, Human-Machine Interface (HMI), Distributed Control System (DCS), Burner Management System (BMS), Supervisory Control and Data Acquisition (SCADA), Programmable Logic Controllers (PLCs) and networks.

Level 1

Smart, connected I/O, transmitters, devices, and analyzers.

A HOLISTIC APPROACH ACROSS THE ENTIRE ENTERPRISE

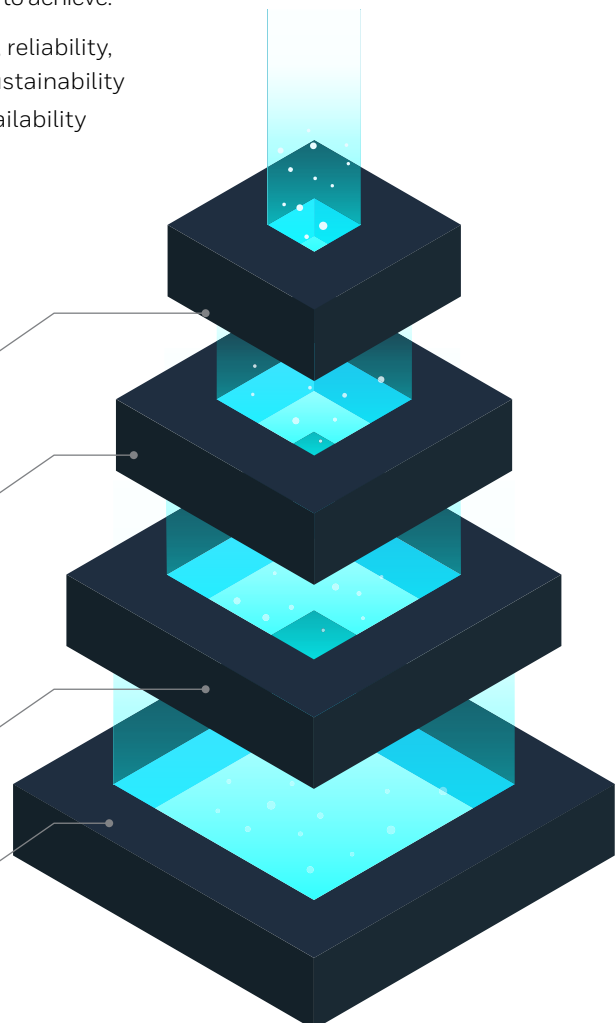
Honeywell is committed to providing customers with visibility into how their operations are performing across the plant. With solutions like Honeywell Experion® PKS, we help convert massive quantities of data from equipment, processes and people into intuitive, actionable insights that enable continuous operations monitoring from a single screen.

In turn, this helps customers optimize the efficiency, effectiveness and safety of their business. Honeywell best-in-class software and cybersecurity solutions are embedded in our entire portfolio, enabling customers to achieve:

- Enhanced safety, reliability, efficiency, and sustainability
- Highest asset availability

- Lowest risk
- Reduced total cost of ownership
- Improved regulatory compliance
- Maximum lifecycle value

With Honeywell as their technology partner, power companies can transform their operations quickly and efficiently, at every level and with minimum disruption, enabling them to focus resources on innovation and achieving business objectives.



INTEGRATED SOLUTIONS FROM THE PLANT TO THE BUSINESS LEVEL

Honeywell is a leading automation supplier with technology, experience and industry expertise covering all facets of the power sector. We offer customers a single point of responsibility, simplifying open systems and ensuring an integrated solution to address all aspects of automation, safety and security. This strategy unlocks and sustains significant business benefits.

By deploying Honeywell's advanced, integrated control, safety and monitoring solutions for boilers, turbines, offsite utility plants, and electrical systems, power industry firms can realize operational and business advantages such as:

- Reduced project schedule and cost
- Better coordination among various plant sub-systems

- Common hardware and software platform
- Common pool of maintenance spares
- Common engineering, diagnostic and documentation console
- Ease of operation and training
- Common operator interface for the entire plant
- Continuous emissions monitoring
- Effective and consolidated data reporting and archiving

In addition to offering the industry's broadest portfolio of control and safety systems, and field solutions and advanced applications, Honeywell can serve as an Integrated Main Automation Contractor (I-MAC) providing project engineering, Electrical & Instrumentation (E&I) construction, project management, installation, startup and commissioning services that help drive safety,

reliability and efficiency for the power generation industry.

Honeywell can also offer migration or modernization of existing non Honeywell control system through our specially developed hardware and software migration tools.

