Navigating the Winds of Change: Powering Up for the Future with Digital Transformation

Hexagon's solutions can help your power generation operations prepare for tomorrow, today!

Introduction

Around the world, power generation companies are working to innovate their operations for an energy-forward, environmentally sustainable tomorrow. To prepare for this future state,[1] strategic plans set forth must include satisfying not only a potential rise[2] in energy demand, but also consist of a reduction in carbon emissions and greenhouse gases that have an impact on the planet's ecosystems that are attributed to the use of fossil fuels.[3]

In fact, the global phaseout of coal power and an end to fossil fuel subsidies are primary objectives of the European Union as it declared tackling climate change as a central part of its foreign policy. Reuters (2021)[4] reports that EU ministers have committed to an aggressive line on climate diplomacy by discouraging other countries from investing in fossil fuels and forging "high-ambition" alliances with large economies to spur faster emissions cuts. Other countries such as China, Japan and South Africa have also pledged to eventually cut net carbon emissions to zero.

A similar transformation is evolving in the United States as the federal government has shifted its approach to energy and the environment. Rejoining the international Paris Agreement, rescinding federal permits for the Keystone XL pipeline project,[5] and pausing new oil and gas leases on public lands, are just some of the examples for how the administration is planning "to cut electricity-sector carbon emissions to zero by 2035 and achieve a carbon-free U.S. economy by 2050."

As such, the winds of change are undoubtedly blowing fiercely towards global investments in renewable resources,[2] including solar, wind, hydrogen and gas, in the hopes of effectively addressing climate change as well as fuel economic growth,[6] create new employment opportunities and enhance human welfare.

And as governing bodies drive companies to deliver upon the committed-to results on climate-related initiatives through economic influences and environmental measurements such as carbon taxation[7] and cap and trade programs,[8] power and energy companies are looking to fast-track their digital transformation journey to manage new project ventures, remain competitive, lower operational risk, reduce downtime, increase worker productivity and facilitate compliance with important regulatory requirements.

However, the green-energy revolution is not the only factor that is propelling the power generation industry toward accelerated digitalization. The resonating effects from the COVID-19 pandemic that disrupted the power and energy industries led some analysts[9] to suggest that firms should consider using crisis times such as these "as a catalyst to usher in the future of work by rethinking how and where work is done and accelerating adoption of automation and digital capabilities." Others have also noted[10] that "for energy companies with the resources to weather the storm, the disruption of COVID-19 has done two things: first, it has underlined that survival requires getting to the next level on cost and adaptability, and that requires digital; and second, by forcing companies to abandon business as usual, it has lowered the barriers to change that typically impede digital transformation."

[1] *Utility Dive*, "2021 Outlook: Greening natural gas while planning for service reliability"
[2] IEA, "World Energy Model, Part of World Energy Outlook"
[3] EPA, "Sources of Greenhouse Gas Emissions"
[4] Reuters, "EU countries mull call for global coal power phaseout, end to fossil fuel subsidies: draft"
[5] Greentechmedia, "As Fossil Fuel Pipelines Fall to Opposition, Utilities See Renewable Energy as Safe Bet"
[6] IRENA, "Renewable Energy Benefits: Measuring the Economics"
[7] International Monetary Fund, Finance & Development, "Putting a Price on Pollution"
[8] C2ES, "Cap and Trade Basics"
[9] Deloitte, "COVID-19's impact on power, utilities & renewables companies"
[10] McKinsey & Company, "Digital transformation in energy: Achieving escape velocity"

This is where Hexagon can help your organization prepare for the "next normal." Whether you need to digitalize and transform operational systems and processes, accelerate your continuous improvement initiatives, improve decision making, maximize leadership time in the field, drive compliance to processes, optimize alarm management, protect your investment with state-of-the-art cybersecurity or build out a comprehensive digital twin, we are here to support your digital transformation journey and prepare for tomorrow, today. In today's digital age where technology is being embraced at an exponential rate, personnel at many power generation facilities are still using hard-copy documents, siloed spreadsheets, scattered databases and other inadequate data collection and management tools for crucial day-to-day procedures such as shift handover. This can lead to miscommunication, mistakes, inefficiencies and major operational and safety risks — all of which can be avoided. Some of the common challenges faced by power generation operators include:

