TRANSFORMATIONS
GE’s Energy Ecosystem Portfolio
“I find out what the world needs. Then I go ahead and try to invent it.”

Thomas Edison
Inventor, businessman and founder of the General Electric Company
GE is a digital industrial company that offers exceptional customer outcomes across the entire energy ecosystem. This puts GE in a unique position to understand the complex interrelationships across the ecosystem, and the implications to our customers of transformations occurring within the ecosystem.

The electricity industry is undergoing transformation. Complex interrelationships across the entire energy ecosystem pose challenges to power leaders everywhere. The new age of digital is now providing the means for driving efficiencies, uncovering business opportunities and better serving consumers. GE is uniquely positioned to help our customers navigate and thrive in changing global markets.

**Energy ecosystem**

**Digital Thread**

**Electrical Consumption**
The efficient use of electricity at its end point by a device producing a useful output

**Transmission & Distribution**
Getting electricity from the generator terminals to its point of use at the required conditions

**Electricity Generation**
Conversion of fuels to kilowatt-hours at the generator terminals

**Refining & Processing**
Conversion of hydrocarbons to useful products

**Fuel Delivery & Storage**
Delivery of a fuel of the desired composition and required conditions

**Exploration & Production**
The extraction of natural resources for use in energy production
Access to affordable, reliable energy is critical to sustaining and growing economies and is fundamental to quality of life in the modern world. Energy powers our factories, provides light to study, enables access to clean water, heats our homes, transports products and people, refrigerates foods and medicines, and connects us to information in a digital world. Each year, $5 trillion is spent across the entire energy ecosystem globally, from capturing natural resources through their final consumption by end users.

Multiple technologies, fuels and industries work in concert across the energy ecosystem to provide energy in the form and quantity required, with desired reliability, at the lowest possible cost. The ecosystem can be segmented into exploration and production, fuel delivery and storage, refining and processing, electricity generation, transmission and distribution, and electrical consumption. In the first chapter of this portfolio we will explore each of these segments, share the breadth of GE’s offerings across each, and highlight a few offerings to illustrate GE’s capabilities and leadership.

The energy ecosystem is undergoing unprecedented changes driven by advancements in technology, growing concern for the environment, changing consumer behavior, new policies, changes in fuel availability and pricing, and resource constraints.

In the second chapter we will address nine major transformations that are occurring across the energy ecosystem. The majority of these transformations are at or near the point of consumption and have rippling effects upstream. For that reason, we have ordered the flow of this document to start at the point of electrical consumption and work upstream.

Changes within one segment of the ecosystem can have dramatic effects upstream and downstream. As rooftop solar installations grow, electricity generation occurs closer to the point of consumption. This reduces the amount of transmission and distribution lines needed to connect central plants to end users. The use of a renewable energy source reduces the need for central fossil generation, which in turn reduces the amount of fuel that must be transported, refined, and extracted. Consumers may also start to change their behavior to align periods of peak consumption with times when the sun is shining or the wind is blowing to reduce their cost of energy.

In the third chapter we will highlight how GE uses the full breadth of the corporation to offer its customers industry-leading technology, talent, financing, digital expertise, and global capabilities and connections through the GE store. This chapter will share insights to the future of energy and how GE is positioned to be your preferred partner for growth. GE’s breadth and continued investment across the entire energy ecosystem stands out in the industry. GE is committed to lead as a digital industrial company and help customers react, adapt and grow as these energy transformations continue.

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GE’S OFFERINGS

GE is a digital industrial company where world-class hardware technology meets unprecedented software technology. We combined GE’s 120+ years of experience developing cutting edge electrical devices with 21st century digital technology, powered by Predix,* to deliver efficient systems to curb your energy consumption and greenhouse gas footprint.

*Trademark of General Electric Company.

**$17B**

Annual savings US cities will realize by 2019 by installing smart street lights and devices

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**Hardware**
- lighting
- controls
- electric vehicle charging stations
- uninterruptible power solutions
- drives
- electrical distribution

**Software**
- applications
- Predix platform
- cyber security
- Asset Performance Management (APM)
- Operations Optimization (OO)
- Business Optimization (BO)

**Services**
- baseline energy auditing
- installation/commissioning
- monitoring and analytics

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**Annual savings US cities will realize by 2019 by installing smart street lights and devices**
Energy Consumption

From illuminating your commercial or industrial environment with bright energizing LED light, to charging your electric vehicle fleet, GE has created products that help power your life.

Lumination® Indoor LED Fixtures
The GE Lumination product line brings energy efficiency, long life and ease of installation together in a group of products that can enhance retail, office and hospitality spaces with the benefits of LED technology. Fixtures are available for many applications including new construction, renovation and retrofits.

As a leader in innovation GE has developed reveal® TriGain.® This advanced technology enhances colors without sacrificing efficiency.

Commercial DuraStation® Electric Vehicle Charging Stations
GE DuraStation is our most versatile line of electric vehicle chargers. It offers a broad array of mounting options, user access control and payment methods with the optional WattStation® Connect Software which includes an RFID reader.

DuraStation enables electric vehicle charging in a safe and convenient package and is available with a variety of connectivity and mounting options making it ideal for any outdoor installation.

*Trademark of General Electric Company.

Energy Management & Optimization Solution

Our cloud-based enterprise solution delivers a single source of truth across assets, systems and fleets for energy and asset management. We offer a secure, open and customizable approach, avoiding vendor lock-in and preserving the customers’ energy and asset data ownership. Our digital platform allows the purchase of energy at the best price, and the efficient management of energy-using assets, which allows intelligence on asset performance. This insight can help prioritize repair and replacement decisions and assure utility bills are error free.

Measurement and Verification
Connectivity
Enterprise/Asset Inventory
Baseline Analytics and Trends Analysis

Controls and Optimization
Controls
Schedule Management
Rule and Optimization Engine
Predictive Service
Efficiency Analysis

Billing and Rating
Bill Verification
Cost and Savings Analysis
Digitized Costs and Consumption
Complex Charge Management

External Inputs
Weather
Meter Data
Tariffs
BillsE
GE’s Offerings

With solutions that modernize the electrical grid, GE is helping with the creation of a more efficient, resilient and reliable power system. GE equips 90% of power utilities worldwide to bring power reliably and efficiently from the point of generation to the end power consumers. We are serving customers globally with employees in about 80 countries.

50% increase in electricity demand predicted by 2040

**Transmission**
- High voltage equipment and services
- High Voltage Direct Current (HVDC)
- Flexible AC Transmission Systems (FACTS)
- Digital substations
- Grid protection and control
- Monitoring and diagnostics
- Control room software and analytics

**Distribution**
- Collaborative control and analytics
- Protection and control
- Distribution automation
- Maintenance and modernization
- Distributed energy resource management
- MV/LV switchgear and power distribution equipment

**Smart Grid**
- Analytics software
- Demand response systems
- Microgrids
- Solar inverters
- Energy storage
- Telecommunications solutions
- Power quality monitoring

**Digital**
- Cyber security
- Asset Performance Management (APM)
- Predix platform
- Transmission and distribution software and analytics
- Geospatial and mobile solutions

**Projects & Services**
- Power system studies
- Turnkey projects and consulting
- Electrical balance of plant maintenance and asset management
- Substation operations and maintenance
- MV/LV power centers

Transmission & Distribution

Helping to meet growing energy demands
Improving grid resiliency and energy efficiency
Upgrading and digitizing aging infrastructure
Enabling renewables and a diversified energy mix

50% increase in electricity demand predicted by 2040
HVDC and FACTS

GE is globally recognized for designing, manufacturing and delivering HVDC and FACTS solutions for utilities worldwide.

HVDC
GE offers two HVDC technologies: Line Commutated Converters (LCC) and Voltage Source Converters (VSC), for a broad range of applications and available in a variety of configurations including overhead line (point-to-point, back-to-back, submarine/land cable, and offshore).

FACTS
GE provides solutions that offer grid operators the ability to provide reactive power support, enhance controllability, improve stability and increase power transfer capability of AC transmission systems. Our portfolio includes:
- Static Synchronous Compensator (STATCOM)
- Static Var Compensator (SVC)
- Series Compensation
- Synchronous Condenser Systems

HVDC provides **3x power capacity**, longer distance capability and lower costs compared to AC systems.

Today’s power plants are becoming increasingly complex—especially when connecting disparate generation systems together on the same grid.

GE helps utilities solve this challenge with versatile and robust solutions for EBoP—for applications spanning heavy duty gas turbines to distributed mobile power plants on wheels and remote wind farms.

GE uses world-class HV substation equipment (such as padmount and generator step-up power transformers, HV circuit breakers, current transformers and gas insulated switchgear), advanced protection and control solutions, and engineering and installation services to help seamlessly get power from the source of generation out onto the grid.

Packaged Substation enables up to **50%** faster implementation of power evacuation solutions resulting in **accelerated revenues**.