Control System for Major COMBINED CYCLE POWER PLANT Project– Electric Utility, The Netherlands

- Honeywell selected as Main Automation Contractor (MAC)
- Experion PKS installed to automate overall power plant operations
- Integration with control systems provided for gas turbine & steam turbine



BEST-IN-CLASS PRODUCTS MEETING YOUR SPECIFIC NEEDS

Honeywell's goal is to ensure power industry operations are productive, safer and more environmentally efficient. We offer integrated process control, safety, field measurement, and information solutions in one open, scalable architecture. This provides complete, plant-wide control for both conventional and renewable power generation.

The key components of Honeywell's extensive product line include:

- Experion Process Knowledge System (PKS) plant automation system
- Experion PKS Safety Manager for boiler protection and Burner Management System (BMS)
- Experion PKS turbomachinery controls
- Experion industrial Power Management System (PMS)
- Experion SCADA solutions
- Experion PKS Safety Manager for Safety Instrumented System (SIS)
- End-to-End Emissions Management Solution
- UniSim® Operator Training Simulator (OTS)
- Plant performance monitoring and optimization
- Plant & Personal Safety solutions such as Closed Circuit Television (CCTV), access control and connected workers
- Fire and Gas detection system
- ControlEdge™ PLC and Remote Terminal Unit (RTU)
- Range of smart transmitters and analyzers
- Gas processing and metering solutions

Honeywell provides integrated solutions for boiler, turbine, Balance of Plant (BOP), offsite, and electrical control requirements. We couple these solutions with our

strong global execution capability for Greenfield Projects as well as Brownfield Upgrade Projects.

EXPERION® PKS: UNIFYING PEOPLE WITH PROCESS, BUSINESS AND ASSET MANAGEMENT

The Experion PKS system is the only industrial automation solution able to improve operating performance, lower project delivery and lifecycle costs, better leverage skills, and drive consistent physical and cybersecurity management.

The Experion solution meets or exceeds all the requirements of the power sector across the globe and has an unmatched capability to unify plant automation. Power industry users can take advantage of robust features such as:

- No single point of failure
- Redundancy offered at I/O modules, controller, power supply, communication network, and servers
- Sequence of events with 1 millisecond (ms) resolution
- Function blocks for power applications
- American Society of Mechanical Engineers (ASME)-compliant steam property blocks
- Sequence control modules for automated plant startup/shutdown
- Remote I/O capability
- Integration with safety system
- Simulation facility for logic testing

- Robust control firewall and cyber security
- Industry standard interfaces
- IEC61850 capability for unified electrical control
- Augmented remote operations and monitoring
- Cloud based virtual engineering and testing platform
- Lean Execution of Automation Projects (LEAP) – a leap change in project execution

Integrated Remote Operations for Multiple Hydro Power Plants – Electric Utility, South Korea

- Experion PKS SCADA system utilized for integrated remote operations of multiple water dams and hydro power units
- Distributed System Architecture (DSA) employed for effortless integration of multiple systems
- Integrated command and control established for power generation, flood control and water management



EXPERION CONTROL HARDWARE: EMPLOYING A VERTICAL, FLEXIBLE AND SPACE-EFFICIENT DESIGN

Experion PKS utilizes space-efficient Series C hardware, along with an optionally redundant process I/O family. Based on a unique vertical design, Series C I/O delivers significant wiring, maintenance and cost savings.

As a result, customers can save on total control room build costs.

The Experion controller and I/O design leverages advancements such as:

- Integrated wiring to reduce footprint
- Two-tier wiring for easy installation and maintenance
- Optionally redundancy to maximize availability
- Uniform heat management to increase product life
- Universal channel technology (UIO module) – optional
- Virtualization of IT hardware – optional

Experion control hardware can increase flexibility and functionality and reduce the customer's footprint by over 30 percent in most cases.

EXPERION TURBOMACHINERY CONTROL SOLUTION: DCS BASED DIGITAL ELECTRO- HYDRAULIC CONTROL (DEHC)

Experion PKS provides a best-in-class, DCS-based turbine governor solution.

This includes a made-for-purpose Speed Protection Module (SPM) with 2.5 millisecond scan time and onboard signal validation and over-speed protection, a Servo Valve Positioning (SVP) module in a compact Series C form factor supporting a wide range of servo valves, and a C300 controller with a 20 millisecond control execution cycle time. This solution is best suited for:

- Steam turbine control
- Gas turbine control
- Compressor anti-surge control
- Turbine-driven auxiliaries such as pumps, compressors, etc.

