The Digital Utilities Industry
Unlocking New Business Value with Intelligent Technology
The utilities added value relies now as much on the commodity (energy and water) as on the unique insights in the business that provides unlimited optimization possibilities.

New business models and new actors are emerging. Consumers are becoming energy producers. Markets are liberalized. Renewable energy sources challenge the commercial viability of “classical” power plants.

Water companies are looking at new business models leveraging circular economy business paradigms.

Innovative utilities are already creating the next generation of service-based business models that are powered by insights gleaned from data collected from smart home devices, intelligent meters, distributed energy sources, weather maps, energy exchanges, and consumer behavior.

We are looking forward to shaping the energy market of the future by powering innovators with the Intelligent Enterprise.

Miguel Gaspar Silva
Global Vice President
Utilities Business Solutions
SAP SE
Utilities Face New Challenges and Opportunities Amid Digital Disruption

Leading utilities use market dynamics to create and capture new business opportunities.

Deregulation
New rules change the energy market dynamics, breaking down the entry barriers for new players.
Utilities innovate to protect their business while capturing new shares of their customers' "energy wallets."

Decentralization
Wind and solar energy are intermittent and are harvested locally.
Utilities transform the grid topology that was built for central generation and one-way distribution while finding ways to store energy and control demand to keep the grid stable.

Decarbonization
Energy is fundamental for our 21st-century lifestyle, and we need to find new ways to sustainably satisfy the rapidly growing need for energy.
Utilities move to carbon-free energy generation, while rapid innovation challenges the large-scale generation and transmission infrastructure.

Digitalization
Digital technology is connecting things, consumers, and enterprises.
Utilities use digital technologies to run an efficient and resilient energy infrastructure and create new value for their customers shareholders.

Leading utilities use digital technologies to:

- Become an intelligent enterprise
- Reimagine their business models to grow their share of their customers’ energy wallets
- Create innovative business processes to protect and expand their customer base
- Drive efficiency in asset operations and customer engagement to protect their bottom line
- Use environmental data and advanced analytics to predict power outages caused by natural disasters, to protect people, and to help the communities recover quickly
With Huge Opportunities and Challenges, It Is Essential to Focus on the Right Strategic Priorities to Drive Digitalization

The regulatory, competitive, natural, and economic playing field creates and constrains the opportunities to drive for efficiency and to capture new growth potential.

In many markets, utilities’ capital assets and customer bases are under attack. Creative energy startups, car manufacturers, infrastructure operators, and retailers tempt residential and commercial customers with attractive energy offerings. Deregulation and decentralized energy generation erode the commercial viability of power generation, transmission, and distribution assets.

Innovative utilities respond effectively to the encroaching competitors and to new demands on the power infrastructure.

The digital prosumer
Consumers harvest solar energy on their roofs and use it, store it in batteries, charge their electric vehicles – or sell it on the energy market. “Prosumers” are tiny but numerous competing power generators. Their assets to generate, store, consume, and manage energy offer new business opportunities. Electric vehicles, especially, open a new, wide playing field for creative utilities.

Power enterprises
Commercial customers run decentralized energy infrastructure to generate power and heating to run their enterprise and charge their car fleets. Energy costs hurt the bottom line, so aligning energy production and consumption with the energy market is a smart way to save energy costs. This offers new business opportunities for utilities by helping customers manage their energy assets and participate in the energy market.

Intelligent assets
Utilities can operate digitalized assets smarter and cheaper using digital insights and controls. Demand-side management and integrated real-time optimization of production and distribution keeps assets running in their sweet spot. Integrated asset-maintenance diagnostics, planning, and execution reduce unplanned, expensive activities.

Outage management
Storms and floods threaten sensitive energy infrastructure and the population’s safety and business productivity. Innovative utilities use digital technology to predict, prevent, and recover from outages to minimize the impact of natural disasters on the population, businesses, and their own energy infrastructure.

Business optimization and extending the value of key processes are key priorities for innovative utilities companies to simplify and reimagine their business and free up resources to invest in transformative programs.