- Deficient mobile technology and/or applications

- Detached real-time and process data from data historians, the CMMS, the DCS, EAM, PLC and SCADA systems

- Double handling of data

- Inadequate schedule compliance or compliance plan performance

- Insufficient leverage of the information collected in business value decision making

- Limited, singular add-on tools or point solutions that are costly and often incompatible with each other

- Missed opportunities to collect, store and structure more situational, qualitative and quantitative information

- Multiple data-entry systems for operations and HSE personnel

- Siloed information that's inaccessible to employees across the operation

- Slow and expensive methods for making changes that impede operational continuous improvement efforts

- Sluggish uptake of multiple systems for new employees

Based on our internal expertise and listening to customers share their experiences, we have identified three principal business reasons why an organization should power up its digital transformation journey (employee safety and fatality prevention, workforce productivity and asset productivity).

Photo: Calpine Corporation: Lake View Geothermal Power Plant

Customer Spotlight

Calpine Corporation, North America's largest generator of electricity from natural gas and geothermal resources, has a fleet of 83 power plants — in operation or under construction — and represents nearly 27,000 megawatts of generation capacity. Serving customers throughout the United States and Canada, Calpine specializes in developing, constructing, owning and operating natural gas-fired and renewable geothermal power plants to generate power in a low-carbon, environmentally responsible manner.

Customer Challenges

Calpine needed to implement a web-based electronic logbook application to facilitate shift handovers that would allow personnel to record plant status, shift activities and open issues. Calpine also required a digital platform that managed operations data in a common format and would be readily accessible and visible at multiple levels in the organization. This operations data needed to be consumable across the numerous Calpine plants and facilities in various regions.

Hexagon Solution

j5 Operations Management Solutions were a perfect fit to meet its needs and resolve Calpine's challenges. Post-implementation of the

j5 Operations Logbook, **j5 Shift Handover** and **j5 Standing Orders**, Calpine is taking advantage of a common operations management methodology with a dedicated data repository for managing and recording plant activities. This provides field operators with the data they need to safely operate their facilities and supports the corporate office with the required information for trending, analysis and compliance needs. Overall, Calpine is achieving the following benefits across their operations:

- Streamlined reporting from the office to the plant

- Improved data flow for all authorized personnel

- Automated shift handover information

- Increased awareness of high-priority actions

- Structured environment for procedures across the fleet

- Reduced risk due to informed digital logbook procedures

"It has become an essential tool. j5 Operations Logbook entries from 12 remote sites can now be easily reviewed first thing each morning via the Emailed Daily Log Report. Old-school operators were initially skeptical but quickly learned how to use the program.

The program is used by 100% of the employees, many of which had no computer skills prior to Calpine. Previous paper logbook entries were lacking and management oversight of the log entries was used mainly when there was an incident. The program is used to support plant administrative activities such as GADs, corporate event reports and used to monitor daily work activities.

One of the other major benefits of the program is the j5 Standing Orders feature. Managers now have the ability to issue night orders, standing orders and new procedures and then have the ability to see that their direct report received and acknowledged. It makes the employees more accountable for their actions and is just a good way to communicate."

- Plant Manager, Calpine Corporation

Accelerate Your Digital Transformation Journey to Operational Excellence with Hexagon

Investing in a comprehensive, interoperable and enterprise-scalable digital transformation strategy will accelerate your continuous improvement efforts in this ever-changing economic landscape. It will also promote the long-term resilience of your company's safety performance, workforce and asset productivity and provides your business with the competitive edge it needs to perform at its best. As your trusted digital transformation partner, Hexagon's operations and maintenance solutions can help you create intelligent information from disparate sources including **unstructured** disconnected data, documentation and **structured** digital data sources and existing databases. Hexagon's solution also help you find and resolve duplicate data and **consolidate** information to reduce operational risk, increase efficiency, decrease downtime, remove value leaks and meet internal and external compliance. Here is how we can work with you to implement your operational excellence digital transformation roadmap, step-by-step.