Advanced Control Implementation for Critical Thermal Power Plant – Electric Utility, Bulgaria

- Experion PKS installed to improve overall thermal power plant performance
- Profit® Loop solution utilized to enable effective Advanced Process Control (APC) capabilities
- Safety Manager safety system employed to protect on-site workers, assets and the environment
- Uniformance® PHD implemented to convert process data into valuable information to help detect faults and improve processes
- Sensors and transmitters upgraded as needed to ensure accurate field measurements
- OneWireless™ network installed to extend the plant's process control network



DISTRIBUTED SYSTEM ARCHITECTURE (DSA): INTEGRATING ALARMS AND PROCESS DATA FROM MULTIPLE SYSTEMS

Honeywell's patented Distributed System Architecture (DSA) provides unmatched scalability and performance across dispersed power industry operations. Effortless integration between Experion clusters allows users to create large plant automation systems. This is a significant asset for centralized operations strategies and system interoperability. The primary benefits of the DSA solution include:

- Single integrated solution instead of several independent systems
- Easy transfer of information between clusters of interested users, rather than between individual users
- Retains the ability to autonomously manage each system
- Adapts to existing firewall configurations
- Provides optimum functionality and flexibility

DSA is the ideal solution for integrating processes when there are multiple units, control rooms or geographically distributed locations.

COLLABORATION STATION/ ORION CONSOLE: PROVIDING A COMMON VIEW OF DISTRIBUTED ENTERPRISE ASSETS

The Experion Collaboration Station and Orion Console are powerful tools for integrating enterprise-wide collaboration, increasing situational awareness, and enabling faster response to routine and emergency situations. Advanced station and console technology allows power industry users to:

- Control operations at multiple power plants
- Drive better decision making by unlocking the full value of information and applications
- Help operators manage a greater scope of responsibility
- Ensure more engaged and informed control room personnel

Honeywell's state-of-the-art HMI solutions break down silos by integrating enterprise-wide data from business, process, assets, and people across roles and geographies.

EXPERION ELECTRICAL CONTROL SYSTEM: ENABLING A COMMON PLATFORM FOR PROCESS AND ELECTRICAL AUTOMATION

Honeywell's Experion PKS SCADA solution, Ethernet Interface Module (EIM) and RTU provides a solution for IEC61850-complaint electrical management. Pairing the EIM with Experion PKS and RTU results in a powerful Electrical Control and Management System (ECMS) delivering seamless power and electrical management information directly to operations and maintenance personnel. The EIM supports peer-to-peer data exchange among process and electrical controllers and allows process control and ECMS to work as a single, integrated system. It supports industry standard protocols like IEC61850, IEC101/103, DNP3, etc.

Experion electrical control solutions are a best fit for:

- IEC61850-compliant electrical SCADA
- Power management systems
- Industrial load management – dynamic fast load shedding
- LV/MV automation
- Interface with grid control



POWER FUNCTION BLOCKS: IMPROVING THE PERFORMANCE OF POWER PLANT CONTROL APPLICATIONS

As part of the Experion PKS solution, Honeywell offers dedicated Power Function Blocks including an ASME/IFC-97-compliant steam properties block for common power plant control applications. A set of 12 high-level, versatile function blocks have been added to the function block library of the Experion Control Execution Environment (CEE).

Specifically designed to meet the needs of power generation customers operating thermal, combined cycle, co-generation and combined heat power plants, this solution enables:

- Robust control and logic implementation
- Reduced time for configuration and testing of control and logic applications
- Efficient usage of control and logic processing hardware
- Enhanced maintenance due to ease of logic de-bugging and simplified documentation

Experion Power Function Blocks are available for drum level computation, main and IBV logic, group capability and run-back, first up alarm capture, etc. Each function block encompasses an otherwise multi-block strategy in to an elegant, functional solution.

EXPERION SAFETY MANAGER: OPTIMIZING ESD CAPABILITIES FOR CRITICAL APPLICATIONS

Honeywell Safety Manager is a modular, fault-tolerant safety system capable of solving the most challenging ESD)/SIS applications in the process control industry. The system is certified by TÜV Rheinland for use in safety applications up to Safety Integrity Level 3 (SIL3). It also complies with IEC61508, IEC61511 and NFPA guidelines.