63%
Of customers are willing to pay more for better customer service1

US$50 billion
Expected worldwide energy storage market by 20202

80%
Of U.S. electricity will be generated by renewable sources by 20503

$130 billion
Annual estimated economic loss in the United States from avoidable (small) power outages4

Our Point of View: To Achieve These Strategic Priorities, Leading Utilities Companies Are Becoming Intelligent Enterprises

An intelligent enterprise enables employees to focus on higher-value outcomes and invent new business models and revenue streams. By applying intelligent technologies such as the Internet of Things (IoT), artificial intelligence (AI), machine learning, and advanced analytics, leading utilities companies transform into event-driven businesses. These event-driven businesses automate repetitive tasks, enable employees to focus on higher-value tasks, and allow the invention of new business models and revenue streams by monetizing data-driven capabilities and applying core competencies in new ways.
SAP Enables Utilities Companies to Become Intelligent Enterprises

SAP helps utilities companies transform into intelligent enterprises through integrated business applications that use intelligent technologies and can be extended on SAP® Cloud Platform. This enables next-generation business processes to deliver breakthrough business value on our customers’ journeys to becoming intelligent enterprises.

Intelligent Suite

The set of applications provides the business capabilities that utilities companies need to run their business. End-to-end business processes span multiple applications, so processes and data must be integrated for automation, a seamless user experience, fast adoption, and ease of operations.

Intelligent Technologies

Several innovative technologies have matured to practical use:
- The IoT makes business applications interact with the physical world.
- Big Data makes large data sets accessible for advanced analytics and intelligence.
- Machine learning and AI automate repetitive processes and learn from human exception handling and decision-making.
- Advanced analytics find data patterns to support decisions and predict the future.
- Blockchain distributes collaborative processes across the entire value network.
- Data intelligence finds new value in data assets for new business models.

Digital Platform

The digital platform, which is powered by SAP HANA®, extends intelligent, end-to-end processes and connects to these data sources:
- Cloud platform that allows customers and partners to extend their intelligent suite to run additional business processes
- Data management to handle and organize data, a key asset of an intelligent enterprise
SAP Leonardo technologies bring the power of intelligent technology to your platform and applications to streamline existing workloads, reveal optimal decisions, maximize revenue and profits, improve customer satisfaction, and capitalize on digitally transformed business models.

In addition, companies can use SAP Leonardo Services, delivered by world-class innovators that combine industry and emerging technology expertise, to help drive innovation and business impact at scale.
SAP Leonardo: Intelligent Technologies Optimize, Extend, and Transform the Business

Utilities intelligent scenarios
SAP Leonardo technical capabilities are embedded in business-core and industry applications to optimize and extend business processes. Companies can also use them together with innovation services to build and assemble next-generation business processes. For utilities companies, we support more than 20 intelligent scenarios to optimize, extend, and transform their business. Below are a few highlighted ones that will be further explained on subsequent pages.

- Cash application
- Service ticket intelligence
- Customer retention
- Project cost forecasting
- Implausible meter reads
- Digital boardroom
- Predictive maintenance and service
- Asset intelligence network
- Customer profitability analytics
- Cloud for energy
- Digital prosumer
- E-fleet management
- Merchant and industrial energy hub
- Green energy tracking and distribution
SAP Leonardo: Applications Optimize Business Processes

Optimizing business processes results in achieving the same business outcome more efficiently and reliably. We begin with scrutinizing current practices: What can be automated using machine learning? How can we make processes aware of the real world by connecting them to the things around them? How do we give people the right analytical tools to make sense of vast amounts of data and to handle exceptions?

<table>
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<td>Labor-intensive and error-prone processes for invoice handling</td>
<td>Labor-intensive and slow resolution of customer service tickets</td>
<td>Lack of insight into root causes of customer attrition</td>
<td>Inaccurate project cost estimations</td>
<td>Manually correcting missing or inaccurate meter reads</td>
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SAP Cash Application software uses machine learning to automatically match invoices to bank statements and extract payment information from unstructured documents. Thus, it frees up finance professionals to focus on strategy and service quality.

SAP Service Ticket Intelligence application efficiently processes inbound social media posts, e-mails, and other channel interactions. It automatically determines classifications, routing, and responses.

The SAP Customer Retention application anticipates customer behavior – such as product cancellations or renewals – with instant insights from transactional data and digital interaction points.

Project cost forecasting uses historical data and machine learning capabilities to help project managers improve their project cost planning and enables investment decisions based on realistic estimations.

SAP solutions enable efficient handling of implausible meter reads, which provides root-cause and statistical analysis of meter-reading exceptions – reducing or eliminating manual processes.

- Increased productivity
- Reduced error rates
- Increased productivity
- Higher customer satisfaction
- Increased customer retention
- Less budget overruns
- Reduced effort for project planning
- Increased productivity
- Reduced error rates

BASF is using machine learning to increase efficiency in its finance organization: 94% of payments are now automatically matched to invoices.