**Electrical Balance of Plant (EBoP)**

Innovative solutions for efficiently evacuating power onto the grid.
Intelligent Digital Substations
Maximizing Substation Utilization and Driving Situational Awareness

Helping utilities meet increasing demands for grid reliability and efficiency.

GE’s solutions provide mission critical electrical protection, control, monitoring and diagnostics of utility grids maximizing reliability, efficiency, security and operational excellence. It also improves personnel safety and reduces overall substation footprint.

From local power networks to wide area interconnected grids, GE’s intelligent digital substations enhance grid management and operation using intuitive dashboards for situational awareness.

It ensures optimum real-time performance of the grid by monitoring availability, health, and dynamic loading capability of the power network.

Digitizing primary equipment and sensing can **reduce substation footprint by up to 50% compared to conventional technology in use today**

Grid Management Systems with Analytics and Data Visualization
Geospatial Systems and Distribution, Outage and Energy Management

**Integrated and Streamlined Operation**
GE’s Advanced Distribution Management System enables distribution utilities to keep the lights on and respond to outages using one model of network operations. These integrated systems can reduce peak load by 2–3%.

**Situational Awareness**
GE’s Energy Management Systems have advanced alarm and event summaries from transmission network assets providing real-time situational awareness and actionable intelligence.

**Geospatial and Mobile Solutions**
A consolidated view of assets, allowing utilities to make faster, smarter decisions to reduce maintenance and repair costs. Integrated mobile apps for dispatch and switching can reduce verbal communications between crews and operators as much as 80%.

**Intuitive User Experience**
Pre-defined dashboard and advanced visualization capabilities for faster user recognition of overall system status and next-step options.

GE’s outage restoration tools enable **30% reduction** in storm response costs
Electricity Generation

GE’s Offerings

GE’s electricity generation portfolio includes some of the most efficient and comprehensive equipment and service offerings available in the industry today. With products ranging in size from reciprocating engines of less than 1 MW through nuclear plants that deliver more than 1,500 MW, and service offerings available for the entire lifecycle of an asset, GE has a solution for almost any electricity generation need.

~1/3 of global electricity is produced by GE technology
HA Combined Cycle Power Plants

The world’s largest and most efficient combined cycle power plants

GE’s HA high efficiency, air-cooled gas turbines are an industry leader among H-class offerings, and now the 9HA.01 version is at the heart of the world’s most efficient combined-cycle power plant in Bouchain, France.

GE’s combined cycle total plant solution includes advanced gas turbines, steam turbines, generators, heat recovery steam generators, plant controls, and balance of plant equipment. All of GE’s HA gas turbines are more than 62% efficient in combined cycle application, and with simple cycle ratings from 280 MW through 519 MW, customers can easily select the right capacity to meet their electricity generation needs.

Full engine validation of GE’s HA gas turbines is performed in GE’s full-speed, full-load test facility in Greenville, South Carolina. Every phase of the testing has been a success, with all aspects exceeding expectations. In addition, the first 9HA plant in commercial operation was cited by the Guinness Book of World Records for achieving the highest combined cycle efficiency in the world.

>62% combined cycle efficiency... a world record

ELECTRICITY GENERATION FEATURED SOLUTION

PRISM Reactor

An advanced sodium-cooled fast reactor with base power ratings from 160 MW to 300 MW, with options for larger modular power configurations to meet multiple customer needs.

PRISM is an innovative GE Store solution for coal plant repowering or replacement while utilizing existing site infrastructure and turbine island assets, and its advanced metal fuel design can enable full recycling of used nuclear fuel or surplus plutonium.

Clean and Green
Generates carbon-free and emission-free electricity
Securely recycles nuclear fuel waste from existing nuclear plants
Compact, diverse footprint with near-zero water usage potential

Flexible and Innovative
Advanced reactor—simplified design, exceptional economics and proven with U.S. national lab test reactor experience
A flexible solution for repowering superheated coal plants while utilizing existing plant assets
Factory-built modular construction
Always available air-cooling keeps the reactor safe without needing people or power

The PRISM reactor is 100x more fuel efficient compared to conventional water-cooled reactors
Cross Fleet Services

The combined GE/Alstom team brings 230 years of collective experience across 90+ OEM brands to customize solutions around:

- Planning and installation
- Long-term operation and maintenance
- Performance upgrades and optimization
- Asset/plant repowering and repurposing
- Digital Solutions for asset monitoring and optimization

Specific OEM solutions include:

- Comprehensive hardware offering for Siemens and MHI gas turbines that improves availability and cost of maintenance
- Generator repair and upgrade solutions – improve availability and reliability
- Performance Acceptance Testing – validate OEM upgrades of steam and gas turbines

State-of-the-Art Coal Plants


Evolving regulations, changing operating regimes to accommodate growing renewable generation capacity, and narrow dark spreads demand more creative solutions than ever before.

At GE we use our unrivaled expertise every day to help customers get tailored systems that stand the test of time, while continually driving improved efficiency and performance benchmarks.

GE offers customers exceptional flexibility in coal power plant solutions for plant upgrades, repowering or new plants. From a single component to a full power plant—our broad range of products covers a large scope of applications and a wide range of fuels including coal, lignite, anthracite and petcoke. We put over 100 years of steam power expertise to work, generating power that is reliable, efficient, and easy to integrate and operate.

Each 1pt improvement in efficiency of the global fossil installed base reduces CO₂ emissions by ~250M tons per year—the equivalent of removing ~50M US cars from the road.

Boiler Optimization

Boiler Optimization, a key component of Operations Optimization, helps coal-fired steam plants improve combustion efficiency and manage soot blowing more effectively. By managing tradeoffs between the combustion and heat transfer processes and identifying any process issues that need immediate attention, plant managers see reductions in tube failures and slagging, lower NOₓ, SOₓ, and carbon emissions, less ammonia consumption, better steam and gas temperatures and improved heat rates.

Technology Advancements

- 1.5% points more efficient and 1% lower emissions compared to today’s best

Digital Capabilities

- Deliver up to 1.5% more power over the life of a plant

Environmental Controls

- Able to lower emissions by 70% more than the world’s most stringent emission standards
Hydropower Solutions

Hydropower contributes to grid stability due to its scale of production and flexibility. It offers a high level of reliability, high efficiency, low operating costs and large storage capacity.

Pumped Storage Plants
GE is a leader in the field of pumped storage technology. With variable speed and GE’s R&D work on asynchronous-motor technology, the pumping power can also be regulated, allowing more efficient use of excess energy, contributing even more to grid efficiency and stability.

Digital hydropower plants
Smarter and more connected, our hydropower plants can store and deliver power to the grid with an unmatched level of flexibility and efficiency. One of our latest digital applications is GE’s intelligent Condition Monitoring System (iCMS) for hydropower plants that tracks the health of the plant in order to detect failures before they happen.

Services
With 30% of the global hydropower fleet being more than 40 years old, we service and retrofit existing plants to unleash their potential throughout their lifespan. Together with our customers, we make hydropower more affordable, more reliable and more sustainable.

Actual results indicate more than 30% additional turbine output is possible due to upgrades

Hydropower Solutions

TM2500: GE’s Mobile Power Plant on Wheels

Fast and flexible power plant – when and where it’s needed
GE’s TM2500 fast power solution solves a number of industry challenges, positioning power at—or near—the point of use. Known as the “power plant on wheels,” the TM2500 generator set is ideal for providing a baseload bridge to permanent power installations or for generating backup power in support of natural disaster relief, plant shutdowns, grid instability due to renewables adoption, or equipment maintenance.

Gorontalo, Indonesia
Four TM2500 generator sets capable of running on diesel or natural gas provide 100 MW of power to the island of Gorontalo in less than 6 months; a model for the Indonesian government’s plan to achieve 98% electrification for the island nation.
Wind Turbine Technology

GE is redefining the future of wind power, delivering with proven performance, availability and reliability, ultimately helping our customers to be more profitable.

2 MW & 3 MW Onshore Wind Platforms
A comprehensive family of smart, modular wind turbine technology that is capable of meeting a wide variety of wind conditions and overcoming geographic constraints across the globe.

Offshore Wind Energy
GE’s Haliade® offshore wind turbine is the first wind turbine especially designed for offshore conditions. GE has the project management experience needed to help control costs and mitigate risks of large projects, especially offshore.

GE Remote Operations Centers
GE has remote operations centers in the US and Germany that monitor over 14,000 turbines globally with Predix, around the clock. Real-time turbine key performance indicators support remote operating center fault handling procedures, and the turbine fault data drives a safe and accurate response. Integrated turbine commands, available at the technician’s fingertips—optimize return to service.

GE’s Digital Wind Farm
The next evolution of wind energy

A dynamic, connected and adaptable wind energy ecosystem that pairs world class turbines with the digital infrastructure of the wind industry. The Digital Wind Farm combines modular turbine platforms with secure Predix software and diagnostics.