Step 1 — Digitalize Operational Processes, Procedures and Permits

The creation of a solid operations management data ecosystem by digitalizing your operational processes, procedures and permits is a strong first step on the road to digital transformation. Critical asset, situational, qualitative and quantitative information should be captured, structured and stored digitally and more importantly, organized and made available to support safety-critical operational processes. **j5 Operations Management Solutions** can take your shift, operator round, personnel, safety, maintenance and process information and make it visible and viable to users across the entire organization. This on-premise, or SaaS, solution is designed to foster greater communication, coordination, transparency and knowledge transfer between teams that in turn leads to improved safety and productivity, reduced operational risk and a more empowered and engaged workforce. j5 Operations Management Solutions offers a unique, straightforward digitalization approach with its patented spreadsheet-like configuration environment. This distinctive yet familiar low-code/no-code approach enables personnel to quickly manage changes without requiring expensive and slow vendor and IT services, accelerating operational continuous improvement so your information collection and sharing is always up to date and reflective of your operations. This distinction allows j5 Operations Management Solutions to be a quick-time-to-value investment, with high flexibility and a lower total cost of ownership.

Reinforcing this first step with an industry-leading knowledge management suite aimed at making human performance better through digital tools and connection to the modern process industry solutions used today is critical.

AcceleratorKMS is an industry-leading solution that expedites the digital transformation of paper-based, high-risk operational procedures and work processes. However, it also enables organizations to easily manage, govern, and distribute the up-to-date critical operational content field workers require to keep operations running optimally and learn faster. AcceleratorKMS is a purpose-built and industry-leading Knowledge Management System for critical operational content. The digital system includes Procedure Life-cycle Management (PLCM), a Connected Worker Platform (CWP), a Learner Experience Platform (LXP), and a Component Content Management System (CCMS). The combined capability facilitates solutions to many critical problems experienced in workplaces across America and around the World. The system provides an integrated digital content ecosystem in an easy-to-use and intuitive package focused on making the complex simple.

Proven Business Outcomes

These are quantitative benefits that were reported by surveyed j5 Operations Management Solutions customers in 2020:

- Enhanced situational awareness (**30%-50%**)
- More accurate shift handovers (**30%-50%**)
- Increased asset availability (**20%-50%**)
- Better workforce productivity (**20%-50%**)
- Improved regulatory compliance (**20%-50%**)
- Reduced maintenance costs (**10%-50%**)

> **The implementation of j5 Operations Management Solutions across the water control function has given greater visibility of ongoing issues and given us a consistent and accountable shift handover tool."**
>
> **- Ant Tyler, Systems Operations Compliance Manager, Thames Water, UK**

> "To me it's completely game-changing to have all this information readily available on one screen. This is the first time an end user can go to one place and get all the operations, maintenance, engineering and process data they need to do their duties. By having all this information readily available in a digital twin, I believe this is an industry first for the oil and gas industry, where it has been difficult to monitor remote assets and equipment in dangerous areas."