The Safety Manager solution provides the optimal level of safety and process integration while still maintaining functional safety separation as mandated by relevant standards. T

hrough Experion operational integration, all systems are unified in a single, operationally integrated architecture, providing a unique opportunity to improve safety, process availability and efficiency. Safety Manager is offered for the following applications in a typical power plant:

- Boiler protection and BMS
- Turbine protection
- Plant protection systems such as Fire & Gas detection
- ESD system in fuel handling areas

Control and Instrumentation (C&I) Upgrade for Coal-fired Power Plant – Electric Utility, India

- High-value engineering provided for C&I refurbishment on coal-fired power plant
- Experion PKS deployed by replacing multiple control systems to improve process automation capabilities
- Single Experion PKS platform to control boiler, turbine and balance of plant
- Replaced entire plant instrumentation, field cabling, power supply system and control room consoles

TARGET CARBON NEUTRALITY WITH HONEYWELL END-TO-END EMISSIONS MANAGEMENT

Honeywell offers a complete range of solutions at each stage of your Sustainability journey to include near real-time reporting, the ability to track scope 1 and 2 emissions, and a consolidated system of record:

- Enterprise-wide emissions management framework
- Sensing technology for proactive leak detection & remediation
- Outcome-based services for emissions reduction
- Emissions reduction enabling technologies

UNISIM OTS: REPLICATING THE PERFORMANCE OF YOUR PLANT'S BEST OPERATOR

With the UniSim Operations and Competency Suites, your power plant can replicate the performance of its best operator every day and every shift. Honeywell has the largest installed base of operator training simulators in the process industries.

The UniSim Suite solutions are specifically designed to:

- Deliver curriculum, criteria, tools, and practices defining operator competency
- Enable experiential training for skills development
- Provide knowledge transfer and thinking exercises
- Promote good operator decisions
- Improve financial performance through safe, reliable and efficient operations

Through implementation of the UniSim OTS, power companies can dramatically improve plant safety, process efficiency, production results, and regulatory compliance.

CONTROLEDGE PLC: CONNECTING CRITICAL PLANT AND BUSINESS-LEVEL OPERATIONS

Honeywell's ControlEdge PLC, integrated with the Experion control and SCADA systems, Safety Manager safety system and Field Device Manager (FDM) for smart field device management, is an IIoT-ready

solution aligned with today's Industry 4.0 requirements. The unit is a best-fit for offsite plants, water treatment and coal/ash handling operations. The ControlEdge PLC offers a variety of advantages to power industry operators:

- Reduces configuration, integration and support costs
- Lowers risk with embedded cyber security
- Minimizes downtime with unified support
- Reduces total cost of ownership through an extended system lifecycle

The ControlEdge PLC, with ISASecure Level 2 certification, provides exceptional engineering flexibility. It offers a host I/O options with a Universal I/O (UIO) capability, as well as connectivity to multiple devices through the leading open protocols.

SMARTLINE™ INSTRUMENTS: DELIVERING ACCURATE, COST-EFFECTIVE FIELD MEASUREMENTS

SmartLine field instruments allow power producers to focus on running their plant. They are the answer to improving productivity and reducing downtime. And above all, they improve safety. This broad offering includes smart transmitters and analyzers for pressure, temperature, level, and flow. Honeywell also offers solutions for gas conditioning skid and gas flow metering.

SmartLine devices offer valuable features such as:

- Modular designs
- Advanced displays
- Easy and intuitive Honeywell User Experience (HUE)
- Faster and easier maintenance
- Lower inventory costs
- Seamless control system integration

With Honeywell's field measurement device and software portfolio, power industry customers are assured of increased accuracy, efficiency and reliability with a lower total cost of ownership.

Automation System Renovation for Integrated Water and Power Plant - Electric Utility, United Arab Emirates

- Experion PKS deployed for control of power generation and desalination units
- Safety Manager safety system implemented for burner management
- Seamless integration provided for turbine EHG controls

INDUSTRIAL CYBER SECURITY: COMPLETE SOLUTIONS TO PROTECT PLANT AVAILABILITY, RELIABILITY AND SAFETY

Cyber security is in every layer and process of Honeywell products and services. Honeywell was the first supplier to earn ISASecure™ Embedded Device Security Assessment (EDSA) certification. We are also a founding member of ISA Security Compliance Institute (ISCI).

Honeywell leverages a long history in plant safety and physical security to offer comprehensive cyber security solutions that ensure multiple layers of defense to help organizations:

- Meet regulatory compliance requirements
- Defend against emerging cyber security threats specific to industrial automation systems
- Establish secure connection between plant networks and IT networks
- Extend cyber security expertise to internal industrial control system staff
- Ensure on going awareness of new vulnerabilities and Advanced Persistent Threats (APTs)
- Timely response to and fast recovery from cyber incidents