GE’s 2 MW modular turbine platform combined with secure Predix software and diagnostics
Platform includes a suite of software applications to enhance annual energy production and improve wind farm profitability

50+GW global onshore wind capacity, in 35+ countries around the world
Digital for Power Generation

Asset Performance Management

**Machine and Asset Health:** Providing a unified view of the asset, anywhere, anytime, to understand performance at many levels and initiate immediate action.

**Reliability Management:** Predicting and accurately diagnosing issues—and responding before they negatively impact assets.

**Maintenance Optimization:** Balancing reliability, availability, performance and costs against risk to maximize asset value.

**Real Customer Results**†

**7500+ ASSETS MONITORED**

**$3M+ FINANCIAL BENEFIT IN ONE YEAR**

**$7.8M PER YEAR INSURANCE SAVINGS**

†Representative customer outcomes are not guarantees of results

Unexpected plant disruptions can cost 3–8% of capacity, or $10B annual lost production cost†

“Now that SRP has realized the incredible performance of the software and how strong and robust it is, we’d like to expand it across our enterprise assets.”

M a y M i l l i e s
Manager, Power Generation Services, Salt River Project

†Unexpected plant disruptions can cost 3–8% of capacity, or $10B annual lost production cost.
Operations Optimization

**Performance:** Focus on improving overall output and heat rate across the plan

**Flexibility:** Focus on improving start time, start fuel ramp rate and minimum load

**Availability:** Focus on improving equivalent forced outage rate, equivalent availability factor and commercial availability

**Capacity:** Focus on improving output and heat rate forecast vs. ambient conditions

**Emissions:** Focus on managing emission rates for NOx, SOx and CO2

Align business strategy to operating models with fact-based Key Performance Indicators (KPIs)

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PSEG’s Linden Generating Station becomes a two-time Top Plant winner for its embrace of advanced digital monitoring and analytics to stay competitive in the power market.

Italian energy firm A2A partnered with GE to return one plant to profitability with a combination of hardware improvements and cloud-based analytics.

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**Typical Coal Steam Plant†**

- **2–3% MW** output improvement
- **3%** improved fuel efficiency
- **10–17%** NOx reduction

†Representative customer outcomes are not guarantees of results
GE’S OFFERINGS
GE is committed to providing innovative solutions across the downstream industry to help customers increase operational efficiency, improve throughput and reduce downtime. Our customers benefit from highly qualified technical expertise, and fully integrated solutions that include refinery, petrochemical and fertilizer plant equipment, parts, supporting technologies and value-added services, carefully tailored to their specific needs.

**Refining & Processing**
- Reciprocating compressors
- Centrifugal compressors
- Axial compressors
- Hot gas expanders
- Turboexpanders
- High speed separable compressors
- Natural gas solutions
- Pumps
- Valves
- Fuel gas systems
- Safety relief valves
- Regulators

**On-site Power**
- Steam turbines
- Gas turbines
- Generators
- Fuel gas booster compressors
- Fuel gas booster
- Natural gas solutions
- Control valves
- Safety relief valves
- Fuel gas systems

**Water**
- Influent, process, utility, and wastewater treatment
- Corrosion and fouling control chemicals
- Crude quality and desalting
- Finished fuel performance additives
- Mobile water services
- Expert services for reliability and profitability

**Over**
- **35K** pieces of rotating equipment and 2.5M valves in operation across the refinery and petrochemicals sectors globally

**Services**
- Aftermarket services
- Parts
- Repairs
- Field service engineers
- Upgrades
- Multi-year service agreements

Refining & Processing (Downstream)
GE provides a complete set of services to support the entire range of rotating equipment offerings. We offer an extensive portfolio of proactive and interactive service products such as condition-based maintenance, Conversions, Modifications and Upgrades (CM&Us) and Contractual Service Agreements (CSAs) complementing the traditional service offerings of OEM spare parts, repairs, and field services. Our innovations go beyond mechanical engineering. We have developed business solutions such as remote monitoring and diagnostics to help drive customer value by providing higher equipment reliability, availability, and productivity at a predictable cost. Other advanced information-based developments include electronic parts catalogs, and e-commerce solutions.

Global services engineers are backed up by our new product design engineering groups and by the GE Global Research Center—hundreds of creative minds working to provide contemporary high-tech products and business solutions for the 21st century.

*Trademark of General Electric Company.

More than 80 years of industry-leading performance with over 4,500 compressors active in the downstream sector

GE’s Predictivity* is a complete package of industrial internet solutions that gives you data-driven insights on everything from individual pieces of equipment to your overall operating efficiency and performance—all to enable better life cycle management
Fuel Delivery & Storage
(Midstream)

GE’S OFFERINGS
GE works with operators to keep the oil and gas flow uninterrupted from production plants to distribution points. Our solutions drive efficiency and profitability for pipelines, LNG liquefaction, gas storage terminals and distribution systems worldwide. We help customers promote environmental and public safety, while optimizing their asset’s long term reliable performance.

Pipeline & Storage
- reciprocating compressors
- reciprocating gas engines
- gas turbines
- centrifugal compressors
- pumps
- pipeline integrity management
- Intelligent Pipeline Solutions*
- actuators
- control valves
- regulators
- safety and relief valves

LNG
- gas turbines
- centrifugal compressors
- pumps
- valves
- turboexpanders
- modular LNG solutions
- modular Compressed Natural Gas (CNG) solutions

Water
- asset integrity
- chemical programs
- flow assurance
- monitoring solutions and digital oilfield

Services
- on-site commissioning
- other OEM repairs
- maintenance
- multi-year agreements
- resident engineers
- training
- field testing and inspection
- cyber security

2M
kilometers of pipeline supported by GE’s pumping and compression solutions

* Trademark of General Electric Company.
The NovaLT16 is a two-shaft gas turbine specifically designed for mechanical drive and power generation in oil and gas and industrial applications.

With a power turbine speed of 7,800 rpm, it is ideally suited for pipeline compression—with direct coupling to the latest generation of PCL pipeline compressors featuring high performance stages and 89% or higher compressor efficiency. It is designed for a 35,000-hour mean time between maintenance, which translates into four years of non-stop running for the gas generator module and eight years for the power turbine module.

Adding to the benefit of long intervals without maintenance, the NovaLT16 also enables extremely short duration of maintenance intervals. In fact, a cold-condition engine can be swapped in just 24 hours due to the optimized modular maintenance philosophy. Beyond the mechanics of the turbine itself, the complete package is designed with the ultimate performance and support features as standard—fully equipped with integrated monitoring and diagnostics sensors and remote tuning capability.

Setting a new standard for 16 MW class turbines in mechanical drive and power generation applications

The NovaLT16 is a two-shaft gas turbine specifically designed for mechanical drive and power generation in oil and gas and industrial applications.
Edge Devices: Connecting Assets Within Process Control Networks

System 1® Condition Monitoring & 3500 Machinery Monitoring

The connection between GE’s System 1 condition monitoring software and the 3500 condition monitoring system provides machinery protection and enables plant personnel to quickly identify important events, evaluate the situation, and respond—leading to increased equipment availability, reliability, and reduced maintenance costs.

Real-time optimization of equipment and selected processes, condition monitoring, and event diagnostics

High resolution trend, alarm, and startup/shutdown data

Short-term "black box" flight recorder for trend data

Anti-friction and hydrodynamic bearing diagnostics

Diagnostic reporting

50+ years of condition monitoring experience

Sensors for a Wide Variety of Industry Needs

GE’s wide variety of vibration, position, speed, pressure and power sensors or transmitters—plus rugged probes of various tip diameters and thread sizes/configurations—are designed to perform even in the harshest industrial environments.

Sensors available include:

- Pressure transducers
- Acoustic sensors
- Acceleration and velocity sensors
- Optical sensors
- Proximity probes
- Vibration and thrust sensors
- Ultraviolet flame sensors
- Depth/level sensors

Condition monitoring instrumentation for machinery intensive industries
GE’S OFFERINGS

Exploration & Production

Tapping into a broad portfolio of technology from across the GE enterprise, we offer advanced exploration and production technology that delivers in the most extreme environments. From off-the-shelf products to fully customized solutions, GE’s domain expertise and ability to deliver truly comprehensive solutions continue to help provide the right product or service for the right application.

Exploration & Production

- Drilling blow out preventers
- Subsea production systems
- Subsea power and processing
- Flexible pipe
- Surface pressure control
- Frac tree systems
- Cased hole wireline services
- Wireline tools
- Drilling measurement systems
- Downhole sensors
- Artificial lift systems
- Oilfield automation and optimization – Field Vantage*

On-site Power

- Reciprocating engines
- Gas turbines
- Steam turbines
- Generators
- Substation
- Electrical distribution
- Motors

Services

- On-site commissioning
- Repair
- Maintenance
- Multi-year agreements
- Resident engineers
- Training
- Field testing and inspection
- Cyber security
- Reliability Max

Water

- Injection, utility, and produced water treatment
- Production chemicals and services
- Sulfate removal and enhanced oil recovery
- Service contracts and remote monitoring
- Temporary or long-term mobile water services

* Trademark of General Electric Company.
GE’s subsea production systems cover all applications from single-well satellites in shallow water, to large and complex multi-well deepwater developments—from low-pressure reservoirs with artificial stimulation or lift, to high-pressure high-temperature (HPHT) applications.