- Michael Fry, President and CEO, Deepwater Subsea, USA
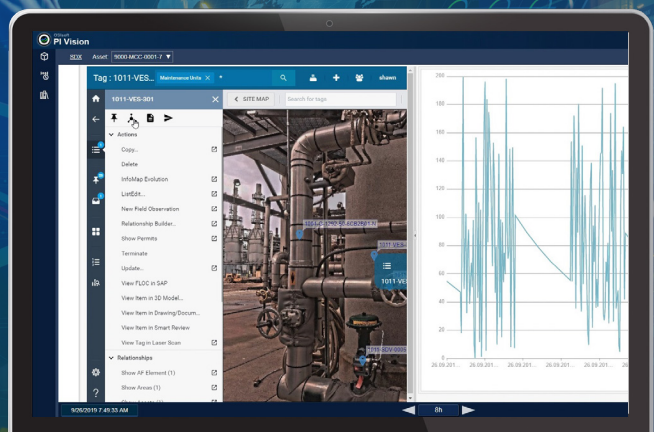
Next, organizations must bridge the islands of crucial information and records in numerous formats on separate systems and digitally connect them to operational processes, procedures, permits and data to help reduce operational risk, increase efficiency, decrease downtime, remove value leaks and meet internal and external compliance. With PAS AlarmManagement™ you can easily implement industry-wide best practices to streamline and improve your alarm systems and operator effectiveness. PAS ControlWizard™ and PAS TuneWizard™ work together to monitor, assess and tune your control loops to ensure optimal performance, robust control, and improve overall safety and reliability. PAS InBound® helps you create a master database of operational limits. With it, you can ensure alignment across all your sources of record and analyze your performance against those limits. PAS IPL Assurance® provides visibility into your Independent Protection Layers (IPL), making it easier to assure your operations are safe to run. And the PAS Solution portfolio are interoperable with j5 Operations Management Solutions. Adding further value to organizations investing in a digital transformation roadmap guided by Hexagon. Companies can further enhance information connection and interoperability by aggregating operational data and enabling a digital thread framework with **HxGN SDx®**. This central asset lifecycle information management (ALIM) solution is strategically designed to capture, organize and link large volumes of information, in context and provides web-based access to your authorized personnel. Available as an on-premise or SaaS solution, it can be adopted by any facility without introducing new software or investments in IT infrastructure. HxGN SDx is a **CFIHOS**-compliant, ALIM digital platform that centralizes and unites operations, maintenance, safety, engineering and real-time data. HxGN SDx can be connected to Hexagon technology such as j5 Operations Management Solutions and third-party industrial data sources such as Aspen InfoPlus.21®, IBM Maximo®, SAP® Plant Maintenance (PM) and the OSIsoft™ PI System™ to provide a consolidated, role and context relevant view of information.

Proven Business Outcomes

Contact Energy (New Zealand)
60% alarm rate improvements by adjusting alarm setpoints, deadbands, delay times and improving control logic and **65%** reduction in long-standing "stale" alarms, contributing to improvement of operators' alarm-related workload

Deepwater Subsea (USA)
70% productivity savings in documentation and completion of inspections and **95%** saving in time retrieving and searching for quality evidence post inspection

Step 3   Protect Your Digital Investments

On the journey to digital maturity, keeping your operations running safely, smoothly and protected from cyber threats is vital to prevent unnecessary interruption to your enterprise. There are no shortages of reports or news outlets raising the alarm on cybersecurity awareness. In fact, the ARC Advisory Group[11] (2019) reported that "many industrial operations remain at risk of costly, disruptive cyber incidents." Its analysts recommended that "all industrial companies consider software like **PAS Cyber Integrity™** as a foundational element of a defense-in-depth cybersecurity strategy." This solution also provides numerous significant customer benefits such as: discovers and automatically maintains a complete inventory of OT assets inventory and enables workflows and documentation for vulnerability remediations and compliance with ISA/IEC 62443, ISO 27001/2, NERC-CIP,[12] NIST and the NIS Directive, as well as other standards and regulations, accelerating recovery with backups of critical control system data and supporting in-depth forensic analysis. ARC Advisory Group also noted that the solution's capabilities support execution of critical tasks in the "Secure Systems" and "Incident Management" processes identified in its "Industrial/OT Cybersecurity Maturity Model." This includes functionality for developing and maintaining asset inventories, identifying, evaluating and managing system vulnerabilities, detecting and managing unexpected system changes and analyzing and visualizing system security risks.

### Proven Business Outcomes

- Speeds time to recovery from major events, cyber incidents, and unplanned outages

- Reduces inventory and documentation effort by **70%** or more

- Improves productivity by **20%** to **50%** via always-on change management insight into OT/ICS configurations

[11] ARC Advisory Group, "PAS Global Cyber Integrity Helps Secure Industrial Control Systems"
[12] NERC, "CIP Standards"

> **In industrial facilities, you typically find an array of proprietary ICS that are difficult to inventory, which subsequently makes monitoring for change and vulnerabilities a security challenge. As these systems have direct authority over process safety and production, there is unaddressed cybersecurity risk within a facility environment. Hexagon has architected its software to cover these systems, and its customers have testified to Hexagon's effectiveness in reducing security risk."