AEGEA is improving the water supply with machine learning and the Internet of Things by increasing efficiency and decreasing water loss for each pump in the system. It is now able to predict critical situations, suggest how to solve them, and drive simulations to improve decision-making.

Swiss Federal Railways (SBB) manages extreme peak loads in electricity demand with SAP HANA streaming analytics software. By replacing hardware with smart technologies, SBB increased liability of the railway power supply and reduced investment costs by one-third.
SAP Leonardo: Capabilities and Services Extend Current Processes to Capture New Sources of Value

Extending business processes aims at generating more value and new outcomes. Begin by challenging the status quo: Are we doing the right things in managing assets or in shaping customer relationships? Innovators use digital technology to reimagine business processes to create new value. Outages never happen, because they have been predicted and prevented; and customers receive service before they realize they need it. Assets go smoothly through their lifecycle because they are networked with OEMs and service providers.

Northern Gas Networks uses SAP Digital Boardroom and analytic solutions from SAP to transform its operations and improve real-time visibility across the business.

CenterPoint Energy implements a predictive maintenance solution based on the SAP HANA business data platform that supports the integration of information technology with operational technology.

Arctic Winds operates wind turbines under extreme weather conditions. With SAP Predictive Engineering Insights, Arctic Winds replaces physical inspections of the turbines with digital inspections.

BASF uses SAP Asset Intelligence Network to establish a fully integrated and centrally managed asset information repository, helping ensure data consistency and availability.

Eight hundred million installed smart devices by 2020 allow utilities to better understand customer behavior.5

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### Table: SAP Leonardo Capabilities

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<th>Customer profitability analytics</th>
<th>Cloud for energy</th>
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<tr>
<td>Poor management decisions due to ambiguous or unclear information</td>
<td>Costly outages due to asset downtime</td>
<td>Costly asset downtime and risk of safety and compliance incidents</td>
<td>No granular margin insights as obstacle for margin-focused transformation</td>
<td>Exploding amounts of meter data and inability to gain data insight</td>
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**SAP Digital Boardroom** equips C-level executives with real-time contextual information and ad hoc analysis and provides a single source of truth for the company (also utilities-specific content such as renewable energy).

**The SAP Predictive Maintenance and Service solution** uses sensor and condition data to predict and prevent failures, thus optimizing asset performance and availability.

**SAP Asset Intelligence Network** enables collaborative asset management – internally and together with business partners across companies along the asset lifecycle.

**The SAP Customer Profitability Analytics solution** delivers multidimensional margin information on the most granular level. With advanced algorithm and machine learning technology, the solution also provides automatic analysis and detection of margin outliers and margin drivers.

**The SAP Cloud for Energy solution** allows utilities to collect and store customer usage data to determine patterns for more-accurate forecasts, develop innovative products and services, and help ensure billing quality.

- Improved institutional knowledge
- More-informed decisions
- Lower maintenance costs
- Optimized investment planning
- Improved asset operating efficiency
- Fewer safety and compliance incidents
- Increased margin
- Reduced revenue leakage
- Higher margin
- Improved customer satisfaction and retention
SAP Leonardo: Intelligent Technologies and Innovation
Transform the Utilities Value Chain and Business Models

Transforming the business starts with ideas to conquer new markets with current products or deliver new value on your home turf. It often goes along with a renewed view on who is the ultimate customer and what kind of value they really need.

“With the help of SAP, we are transforming to a ‘live’ digital enterprise to better serve customers.”
– Gary Hayes, CIO, CenterPoint Energy

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<td>Private customers are creating their own energy and are becoming “prosumers.” The classic business model of just selling energy no longer works.</td>
<td>Companies want to create positive economic, social, and environmental impact by transforming their fleets into electric fleets.</td>
<td>Base and peak load-driven generation may lead to insufficient short-term flexibility at markets, with renewable energy additions and integration of industrial targets. More variability and volatility are the consequences.</td>
<td>Customers struggle due to the lack of auditability and transparency and high cost of tracking and tracing consumption of renewable and regional energy products.</td>
</tr>
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Using SAP solutions for customer engagement and the IoT enables utility companies and energy service providers to sell new services, such as solar panel management or e-mobility, and manage the prosumer lifecycle (win, onboard, operate, up-sell).

E-fleet management software from SAP enables customers to manage e-cars, drivers, and charging infrastructure and procedures.