Our first subsea tree was installed in 1963 and we now have close to 1,400 tree systems operating across every major production basin in the world. GE also has the largest installed base of large-bore gas projects in the industry, all anchored by the Diverless (deep water) Horizontal Cluster Manifold.

With the introduction of the Deepwater Vertical Xmas Tree (DVXT), GE’s trees portfolio provides the industry with a tree for any depth and any challenge. Designed for water depths up to 3,000 m, and for HPHT environments, the DVXT’s structured, modular approach shortens the delivery cycle, while increasing overall quality and engineering focus on the most important and unique project challenges.

The industry’s most reliable solutions with uptime on the critical control system exceeding 99.9%, including zero failures on SemStar® control system since its first installation in 2011.

Artificial Lift Systems
The world’s most reliable artificial lift equipment solutions and services; GE simplifies how you select, install, produce and maintain your wells

At GE we put our best minds to work for customers’ artificial lift operations, helping to maximize production.

We offer Electric Submersible Pumps (ESP), Rod Lift Systems (RLS), Progressing Cavity Pumps (PCP), and Gas Lift solutions. Our approach is holistic, offering expertise across all forms of artificial lift, regardless of location or lifecycle. From field technicians to production optimization consultants, our global team is available to simplify how customers select, install, and maintain their equipment.

A crank balanced beam pump unit (BPU)—in 1922, GE’s Lufkin BPU unit was the world’s first crank balanced BPU
GE is fueling the future.
We are leading a digital revolution, harnessing the power of data and analytics to help customers optimize their operations from reservoir to refinery.
Together, we are reinventing the oil and gas industry to boost production, reduce risks and better serve the world’s growing energy needs.
Asset Performance Management (APM)

For asset intensive companies, such as Oil & Gas entities, APM solutions for Upstream, Midstream and Downstream connect disparate data sources and use advanced analytics to turn that data into actionable insights while fostering collaboration and knowledge management across an organization—minimizing the total cost of ownership.

Data-driven insights empower customers to make informed decisions faster, to optimize production in fields and facilities while reducing operating costs.

Production Optimization

Gain Visibility Across Wells
Increase visibility and efficiency
Go from reactive to proactive
Ensure optimal flow

Committed to cyber security; protecting our systems, products and customer operations
Asset Performance Management

Examples of productivity from reservoir to refinery

UPSTREAM
Centralizing big data for real-time plant operations visibility

EXCURSION & ANOMALY MANAGEMENT
Detection of safe operating limits and prediction of process related issues.

EQUIPMENT MONITORING
Monitor Key Performance Indicators of equipment health—and correlate current issues with historical and future maintenance activity.

PROCESS SURVEILLANCE
Threat map presenting real-time safety and production risks including health metrics at the plant, system, train and equipment levels.

PIPELINE
Aggregate and analyze multiple streams of data to increase situational awareness for more informed, proactive decisions

ENHANCE INTEGRITY AND SAFETY
Improved data and risk management reduces the likelihood of high consequence of failure and enhances regulatory compliance.

OPTIMIZE O&M SPEND
Modern management tools enable efficient capital and human resource allocation and improved maintenance decisions.

IMPROVE THROUGHPUT AND UPTIME
State-of-the-art technologies and digital knowledge transfer help resolve critical industry challenges impacting reliability.
Asset Performance Management
Examples of productivity from reservoir to refinery

LNG
Minimize unplanned downtime for GE heavy-duty and aeroderivative gas turbines.

*A Predictivity Solution that Increases Machinery Reliability*

**ADVANCED SENSORS** in the gas turbine provide predictive analytics to help optimize performance and minimize costs.

**DATA ANALYTICS** diagnostic, prognostic, and predictive rules provide foresight on potential issues and quick, actionable insights.

**REMOTE MONITORING** advisory services reduce trips, enhance performance, improve asset health, and perform remote tuning.

REFINERY
Optimize processes across your refinery by improving the reliability and productivity of assets

**COMPLETE VISIBILITY**
Connect data from pumps, heat exchangers, pipes, towers, reciprocating compressors and other assets at your site to provide one digital view of your refinery and remove deviations from the production plan.

**ASSET INTEGRITY**
With mobile reviews of alerts, and trend reports to set baselines, identify the root cause of potential failures and extend asset life.

**MAINTENANCE OPTIMIZATION**
Recommended mitigation actions to enable proactive and preventative maintenance and maximize flow through the refinery.
The energy ecosystem is undergoing transformation on a scale never experienced, from the way electricity is used by consumers to the methods for accessing and transporting hydrocarbon fuels. A digital thread runs throughout these transformations and will define their path and future state. GE is in a unique position to provide customers with the solutions needed to navigate these transformations and help them prosper in the process.
SINCE THE INTRODUCTION OF PERVASIVE ENERGY ACCESS IN INDUSTRIALIZED ECONOMIES, GROWTH IN ECONOMIC ACTIVITY HAS LED TO GROWTH IN ELECTRICITY CONSUMPTION.

For example, in the United States, the energy intensity, or kWhs required to produce one dollar of GDP, more than doubled between the 1940s and 1970s, as the economy grew and new technologies that consumed electricity were introduced. With the US Energy Crisis in the 1970s came the first significant focus on energy efficiency and conservation which may have fueled the persistent decline in energy intensity observed in the US since the 70s. This trend is not unique to the US; indeed, with advancements in devices that consume electricity, energy intensity around the world continues to decline. LED lights consume almost 80% less than their incandescent counterparts; the latest heating, ventilation, and air conditioning (HVAC) equipment can be 30% more efficient than older equipment. As other commercial and industrial equipment evolves, such as motors and drives, their respective per-unit energy consumption decreases.

For utilities that rely on capacity tariffs for revenue, declining energy intensity can be an issue. The cost of installing and servicing equipment in most cases is not declining, but now this cost must be covered over a decreasing amount of electricity sales. Decoupling rates from capacity charges, instituting other charges, and allowing utilities to earn a return on efficiency investment are among the many ways regulators are addressing this issue. In countries where electrical grids are still being extended, efficiency can often be a “first fuel.” It eliminates the need for generation capacity, reduces the size of transmission and distribution infrastructure, and reduces fuel consumption. Electricity customers see demand-side efficiency investments not only as a way to reduce their bills, but also as a way to reduce their carbon footprint.

Challenges

Traditional utility revenue models are at risk as efficiency continues to reduce consumption growth
Lack of incentives to invest in efficiency for buildings that are not owner occupied, as the occupant typically pays for the energy usage
Energy efficiency (and consumer behavior) can be challenging to coordinate as a generation resource, vs. larger centralized power stations

Opportunities

New revenue opportunities for utilities and other energy industry stakeholders
Lower energy spend by electricity customers, and potentially lower carbon footprint
Lower overall generation and distribution capacity costs in fast-growth and large markets

“Energy efficiency could well be called the ‘first fuel’; for, overall, it has had the single biggest impact of any source in the energy mix.”

Daniel Yergin
Pulitzer Prize-winning American author, speaker, and economic researcher
Highlights of GE’s solutions

Energy Management & Optimization Solution
After performing an expert audit of existing HVAC, lighting and equipment systems—data measuring, analyzing, predicting and energy consumption optimizing are conducted on the Predix platform. Energy conservation methods utilizing asset, fleet and external inputs are developed with impacts to cost savings, financial tracking, and carbon management.

LED Lighting Systems
Relative to traditional technology, these systems can reduce energy consumption by nearly 80% compared to incandescent technology with longer-life—and are designed to serve a wide variety of uses both inside and outside in the residential, commercial and industrial sectors.

Variable-Frequency Drives (VFD)
VFDs are increasingly being incorporated into new motor systems to enable motors to operate at their most efficient operating point, resulting in energy consumption savings upwards of 50% compared to static drives.

Electric Motors
GE brings nearly 125 years of expertise to developing high-efficiency motors, to drive fans, pumps, compressors, grinding mills, mine hoists, refiners, propulsion and many other process equipment needs across industries such as oil and gas, marine, power, mining, cement, metals, pulp and paper, water and wastewater.

GE’s intelligent exterior LED lighting systems that are installed in Oceanside, CA will save the city more than $600,000 in annual energy and maintenance costs. The efficient LEDs provide bright light at much lower energy use, while the embedded GPS technology can be used by the city to identify operational issues and address them quickly and proactively.
FOR DECADES, UTILITIES HAVE WORKED WITH SOME OF THEIR LARGEST CUSTOMERS ON CONTROLLING DEMAND, ASKING THEM TO REDUCE THEIR USAGE DURING CRITICAL PEAK PERIODS.