- Vikrant Gandhi, Industry Director, Frost & Sullivan, USA
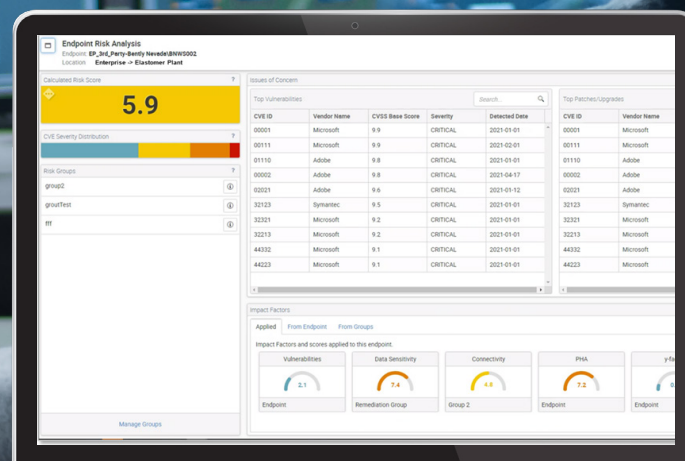
> **Digital twins are becoming a business imperative, covering the entire lifecycle of an asset or process, and forming the foundation for connected products and services. Companies that fail to respond will be left behind.”**
>
> **- Thomas Kaiser, Senior Vice President of IoT, SAP**

End Goal Build, Maintain and Evolve a Digital Twin

A **digital twin** enables asset owners and operators to build and maintain an information management data ecosystem throughout the asset lifecycle, allowing for a continuous journey of operational excellence. By deploying a comprehensive digital twin, complex data can be analyzed and transformed into actionable information. The significance of this ultimate digital platform is that it opens the door to the competitive advantages made possible by using predictive and prescriptive analytics, artificial intelligence (AI), machine learning and automated decision making across the power generation value chain. As mentioned in an article published by Forbes (2017),[13] digital twin technology helps companies improve the customer experience by better understanding customer needs, develop enhancements to existing products, operations and services and can even help drive the innovation of new business. **Hexagon's Situational Awareness solution** — powered by **Luciad** — boosts your operations and empowers your workforce by delivering to them a valuable, data-driven experience that encapsulates easily consumable, timely information regarding past events (what's happened), present facts (what's happening now) and future predictions (what could happen/what should happen/what's scheduled to happen). Therefore, seamlessly connecting your safety-critical operations processes, procedures and permits, alarm management methodology, maintenance work orders, real-time and historical process data, engineering schematics and technical documentation with 3D models, laser scans and cybersecurity safeguards enables a robust and comprehensive digital twin for your entire operation.

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[13] *Forbes*, "What Is Digital Twin Technology - And Why Is It So Important?"

Connect

A digital twin is a dynamic digital depiction comprised of physical entity information. It is the single version of the truth unique to a user's perspective for a point in the lifecycle with many digital levels.

Think

Data is diffused seamlessly between the digital depiction and physical entity to enable co-existence. Then advanced technologies bring data, algorithms and context together.
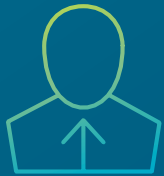
Do

With this comes understanding, prediction and optimization for the physical entity to drive improved business outcomes.

About HxGN SDx

HxGN SDx is a modular, on-premise or SaaS ALIM solution that digitally transforms facilities and allows companies to build a digital twin to optimize efficiency, reliability, predictability and safety across the lifecycle of an asset.

HxGN SDx is comprised of two independent, yet integrated modules that address the major asset lifecycle stages of an industrial facility. Each module provides work processes, roles and content tailored to address a specific phase of the asset lifecycle. Each module also includes a comprehensive set of capabilities with additional options that can be licensed as needed:

HxGN SDx Projects

Enables better projects planning and review, ensuring effective information aggregation and collaborative project execution, improving project efficiency and reducing risk.