Transformation into short-term operation strategies, integrating utility and industrial-scale energy resources into flexible trading and industrial-energy portfolios. The merchant and industrial-energy hub enables continuous monitoring and balancing of short-term reliability and trading schedules.

Personalized 1:1 certification of green energy products is automated by Wipro using the SAP Leonardo for Utilities industry innovation kit, SAP Cloud Platform Blockchain service, and the SAP for Utilities solution portfolio.

- Reduced customer churn
- Increased revenue with new services
- Reduced CO₂ emissions
- Increased cost-effectiveness through the electric power train
- Increased reliability
- Reduced balance and energy costs
- Reduced number of intermediaries and manual process steps
- Increased revenue due to new energy products
SAP Solutions and Services Extend Current Business Processes to Capture New Sources of Value

Business transformation often starts with a paradigm shift that triggers a cascade of business innovations that may end with new business models. Change the focus from assets to relationships or from physical goods to data, and innovators will generate a broad range of opportunities. Rapidly turning ideas into experimental practices requires technologies and services for rapid composition of new ways to do business.

Historically, the meter has been the centerpiece of a utility’s relationship with its customer.

Modern utilities develop their traditional customers into prosumers – producers and consumers of energy.

In this way, utilities can sell many services – such as optimizing consumption, selling solar panels and storage solutions, and providing more complex services such as e-mobility. Further, they can continuously invent the “next-best services” that improve the prosumer’s life, extending offerings over time to also include nonenergy services.

Finally, utilities can create energy communities that benefit from surplus production by connecting the various renewable energy sources in an intelligent way.
SAP Leonardo: Transformational Scenario – Merchant and Industrial Energy Hub

SAP customers and SAP experts collaborate to design and build complete use cases using innovation technologies – fully tailored to the specific customer situation and supported by SAP Leonardo Innovation Services.

Enable continuous monitoring and balancing of reliability and trading schedules and integration of utility-scale and industrial-scale energy resources into more flexible trading and industrial energy portfolios.

Decarbonization is the main driver for renewable support policies. Large-scale wind and solar additions and the development of distributed energy infrastructures, including electric vehicles, are changing the economics and mechanisms of power markets. As they add new market capacity and demand, they are also adding variability and volatility; and due to policy support, they achieve favorable margins. This leaves base- and peak-load-driven generation portfolios on long-term contracts with insufficient full-load hours and short-term flexibility, moving the units beyond the merit-order clearing price and exposing the trader’s portfolio to short-term open positions.

Over time, industrial-scale decentralized energy resources will be integrated into energy markets and become active portfolio positions of traders and merchants – virtual power plant portfolios combined with utility-scale generation portfolios. Consequently, generation and trading schedules are transforming from simple base load and peak load shapes into highly variable curves with flexibilities and open positions. In response, short-term operation and market integration strategies need to be put in place. They require continuous monitoring and balancing of reliability and trading schedules and the integration of utility-scale and industrial-scale energy resources into more flexible trading and industrial energy portfolios.
SAP Leonardo Blockchain: Wipro’s Green Energy Tracking and Distribution System

SAP Leonardo Innovation Services enables energy retailers to automatically create and consume renewable energy certificates on a fine-grain individual level based on innovation co-developed with partner Wipro.

The typical business benefits of this scenario include:
- Full auditability and transparency – from green-energy generation to consumption – with no manual transactions and no double spending
- Automated transparency for consumers regarding the source of green energy in detail
- Reduction in handling costs resulting from, for example, manual processes, manual audit steps, and fees paid to intermediaries

The software was developed to deliver the following IT-specific benefits, which other implementations in the utilities industry do not:
- Secure and low-effort integration of new blockchain innovations into existing SAP software landscapes (on-premise and cloud solutions)
- Elimination of the need for additional hardware oracles on the prosumer and consumer side by integrating blockchain with the SAP for Utilities solution portfolio (the SAP Energy Data Management application)
- Reuse of existing SAP solution landscape for full end-to-end processes, including energy data management and customer experience solutions
- Efficient, low-cost, and robust development thanks to the SAP Cloud Platform Blockchain service, the technology of the SAP Fiori® user experience, the SAP Cloud Platform Integration service, and other services
- Demonstration of the partnership between SAP and a partner as a template for blockchain innovations in the utilities industry
- Starting point for SAP customers in the utilities industry for new blockchain-enabled business models, such as local renewable energy tariffs, blockchain-based loyalty programs, renewable energy marketplaces, and blockchain-powered demand and supply optimizations

SAP Leonardo Innovation Services makes it possible to establish new business models and evolve toward peer-to-peer trading in microgrids through blockchain-based decentralization.
SAP and Customers Jointly Enable the Transformation Journey of Utilities

Our innovation methodology is based on co-innovating with our customers. It is designed to deliver and test innovation fast and early to drive learning cycles at the speed of the digital economy. Together with E.ON, the SAP Prototyping Factory service combines customer expertise and SAP technology to churn out creative solutions.