A more recent phenomenon is to formalize such arrangements through a demand response product, in which a commitment to lower demand when requested can be quantified and paid-for through instruments such as capacity payments. Customers benefit through lower electricity spend, while grid operators can ensure reliable operation during peak events. Indeed, a “negawatt” of capacity can be more cost effective than firing up a megawatt of generation.

However, issues of Demand Side Management (DSM) adoption persist. The amount of DSM can vary by season, preventing operators from considering it an annually-available asset. Unlike a generator, which has deterministic performance, load management’s efficacy and impact on the grid is harder to rely upon. Such disadvantages may be temporary as the Industrial Internet becomes more pervasive. Intelligent devices can allow more consumers to participate in a seamless and less intrusive manner. Such devices can communicate with grid systems, and adjust their operational patterns based on grid peak requirements. When aggregated over millions or even billions of devices, DSM’s impact becomes more deterministic and reliable, as any one individual customer or device that may choose to not participate can easily be substituted by another. From a grid operator’s perspective, dispatching on-site generation also can achieve the same purpose, that is to lower bulk grid demand, assuming that the power produced does not exceed the site’s local demand. As inverters and on-site generation interconnections become more intelligent, such assets can become an important and reliable part of the equation.

Challenges
DSM has been limited by how reliably it can be called upon in its current form, unlike “hard” generation assets.
The amount of DSM has varied by the time of year and year to year, preventing operators from incorporating it into longer-term plans.
Myriad of market rules and regulations prevent DSM operators and aggregators from achieving meaningful scale.

Opportunities
DSM can be a much more economical way to address system peak requirements.
When aggregated across customers as a portfolio to improve deterministic performance, it can be equivalent to generation capacity.
The Internet of Things will facilitate less-intrusive participation by more customers, allowing for greater reliability.

“[Demand-side management] will have a tremendous impact on consumers to control their energy cost and provide a service...It’s going to make consumers an equal participant in the market in a way they never were before.”

Jon Wellinghoff
Former FERC chairman
Our Approach:

1. Analyze
   We figure out your energy strategy by evaluating how you use energy and its effect on operations. And we consider how data insights can create value for your business.

2. Implement
   We provide the hardware and software you need, plus offer financing to make it happen.

3. Optimize
   All our solutions can be updated and augmented as needed. At Current, we continually ask: “What’s next?”

Highlights of GE’s solutions

Energy Management & Optimization Solution
After performing an expert audit of existing HVAC, lighting and equipment systems—data measuring, analyzing, predicting and energy consumption optimizing are conducted on the Predix platform. Energy load shifting methods utilizing asset, fleet and external inputs are developed with impacts to cost savings, financial tracking, and carbon management.

Demand Response System
Engineering studies can assess the benefits for grid operation, demand response road mapping, business case development, technology assessment, application of smart grid integration, and impact analysis.

Intelligent LEDs
Intelligent LED lighting systems that are infused with sensors, and combined with analytics and software, can help building owners smartly reduce lighting usage during periods of peak power demand.

Reciprocating Engines
With outputs ranging from 250 kW to 10 MW, reciprocating engines can start and achieve full load in minutes, reducing the need for bulk grid-connected peak capacity.

Aeroderivative Turbines
Aeroderivative turbines with fast startup times and highly cyclic duty operability are ideally suited to provide reliable on-site power for industrial applications, and thereby can reduce bulk grid demand dispatching.

Demand Side Management

14%
Potential US peak energy demand could be reduced through demand response

100M
Internet connected lighting systems by 2020

A Unique Approach Within GE
We know one size doesn’t fit all. So we’ll build the solution that’s right for your organization, today and tomorrow. We’re here to help our clients navigate this new energy landscape—and prepare for what’s next.
The next generation energy landscape is expected to look very different from today’s centralized structure. The power sector is undergoing a revolution that is reshaping a well-defined and established industry. Consumers will have increasing access to “things”—cars, planes, appliances, industrial processes—that when powered by electricity may be more efficient.

The largest consumer of fuel-based power is the transportation sector. With fuel costs for rail at $11B and airlines spending over 40% of their costs on fuel, companies have huge incentives to shift towards electrified systems. Electric vehicles are also expected to more than quadruple through 2025. Harsh environments and difficult access to fuel are also driving electrification in industrial sectors like mining, chemicals, and oil and gas exploration. Decarbonization and declining technology costs will continue to drive switching consumption at the point of use from fuel to electricity.

As the energy ecosystem continues to evolve, consumers and industries at all levels are seeking technology opportunities and new business models in this new and ever-changing landscape, and electrified “things” will play an increasingly important role in the future energy ecosystem.

Challenges
- Inadequate supporting infrastructure and grid architecture
- Uncertainty in regulation
- Ability to recharge mobile assets is a key challenge to adoption
- Increased complexity of utility planning

Opportunities
- Demand for more electrical generation and distribution of electricity
- Growth opportunity for electrical generation that is otherwise flat in OECD world
- Growth in demand for mechanical energy driven by electricity
- New markets for “electrical” devices and offerings

“All peoples everywhere should have free energy sources. Electric Power is everywhere present in unlimited quantities and can drive the world’s machinery without the need for coal, oil or gas.”

Nikola Tesla
Inventor, engineer and futurist
Electrification of Things

Highlights of GE’s solutions

Electric Vehicle (EV) Charging
Commercial and residential EV charging stations are available to suit extreme outdoor conditions, indoor conditions, various pedestal and mounting needs, user access control and payment methods. User convenience, safety, communication connectivity, and expansion flexibility are delivered with reliability, durability, and style in a practical solution.

Motors and Generators
High-efficiency motors avoiding fuel-power based power are available to drive compressors, fans, pumps, grinding mills, mine hoists, refiners, propulsion, and many other process equipment needs across industries such as oil and gas, marine, power, mining, cement, metals, pulp and paper, water and wastewater.

Drives
Drives applied at electricity point of use range from 1/3 to 1350 HP, each in a compact package and with a host of built-in features that heighten performance, reduce energy consumption, simplify installation and eliminate the need for many costly add-ons. With the AF-6 Series, the drives are already in tune with the application, in the most cost-efficient and space-efficient manner possible.

Energy Storage
Integrated energy storage systems are being made more competitive by incorporating anticipated battery performance and value analysis, power electronics inverters, transformers and medium voltage switchgear, grid-connecting controls, and fit for purpose enclosures that optimize battery life and performance and reduce downtime.

Converting from Diesel to Electric Power in Mining

Customers creating safer and quieter work environments

Value of Electric Drive
Zero tailpipe emissions, and no diesel particulates
High efficiency and low maintenance propulsion system
Lower heat emission and operating temperature
Reduced ventilation and refrigeration needs

Life Cycle Cost Savings
Improved energy efficiency
Lower fuel costs
Lower maintenance costs
Reduced ventilation requirements
Residential, commercial and industrial customers are choosing to become prosumers (producer-consumers) by installing distributed generation systems, and in turn are becoming active, rather than passive, participants on the grid. Distributed generation is not new; indeed, industrial customers have used combined heat and power solutions for nearly a century, with much of the growth enabled over the last few decades by advancements in gas turbine technology. However, with the recent declines in solar and energy storage costs, more commercial and residential customers are installing power generation assets within their premises.

This is driven in part by a desire to be more efficient. In some instances, producing power at the point of use is more economic than paying the increasing retail price of electricity. In yet others, customers are looking for generation assets that will enhance their resiliency to grid outages by being able to produce, and thus consume, power even if the larger system experiences a failure. As distributed generation increases, electric utilities, and in particular those with distribution systems, are faced with numerous challenges. They must continue to ensure reliable power delivery to all customers while being able to address changing power flows caused by distributed generation and lower revenues from customers that are self-generating. Those distributed generation sources that are more variable and uncertain in nature can create more volatility in the system by creating voltage fluctuations outside the prescribed levels. Even as utilities must address these challenges, they also are seeking to harness the power of distributed generation. Placing generation assets closer to their customers allows utilities to forgo expensive system upgrades for peak capacity, provide greater reliability during weather events, and increase system sustainability while also ensuring that customers receive cost-effective power, particularly during peak periods. As electricity consumers become producers, and more entities begin installing and operating distributed generation, one thing is clear: the traditional way of operating the grid will need to change.

**Challenges**
- Traditional utility business models stressed as more customers self-generate
- Ensuring reliable power delivery with “two-way” power flows
- Incorporating more resources that are variable and uncertain in nature

**Opportunities**
- Provide electricity consumers with more sustainable and cost-effective electricity
- Enhance system reliability by islanding during grid outages
- Ensure more efficient distribution system design and upgrades

**POWER PRODUCED AT OR CLOSE TO WHERE IT IS NEEDED IS TRANSFORMING RESIDENTIAL, COMMERCIAL, AND INDUSTRIAL CUSTOMERS INTO PROSUMERS.**

**Residential, commercial and industrial customers are choosing to become prosumers (producer-consumers) by installing distributed generation systems, and in turn are becoming active, rather than passive, participants on the grid.**

**GLOBAL ENERGY FROM COMBINED HEAT AND POWER**

21 GW

ROOFTOP SOLAR INSTALLED IN 2015

9%
GE’s Jenbacher 10 MW range J920 FleXtra gas engine is the centerpiece of the largest cogeneration plant in Northern Germany operating in conjunction with a heat storage system. The plant produces environmentally friendly power for 21,500 households and heat for 6,000 average single-family homes in the region.