HxGN SDx Operations

Increases operations and maintenance efficiency, safety and internal and external regulatory compliance through templated work processes and manages change and interoperability with other industrial systems of record.
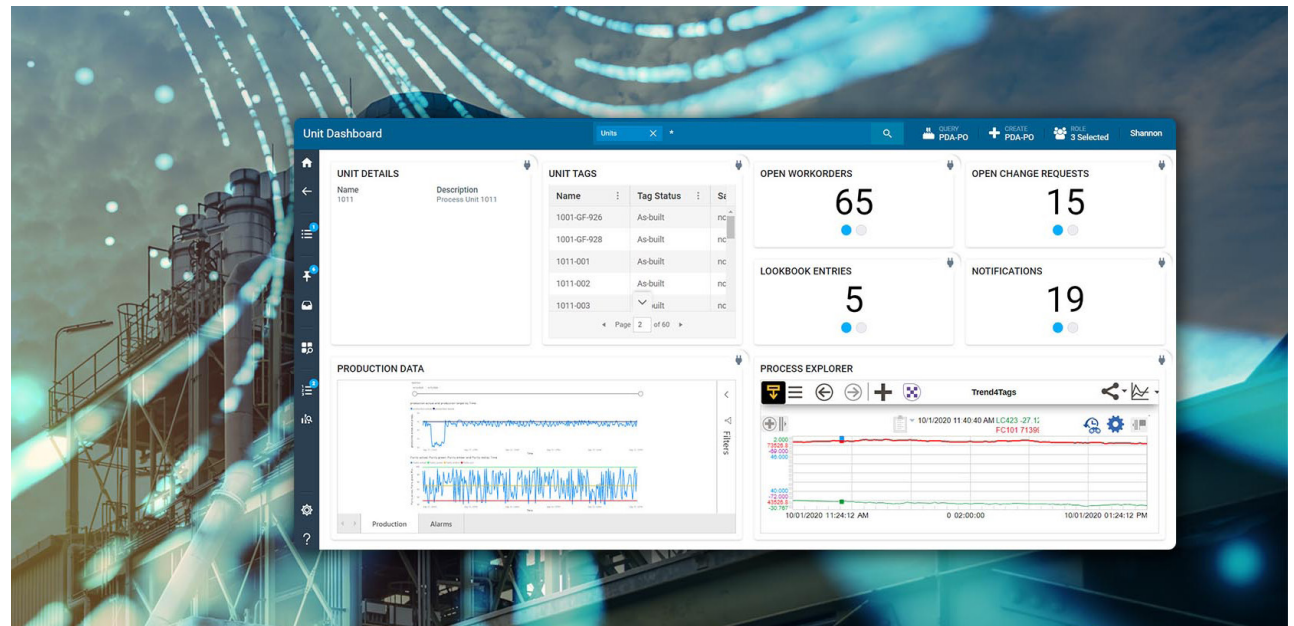
Achieve Operational Excellence in Power Generation

Employee Safety and Fatality Prevention: Risk Mitigation and Workforce Accountability

Digitalizing and automating operational processes such as area and shift handovers, permitting and inspections enables an additional level of situation data to be collected and insights into workforce compliance and efficiency. These new insights help close operational gaps that create safety risks and help improve your operations to save time and money.

Workforce Productivity: Decrease Operating Expenses (OpEx)

Optimized assets, reduced downtime, enhanced productivity and better safety compliance all contribute to lower OpEx and higher profitability. Technology is now allowing a larger percentage of an operational workforce to work remotely, which has been shown to increase employee engagement and happiness while reducing hazard exposure hours.

Asset Productivity: Increase Efficiency

Empower your workforce to make informed decisions in real-time with the information they need, when they need it and where they need it — via desktop, laptop or mobile devices. With digitalize processes, the information you need is always on hand, there's no need to search for paperwork from a previous shift or interrupt a co-worker who's on break or on vacation.

Employee Safety and Fatality Prevention: Meet Compliance

When you need clear, concise and current records for local, state or federal regulatory compliance requests and procedures, having your data locked in a physical paper trail to can lead to unnecessary delays and misinformation. Digital records allow you to instantaneously deliver accurate, current and complete information to internal and external regulators.

Workforce Productivity: Save Time

From the office to the field, personnel can save hours each day with digital access to the right information at the right time. Instead of spending precious time sorting through paper documents or multiple systems to track, access and manage vital operational information your personal can put your data and their skills to work optimizing and improving operations.