E.ON and SAP are jointly establishing an SAP Prototyping Factory for agile innovation implementation.

E.ON aims at reducing the time to adoption of business process and business model innovation. SAP Prototyping Factory uses an agile engagement and development methodology from ideation to production.

The prototypes can be tried out by the business and show how the latest technology can optimize processes, extend business value, and transform the business. Within six months, the factory has churned out 15 prototypes from ideation to go-live – and there are more than 30 ideas in the pipeline. A guiding principle of the prototyping factory is to combine today’s commodity processes with the adoption of innovations in hybrid scenarios (bimodal IT).

SAP Prototyping Factory: Guiding Principles

Learning Culture
- “If we fail, we fail early” to learn more quickly and iterate more often.

Agile Approach
- We want high and efficient interaction instead of long-term analysis.
- We think and act flexibly.

Value First
- We’re chasing opportunities, asking ourselves about value first and about cost second.
- We encourage “positive” stakeholders looking for opportunities.

Fast Decision
- We’re defining quantitative goals for each activity.
- We make required decisions a priority.

Collaborate
- We’re looking for partnerships inside and outside the company.
- We want to establish an innovation-driven business network.

“Together, we have been establishing breakthrough innovation services for all E.ON business units. Today, we see increased demand to engage with the prototyping team, because it is increasingly viewed as the only team that can provide end-to-end process delivery quickly and flexibly.”

E.ON’s prototyping factory team

View this video to find out more on how E.ON, in collaboration with services from SAP, develops innovative solutions to face the changing market of tomorrow.
How to Get Started with SAP Leonardo

Whether you’re still exploring new ideas or have defined one idea in detail already, SAP Leonardo brings together world-class innovators, industry and emerging technology expertise, proven use cases, and design thinking methods to help you optimize your business and drive innovation and impact at scale – faster and with less risk.

Explore in a workshop
Identify and prioritize your business challenges, explore how SAP Leonardo might help to rapidly solve them, and define a path for the way forward.

Accelerate
Draw on our library of industry innovation kits to address common value propositions, and let SAP guide you to a business outcome in weeks, not months.

Design for the future
Use a guided process to reimagine the future of your business and uncover where a blend of SAP Leonardo and established technologies might take you – from testing a new business model to organization transformation.

Bring your own idea
Bring a defined idea and we’ll support rapid prototyping and progression with a constant eye toward how to scale it across your business.

SAP takes a holistic approach to innovation. Because digital transformation isn’t just about installing the latest technology, we also address the readiness to receive a new idea. From human capital to infrastructure, we bring best business practices across your organization to improve communication, plan for employee training, review technical and regulatory feasibility, and consider other cross-functional needs to drive change and truly scale your innovation.
SAP Is the Innovation Partner for Utilities

Ten-year innovation vision
Deliver fully intelligent business solutions and networks that span across company boundaries and promote purpose-driven businesses. These solutions will be the most empathic symbiosis between machine intelligence and human ingenuity.

- Self-running enterprise systems
- Self-organizing business ecosystems
- New markets and business models

Comprehensive industry coverage
SAP enables the comprehensive coverage of the complete utilities value chain across the enterprise. With its clear industry road map, SAP is the partner of choice for the utilities industry.

- More than 4,200 utility customers in 107 countries
- 91% of utilities in the Forbes Global 2000 are SAP customers
- All lines of business are supported on a single platform

Proven services offering
By bringing together world-class innovators, industry and emerging technology expertise, proven use cases, and design thinking methods, we help utilities develop innovations that deliver impact at scale.

- Use proven methodologies to drive innovation, from reimagining customer experiences to enhancing operations
- Fuel your innovation through a managed innovation ecosystem from SAP
- Build your own innovation capability and culture

SAP delivers support for becoming an intelligent enterprise in the utilities industry – providing integrated business applications that use intelligent technologies and can be extended on SAP Cloud Platform to deliver breakthrough business value.

Learn more
- SAP.com for utilities
- SAP Leonardo
- SAP Digital Business Services
- SAP Design Thinking