The “High Efficiency Power Generation (HEPG)” concept developed jointly by HanseWerk Natur and GE in Jenbach increases the efficiency of the cogeneration plant to more than 95 percent.
SCIENTIFIC EVIDENCE HAS BEEN MOUNTING THAT GLOBAL CLIMATE CHANGE IS BEING CAUSED BY MAN-MADE SOURCES OF CO₂ IN THE ATMOSPHERE.

The largest sources of man-made atmospheric CO₂ are electricity and heat generation (42%), transportation (23%), and industry (19%). In December 2015, 196 countries signed the COP21 agreement to limit climate change impact to less than 2°C above pre-industrialized levels by reducing CO₂ emissions from all sources. Each country that is part of the agreement is expected to put in place local policies and regulations to achieve their Nationally Determined Contribution (NDC).

Irrespective of COP21, the power generation industry had been on a path of reducing CO₂ emissions. Methods to achieve lower CO₂ emissions in the power industry include deploying nuclear and renewables sources such as wind and solar, retiring coal-fired plants and/or switching from coal to natural gas as a fuel source, and improving the efficiency of existing fossil-fueled generation. The effects of these new or changing fuel sources has implications throughout the energy ecosystem, including new grid infrastructure to accommodate renewables, and natural gas transportation infrastructure improvements. The multi-national progress on COP21 is an unprecedented and important step, with more aggressive actions needed from all CO₂ emitting industries to mitigate the approximately 1/3 increase in global CO₂ emissions expected through 2050.

Challenges
Fossil fuels make up the majority of global electricity generation
Some developed grids need to evolve to accommodate renewables penetration
Policies have not kept pace with technology advancements

Opportunities
Broad consensus of need to curb CO₂ emissions
Lower costs for renewable technologies
Fuel diversity leads to energy security

"We called for strong ambition, for remarkable partnerships, for mobilization of finance, and for implementation of national climate plans. Paris delivered.”

Jim Yong Kim
World Bank President on COP21
Highlights of GE’s solutions

Onshore and Offshore Wind Turbines
Delivering up to 6 MW of zero-carbon electricity per tower, enough to power approximately 2,000 US homes, GE wind turbines are among the most advanced in the industry. Construction of the first offshore wind farm in the US, with GE’s Haliade® technology, was recently completed off Rhode Island.

Hydro
Representing more than 25% of the world’s installed capacity of hydro generators, GE offers a broad range of hydro solutions and services: from water to wire, from individual equipment to complete turnkey solutions, for new plants and the installed base.

ESBWR Nuclear Power Plant
The Economic Simplified Boiling Water Reactor (ESBWR), capable of generating 1,520 MW of baseload, carbon-free electricity, is the world’s safest generation III+ reactor. It can safely cool itself with no AC electrical power or human action for more than seven days.

Carbon Capture and Storage
With an intensive research and development program, we have designed and constructed 13 CO2 Capture Solutions (CCS) demonstration projects around the world, and these technologies are ready for large-scale implementation.

HA Combined Cycle Power Plants
GE introduced the first H-class gas turbine in the industry and has evolved the technology to the HA class which are at the heart of the largest, most efficient combined cycle power plant in the world. Higher efficiency results in lower CO2 emissions compared to other combined cycle plants.

Solar
From components to full plants, GE’s Concentrated Solar Power (CSP) solutions can be configured to the most challenging environments and stringent customer specifications. GE can also handle every aspect of your solar photovoltaic project, including design, development, construction, operations and maintenance and financing.

Operations Optimization
Operations Optimization is a cloud-based suite of digital solutions that deliver proactive recommendations by analyzing internal plant data, historical operational data, or external information in order to inform key resources, reduce production costs, and enhance plant flexibility. It delivers results regardless of OEM.

Advanced Gas Path
Blending hardware innovations with GE’s advanced OpFlex® software delivers world-class performance and operational flexibility. For the existing fleet of 7F gas turbines, it can improve output by more than 10 percent and heat rate by more than 3 percent, reducing fuel burn and CO2 emissions per kWh generated.

GE just finished installation of the turbines in the first offshore wind farm in the US. The wind farm, built by Deepwater Wind and located three miles off the coast of Block Island, Rhode Island, will power 17,000 homes and will reduce electricity bills on the island an estimated 40%.
Countries seeking universal access should continue strengthening existing grid extension plans, utilizing native fuel resources and cost-efficient central generation plants, while minimizing distribution system losses and strengthening financial viability. This will be key to addressing the 50% greater electricity demand expected over the next 20 years. However, for more than half the unconnected population, getting access to the grid may not be an economically-viable solution.

Powering everyone will require new solutions, different grid structures, and new commercial models. Declining solar and storage costs, internet connectivity, and new metering and power distribution technology will all facilitate access. Success also will require a collaborative effort between utilities and power producers, governments, financing institutions, and nongovernmental organizations (NGOs).

These new paradigms will have significant impacts on the industry. Reliable access to electricity is the foundation these communities need for progress, and will lead to further developments in improved healthcare, clean access to water, and more reliable transportation infrastructures.

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“it’s been well over a century since Thomas Edison demonstrated how an incandescent light bulb could turn night into day. And yet, there are parts of the world where people are still waiting to enjoy the benefits of his invention.”

Bill Gates
Microsoft co-founder, investor and philanthropist
Highlights of GE’s solutions

**TM2500 Mobile Gas Turbine-Generator Set**

Known as the “power plant on wheels,” this fast and flexible power plant solution harnesses the widely deployed LM2500 aeroderivative gas turbine. It can be delivered via land, sea, or air to remote locations in weeks, not months, providing scalable blocks of affordable power capable of operation on natural gas, distillate oil, or condensates.

**Grid Planning Solutions**

GE performs detailed steady state, voltage and transient stability studies of regional transmission systems, generation interconnections, distributed energy resources and renewables integration to enable customers to seamlessly deploy new technology and take advantage of grid modernization architectures.

**Reciprocating Engines**

With outputs ranging from 250 kW to 10 MW, reciprocating engines are well suited to provide a dependable and efficient distributed energy resource of on-site power, heat and cooling in isolated, mission-critical applications in some of the world’s harshest operating environments.

**Double Reheat Ultra-supercritical Coal Plants**

New electricity consumers with access to large grid systems can benefit from the addition of reliable, cost-effective and durable baseload electricity generation from high efficiency coal plants with advanced air quality and pollution control technologies.

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**Bringing Power to Paradise**

MAECI Solar, GE and Princeton Power Systems are installing a 5 MW solar grid across three locations on Annobon Province, Equatorial New Guinea including the airport, hotel and mountain top. The island-wide microgrid will provide reliable, predictable power and meet 100 percent of current energy demand. As energy requirements increase, extra storage batteries can be added. It will be the largest self-sufficient solar project in Africa.

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**Powering Everyone, One Village at a Time**

GE Power has teamed up with Global Himalayan Expedition to install DC microgrids at several remote villages in northern India. Our partnership is reinforced by the time and effort GE employees put in to travel to these villages, help install the microgrids, and ultimately provide light where none existed before. GE Power also is undertaking such activities across Africa and Asia as part of its mission of Powering Everyone.
The EU has a major opportunity to improve its energy security and its competitiveness thanks to the positive development of the global LNG market.

**Challenges**
- Environmental concerns, including seismic, water usage, and fugitive methane
- Fuel transportation infrastructure
- Global price variations

**Opportunities**
- Enables fuel diversity
- Technology opportunities for extraction, transportation, and efficient consumption
- Gas to liquid technology to replace incumbent liquid fuels

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IN 2011 THE INTERNATIONAL ENERGY AGENCY ISSUED A SPECIAL REPORT THAT ASKED THE QUESTION “ARE WE ENTERING THE AGE OF GAS?”

The report cited favorable factors that drive natural gas demand including: lower emissions compared to other fossil fuels, the benefits of a diversified energy supply, and the ability to provide flexibility and back up capacity in the electricity sector as more renewables capacity comes on line. These factors, combined with vast and widely dispersed global natural gas resources underpinned a much more positive future view for gas.

Since then, there has been a collapse in global oil prices, the COP21 climate agreement was signed by 196 nations, and bans were enacted in some regions on hydraulic fracturing, a key enabler to increased availability of natural gas. Despite these headwinds, natural gas is expected to be the fastest growing fossil fuel for global power generation over the next 10 years, accounting for more than 20% of total electricity generation, and natural gas power plants are expected to lead all other fuel sources in new capacity additions over the next 10 years.