Asset Productivity: Reduce Operational Risk

Workforce safety is improved when you reduce the chances of human error due to reliance on physical paper, especially when it comes to equipment inspections and shift handovers. Digitalizing these processes ensures the right equipment and readings are inspected at the right time and assists employees to quickly highlight when equipment is operating out of its specified ranges.

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Introducing R-evolution

In February 2021, Hexagon launched a new business venture, R-evolution, to further develop its sustainability agenda, which include climate goals to significantly reduce its own carbon footprint. R-evolution will invest in and run profit-driven, sustainable projects that leverage Hexagon's technology to accelerate the world's transition to a sustainable economy. The first set of investments, centered around renewable energy, will involve the construction and operation of solar farms in Andalusia, Spain, producing energy with 50,000 tonnes less CO_2 equivalents per annum than the grid's residual mix.
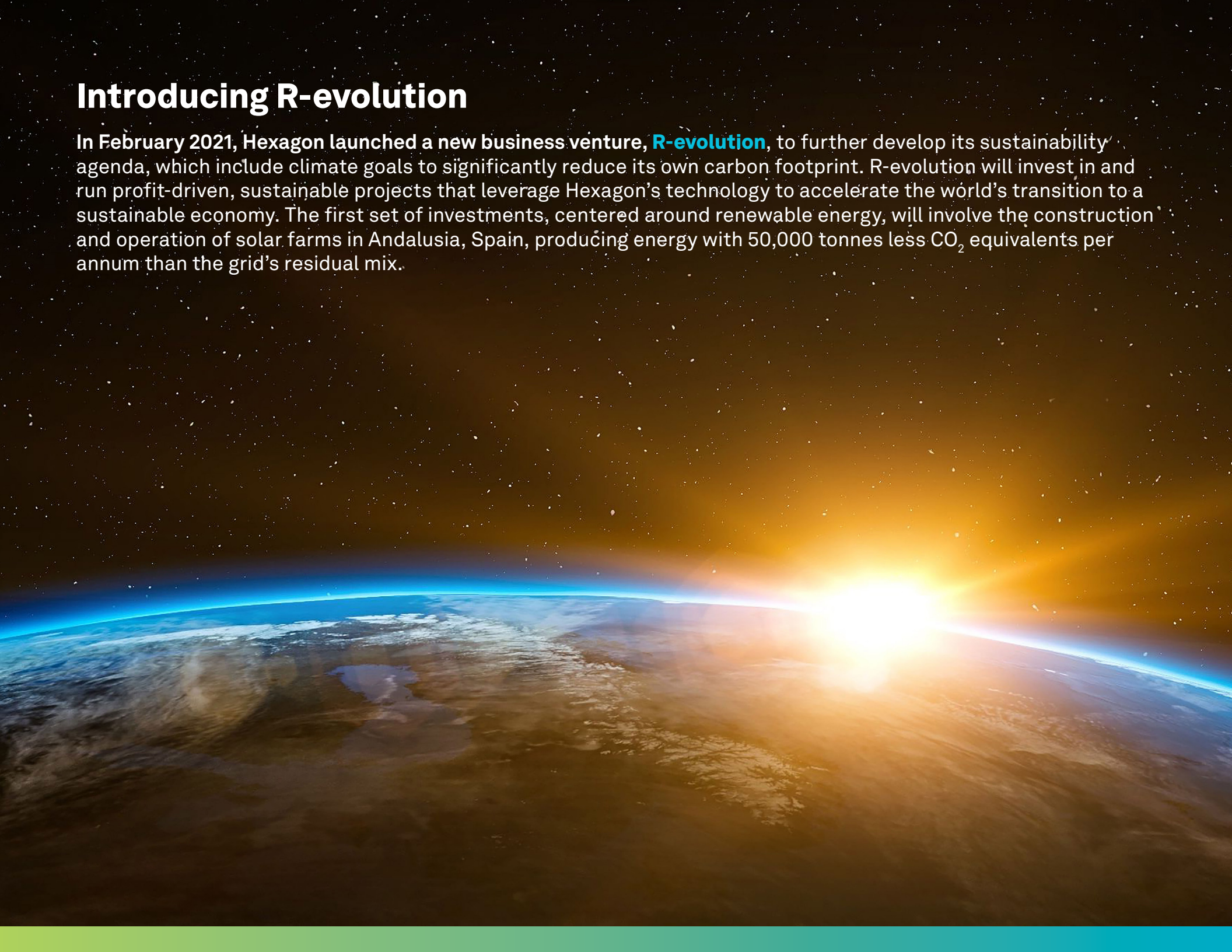
Working with a Trusted Digital Transformation Partner