A TRUSTED PARTNER IMPROVING YOUR BUSINESS RESULTS

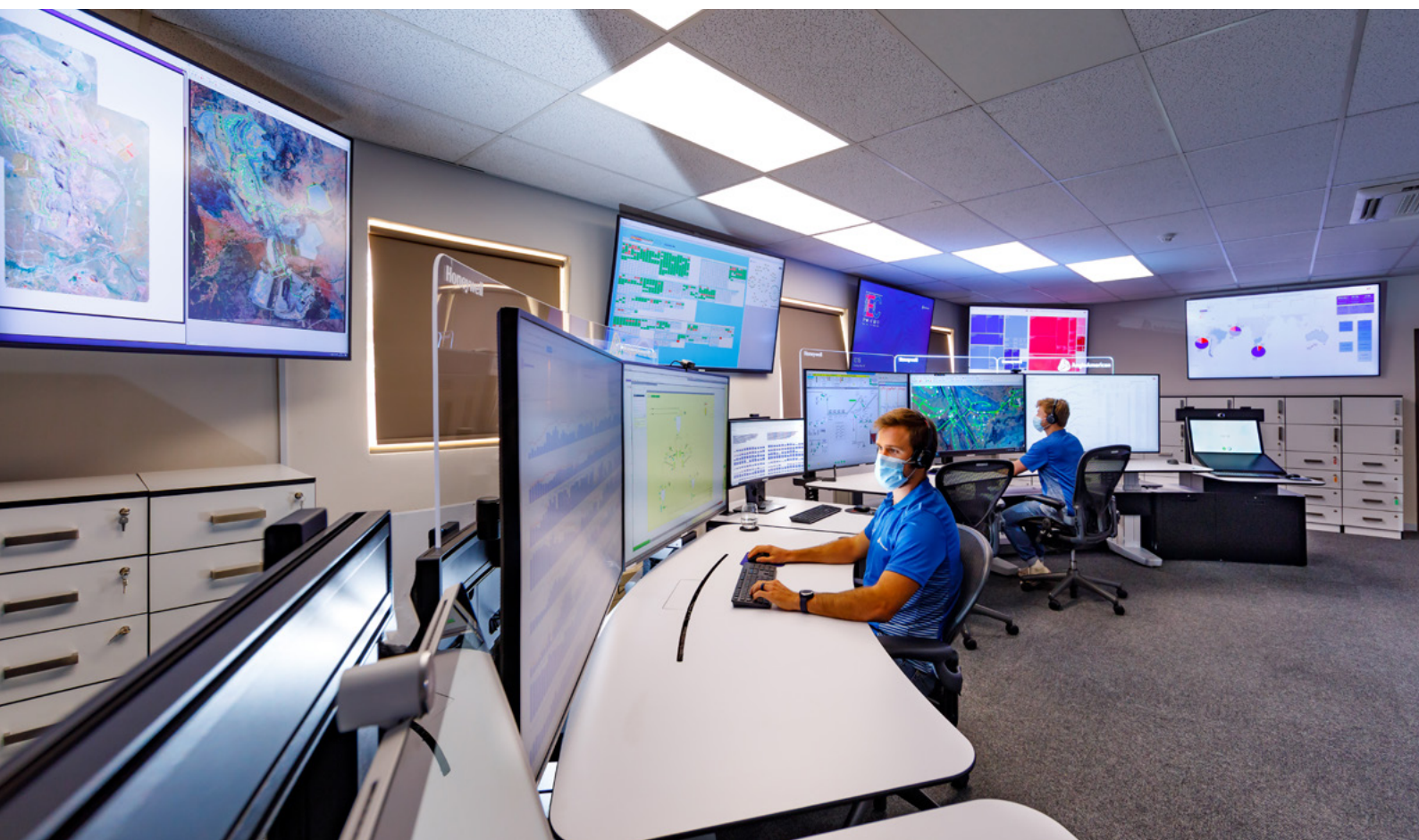
Honeywell Process Solutions is a full-scope technology and services provider to the power sector. As a trusted automation partner, we can leverage our strengths in advanced applications, production management and control system to business system integration along with our ability to drive tight integration of these applications across the enterprise.

Backed by decades of power generation industry experience, Honeywell delivers state-of-the-art products and services to ensure the reliable and efficient operation of customer plants and facilities all over the world.

Honeywell is there from project start to finish and beyond, helping unite people, assets, processes, and knowledge to maximize operational efficiency, project outcomes and business results.

Automation Solution for World's Largest IGCC Power Plant – Electric Utility, Saudi Arabia

- One of the largest Experion PKS installation with around 100,000 process tags
- Uniformance PHD implemented for plantwide process history archiving and reporting
- One of the industry's largest Operator Training Simulators (OTS) when completed



For more information

To learn how Honeywell's Power Industry Solutions improve performance and safety, visit automation.honeywell.com or contact your Honeywell account manager.

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