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\[\text{PERCENTAGE OF NEW POWER PLANTS ORDERED GLOBALLY IN THE NEXT 10 YEARS FUELED BY NATURAL GAS} \approx 28\%\]

\[\text{PERCENTAGE OF GLOBAL ELECTRICITY GENERATION FROM NATURAL GAS IN 2025} \approx 22\%\]
Highlights of GE’s solutions

Gas Turbine-based Power Plants
Natural gas-fueled simple cycle and combined cycle plants utilizing heavy duty or aeroderivative gas turbines are available in various sizes and configurations to meet customer-specific site and operability requirements. All of the gas turbine units in GE’s portfolio can operate on natural gas and a wide range of other gaseous and liquid fuels with operational flexibility and low emissions.

Reciprocating Engines
With outputs ranging from 250 kW to 10 MW, reciprocating gas engines with fuel flexibility to run on either natural gas or a number of other gases, are well suited to furnish on-site power, heat and cooling for a variety of commercial, industrial and municipal applications. Reciprocating gas engines with high power density and high efficiency provide a reliable solution with fast startup times and exceptional efficiency.

Advanced Gas Path
In-service F-class gas turbines can be uprated with GE’s Advanced Gas Path solution that improves output, efficiency, emissions, and availability to unleash additional long-term value from existing assets. This solution, which blends hardware innovations with OpFlex® software, can increase output 6% and increase efficiency 2% while improving parts lives and reducing start-up emissions by 50%.

Intelligent Pipeline Solution
Utilizing the Predix software platform, GE and Accenture have teamed together on the Intelligent Pipeline Solution, which aggregates and analyzes multiple streams of data to deliver a comprehensive view of gas and oil pipeline operations. This improved situational awareness enables well informed, proactive decisions that can provide better risk management, reduce the likelihood of failures, enhance regulatory compliance, allocate capital and human resource more efficiently, improve maintenance decisions, and increase throughput and uptime.

Compressors
GE has a broad portfolio of compressors including horizontally-split, vertically-split barrel, pipeline, axial, single stage overhung, and integrally geared configurations. These compressors help customers to reliably meet the wide range of size and pressure requirements in gas production, transportation, refinery, fuel gas boosting and other applications.

Plug & Play Modules
Power generation and compression modules are pre-fabricated and fully tested in a factory environment. They include the requisite equipment, piping, cabling and a dedicated control room with single screen monitoring and analytics, resulting in reduced risk and cycle times. While solutions can be fully customized, and are project-specific, we also have a portfolio of pre-designed modules with a wide variety of configuration options, offering great flexibility.

*Trademark of General Electric Company.

From Massive to Mega
GE designs and delivers the advanced turbocompression technologies needed to make the world’s largest LNG plant a success

Before this project, the Qatargas facility in Ras Laffan was already the world’s largest LNG project—and the first to integrate the entire value chain. It includes offshore gas production, onshore treatment and liquefaction, a dedicated fleet of LNG ships, and regasification plants in the UK, US, and Italy.

Having provided turbocompression equipment for the facility’s first development phase (QG1), GE Oil & Gas was again asked to meet the technology challenges for the second and much larger phase (QG2). Although every aspect of the QG2 project was ambitious and astounding, overall success depended primarily on the ability to achieve enormous economies of scale. And the key to that would be the LNG megatrain technology from GE Oil & Gas.
GLOBAL POPULATION GROWTH AND ECONOMIC DEVELOPMENT SUGGEST A FUTURE OF INCREASED DEMAND, COMPETITION AND COST FOR LIMITED FRESHWATER SUPPLIES.

Scarcer water, in turn, creates new challenges for energy supply because fuel extraction and electricity production can require massive amounts of water. According to the International Energy Agency, water withdrawals related to the energy sector are expected to rise by one-fifth through 2035, and water not returned to its source, due to closed-loop cooling systems or to evaporation, is expected to increase by 85%.

Public and private sector leaders have recognized that socioeconomic development and human well-being depend on current and future access to clean water and energy. In 2015, the United Nations acknowledged the scale of the challenge and established global ambitions for water and energy access in its Sustainable Development Goals:

- Goal 6: Ensure availability and sustainable management of water and sanitation for all.
- Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all.

Challenges

- Stricter regulations on freshwater withdrawals place pressure on thermal and hydro power generation
- Increased regulations on wastewater effluent, requiring further treatment before discharge
- Urbanization and industrialization increase demands on infrastructure and wastewater treatment needs

Opportunities

- More complex treatment solutions will be needed to meet water reuse requirements
- Harnessing the energy in wastewater and food waste to create renewable heat and power
- Access to data and increased use of analytics to monitor and optimize water and energy consumption

“Unless new water-conserving practices are developed, there likely will not be sufficient water to generate adequate supplies of energy and food, and for industries and cities.”

*World Energy Council*

March 2016

1.2B
PEOPLE LACK ACCESS TO ELECTRICITY

650M
PEOPLE LACK ACCESS TO CLEAN WATER

9B
ESTIMATED GLOBAL POPULATION IN 2040
Zero Liquid Discharge (ZLD) in Power Generation

GE’s ZLD Technology Enables Wastewater Reuse at Orlando Utility

When faced with water shortages and community pressure to conserve and protect drinking water sources, the state of Florida developed stringent wastewater guidelines. Like other power plants and industrial sites in Florida, the Orlando Utilities Commission (OUC) needed a way to reduce makeup water requirements and to recycle and reuse as much wastewater as possible at its Stanton Energy Center.

Based on the ability to meet the reliability and on-stream demands, GE was selected to provide a combination evaporation and crystallization system. Using wastewater from Orange County’s Eastern Wastewater Treatment Facility as cooling tower makeup, GE’s system is taking the cooling tower blowdown stream and reclaiming it for use as makeup water.

Through a partnership for over 20 years, the Stanton Energy Center’s ZLD facility was built over three phases and treats approximately 1,700 gallons per minute of cooling tower blowdown. The ZLD component prevents the discharge of this wastewater stream, and maximizes the reuse of wastewater, which limits the need for additional groundwater removal. GE’s ZLD process also allows OUC to satisfy their permitting requirements for zero-liquid discharge, and conserve Florida’s most valuable resource—its drinking water!
DIGITAL TECHNOLOGY IS DISRUPTING AND TRANSFORMING THE ELECTRICITY INDUSTRY, CHALLENGING OLD MODELS AND CREATING UNPRECEDENTED OPPORTUNITIES. EDISON WOULD NOT RECOGNIZE OUR WORLD TODAY.

Although digitization has become ubiquitous in all aspects of our lives, the energy industry has one of the largest digital opportunities. Digitally-enhanced power generation, with software and data analytics, combined with advanced hardware, will deliver greater affordability, reliability and sustainability. This will be accomplished while lowering costs, improving efficiency, and reducing the electricity industry’s carbon output.

Traditional participants in the electricity industry are recognizing the momentous change taking place and are seeking solutions and partners in the new age of digital. There are new and old players leveraging digital technologies, new policies creating new requirements, and new business models that are challenging traditional revenue sources and creating new growth opportunities.

**Challenges**
- Data access: <2% of data is captured and is primarily done without automation
- Lack of data scientists
- Old assets must be retrofit

**Opportunities**
- Connectivity: connected machines drive optimization, increase efficiency, and reduce emissions
- Grid 2.0: A highly connected, fully optimized grid enables greater transparency, new business models, and enhanced security
- Address variability, reliability and line loss issues

"We have to look to innovation in emerging technologies."

**Mike Kurzeja**
Emerging Technology, Exelon Corporation

> $2T

OF SOCIETAL BENEFITS FROM REDUCTION IN CARBON EMISSIONS, NET NEW JOB CREATION AND VALUE CREATION FOR CONSUMERS
Highlights of GE’s solutions

Digital Power Plant (DPP)
The DPP combines the physical strengths of high-efficiency air-cooled (IHA) gas turbines with a powerful tool to improve reliability, availability and dispatch with reduced production costs. New revenue streams can now be realized to provide improved primary response to meet grid demands, ancillary market frequency regulation, and real-time trade-offs between faster starts versus parts lives and grid demands.

Asset Performance Management (APM)
APM is a suite of cloud-based software and service solutions that works across all equipment, all OEMs, and all industries—across the plant and across the fleet. The solutions cover Machine & Equipment Health, Reliability Management, and Maintenance Optimization—to help asset-centric industrial companies increase uptime, decrease costs, and reduce operational risks.

Operations Optimization (OO)
OO is a cloud-based suite that provides Key Performance Indicator (KPI) focused analytics and by analyzing internal plant data, historical operational data, or external information delivers proactive recommendations in order to inform key resources, reduce production costs, and enhance plant flexibility. Every level of operations can tap into consistent visibility across systems, giving the insights to act towards optimal operational excellence.