As **YOUR** trusted digital transformation partner, we provide evolving solutions that allow people to design, engineer, construct, operate and maintain industrial assets with state-of-the-art technology backed by a team of global experts and research. Together, we are co-creators of the smart solutions that improve today, work tomorrow and empower adaptive change. Putting data to work — to boost safety, efficiency, productivity and quality outcomes — are values we share with you.

Our focus is on autonomy

Leveraging data to its fullest potential is the outcome we want – **moving beyond automation to autonomy**
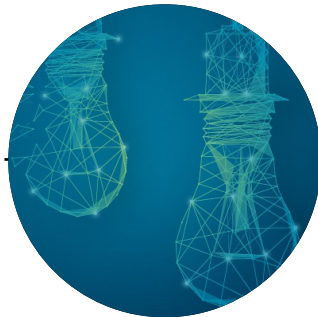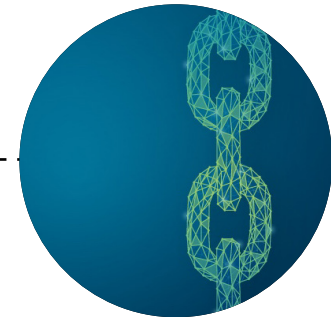
Our commitment is to innovation

With **nearly 4,000 employees in R&D and more than 3,700 active patents** our technology leadership is clear
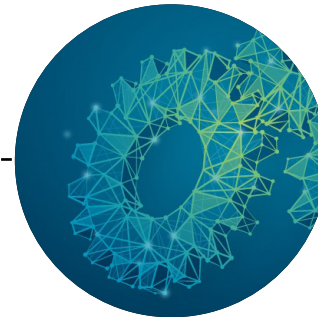
Our value is strategically vital

Efficiency, **productivity** and **quality** results in scalable sustainability – fewer resources, less waste, less pollution

Our stability is consistently proven

Sales growth from €500 million in 2000 to **€4.3 billion** in 2021 with **approximately 22,000 employees across 50 countries**

About Hexagon's PPM Division

Hexagon's PPM division is the leading global provider of enterprise engineering software, enabling smarter design and operation of plants, ships and offshore facilities. With 50+ years of experience in delivering innovative industrial software, Hexagon solutions transform unorganized data into intelligent, actionable information that enables smarter design, construction and operation of industrial projects across the asset lifecycle.
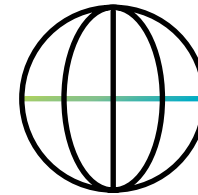
Revenue Distribution

34%　**37%**　**29%**

Awarded Solutions Provider

Ranked No. 1 over 13 consecutive years, across **5 different categories,** recognized in 2019 by ARC Advisory Group
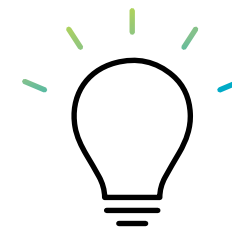
Global Presence

More than **4,000 employees**, with offices in **50 countries**

R&D Focused

More than **19%** of total revenue invested in 2021

Innovative

More than **40 registered patents** around the world

About Hexagon

Hexagon is a global leader in digital reality solutions, combining sensor, software and autonomous technologies. We are putting data to work to boost efficiency, productivity, quality and safety across industrial, manufacturing, infrastructure, public sector, and mobility applications.

Hexagon's PPM division empowers its clients to transform unstructured information into a smart digital asset to visualize, build, and manage structures and facilities of all complexities, ensuring safe and efficient operation throughout the entire lifecycle.

Hexagon (Nasdaq Stockholm: HEXA B) has approximately 22,000 employees in 50 countries and net sales of approximately 4.3bn EUR. Learn more at hexagon.com and follow us @HexagonAB.