Business Optimization (BO)
BO is a cloud-based suite that helps power producers take full advantage of predictive analytics to make improved decisions around power trading, fuel purchases and portfolio management. Modules can forecast plant capability and market behavior to maximize revenue, while optimizing profit by scheduling outages and operations, against factors such as market conditions, load/demand variations, weather forecasts, fuel forecasts, transmission constraints and power/fuel pricing considerations.

Energy Management & Optimization Solution
After performing an expert audit of existing HVAC, lighting and equipment systems—data measuring, analyzing, predicting and energy consumption optimizing are conducted on the Predix platform. This digitized solution enables energy purchase at the best price, efficient management of energy using assets, actionable intelligence development on asset performance to better prioritize repair and replacement decisions, and assurance that utility bills are free from errors.

~$1.3T
OF INDUSTRY VALUE FROM SERVICE PLATFORMS, SMART DEVICES, THE ‘CLOUD’, ADVANCED ANALYTICS

A large renewable and clean energy company:

Challenge
Misalignment between traders and plant managers caused missed market opportunities

Solution
Building a digital twin, thermal model and forecasting model enabled traders to bid more on the capacity market

Results
GE’s Operations Optimization informed engineers and operators of recommended repairs and additional capacity

Improving Customer Outcomes with the Digital Power Plant

~$1.3T OF INDUSTRY VALUE FROM SERVICE PLATFORMS, SMART DEVICES, THE ‘CLOUD’, ADVANCED ANALYTICS

Improving Customer Outcomes with the Digital Power Plant
Combining data + physics to improve outcomes:*  

Typical Gas Digital Power Plant:†  
- 3% increase in fuel efficiency  
- 2% output  
- 5% unplanned downtime  
- 25% O&M costs  
- 20% fuel on starts  

Typical Digital Wind Farm:†  
- 10% maintenance cost  
- 1% production based on availability  
- 10% annual energy production  
- 1–3% revenue  

*Representative customer outcomes are not guarantees of results  
†Representative customer outcomes are not guarantees of results  

GE’s security experts help customers identify potential exposure to cyber attack and implement technologies and processes to reduce operational risk and assure availability.
We drive enterprise advantages that benefit our customers through what we call the “GE Store.” It means that every business in GE can share and access the same technology, markets, structure and intellect. The value of the GE Store is captured by faster growth—it makes the totality of GE more competitive than the parts. No other company has the ability to transfer intellect and technology as we can through the GE Store.
GE Beliefs

HELPING US WORK TOGETHER TO CHANGE OUR CULTURE AND DELIVER ON SIMPLIFICATION

We are being challenged to think, act and lead in new ways, pushing our boundaries to create a GE that is faster, simpler and more customer-focused.

To accelerate our journey we must embrace a new way of working that enables us to: keep pace with change, harness complexity, transform our culture and deliver results.

THE GE BELIEFS:

1. Customers Determine Our Success
2. Stay Lean to Go Fast
3. Learn and Adapt to Win
4. Empower and Inspire Each Other
5. Deliver Results in an Uncertain World
Delivering True Change in Three Focus Areas

**BETTER BUSINESSES**
At Global Research, we work every day to see, move and create the future. This is all about positioning GE for the long-term, making the world a better place and partnering with our business teams who are serving our customers.

Each GE business commits to investing for the future, knowing that it is vital to our Company’s success. At Global Research, our technologists deliver outcomes—technologies that will lead GE, our customers, and industries into the future.

**BETTER GE STORE**
The power of GE is rooted in the distinction that our businesses are more competitive together than apart. Through the GE Store, we are able to scale processes, knowledge and, most importantly, our technology to innovate faster across multiple industries.

From additive manufacturing to the digital twin to connected controls, the ability we have to scale technologies and apply them across everything from wind turbines to offshore oil rigs to aircraft engines is incredibly powerful.

**BETTER GLOBAL RESEARCH**
Around the world, our Global Research team collaborates with our GE business partners, customers and external collaborators to lead the future.

When it comes to creating the future, we need faster technology development and prototypes. In 2016, we launched the Edge Lab, which is the nexus of robotics, artificial intelligence and more.
Featured Technologies

Additive Manufacturing
Additive Manufacturing will break conventional constraints in design and manufacturing, and enable significant improvements in GE product capabilities. GE is unleashing this potential through its unique position at the confluence of materials development, process and machine engineering, Brilliant Factory,® and advanced design rules.

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Advanced Materials
Ceramic matrix composites (CMCs) are a breakthrough materials technology for jet engines and gas turbines that started at our Global Research Center in Niskayuna. With more than 20 years of experience, GE has taken CMCs from the lab to robust, cost-effective manufacturing. What’s so innovative about CMCs is that they can be made as strong as metal, yet are much lighter and can withstand much higher temperatures.

Silicon Carbide
Silicon Carbide (SiC) based power devices have significant advantages over Silicon (Si) capabilities—and we’re excited by the possibilities. SiC will set new standards in power savings for virtually everything that converts or uses electricity.

Combustion
Innovation in combustion technology enables higher power generation efficiency while reducing pollutants. GE is developing advanced combustion components and systems capable of using a wide variety of gaseous and liquid fuels. This enhanced combustion capability is coupled with advanced diagnostics to evaluate and enhance operability and durability.

Global Research Centers

What we do every day matters to millions of people and makes our world a better place. Thanks for joining us on this journey.

Niskayuna, New York
Oklahoma City, Oklahoma
Rio de Janeiro, Brazil
Munich, Germany
Dhahran, Saudi Arabia
Bangalore, India
Shanghai, China
GE is dedicated to developing financing solutions designed to leverage public, private and development finance mechanisms. We focus our attention on the project’s regulatory and investment environment in order to manage the risks and returns for our clients. Our main objective is to allow our global clients to meet their energy targets by mobilizing financial resources.

Export Credit Agency Financing
Raise competitive financing for customers using ECAs

Banks/Direct Foreign Investment
Develop financing platforms, expanding regional niche investor base

Development Capital
Unlock equipment sales and service through investment in growth market projects

Selected Equity Investments
Enable mega deals with strategic customers; underwriting and investment support

Cooperation Structures
Establish partnership structures including strategic cooperation agreements/joint ventures

$13B
COMMITTED FINANCING BY GE FOR ENERGY ASSETS
GE is investing in digital technologies to solve energy ecosystem pain points.

**GE’S DIGITAL INDUSTRIAL JOURNEY**

- Applied 20 years of machine data and analytics to monitor and optimize industrial assets
- Invested $1B in software and analytics R&D, and opened a software center in San Ramon, CA
- Developed advancements in big data, analytics, sensors, and networking to create an Industrial IoT for nearly every piece of industrial equipment and process
- Powered by our Predix platform, customers can “see” in a new way, monitor and manage their entire ecosystem, and deliver products more efficiently, reliably, sustainably

*This delivers up to $75B in savings industry wide*

**THE ENERGY INDUSTRY IS TRANSFORMING**

- Only 3% of modern industrial data is analyzed
- 93% of power executives put analytics in their top 3 business priorities

**50M**

DATA ELEMENTS MONITORED DAILY FOR GE CUSTOMERS

**$1T**

ASSETS SECURED AND MONITORED CONTINUOUSLY
GE’s Predix Platform
Purpose-built for the Industrial IoT

Reasons for Cloud
- Speed to implementation and innovation
- End-to-end security
- Lower costs
- Ability to scale
- Ubiquitous and global visibility
- Failure isolation with microservices

Cloud-based platform for Industrial Internet
- Connected Assets
- Industrial Data Science
- Industrial Data Management
- Cloud and Mobile

Optimized for Industrial Requirements
- Asset Performance Management
- Industrial Analytics
- Operations Optimization
- Digital Twin

Reliability
- Increased availability and longer asset life

Cost Reduction
- Lower operating costs with greater efficiencies

Risk Mitigation
- Lower operations and financial risk

Profitable Growth
- Increased production for market advancement

GE Digital Twin
A unique data model of a physical asset

INDUSTRIAL DATA STREAMS
- Atmospheric data
- Operational data
- Inspection and repair
- Site events

MODELS
- Lifing models
- Anomaly models
- Thermal models
- Transient models

BUSINESS APPLICATIONS
- Business optimization
- Operations Optimization
- Asset Performance Management
- Advanced controls
- Cyber

CUSTOMERS KPIs
- Reliability
- Capacity
- Emissions
SINCE ITS INCORPORATION IN 1892, GE has grown from a US company to a global company that operates in approximately 180 countries and happens to have its headquarters in the US. We have been active in countries like China for more than 100 years, and in 2015 approximately 55% of the company’s revenues came from outside the US. More than 60% of GE’s approximately 330,000 employees reside in countries other than the US.

Six years ago GE created its Global Growth Organization, led by John Rice, with three primary responsibilities:

1. Support GE businesses in local market expansion and growth
2. Help GE localize faster and become more locally competitive
3. Maximize the GE Store advantage in each region

GE has manufacturing facilities in more than 39 countries around the globe. This local manufacturing capability enables us to get closer to our customer’s markets while providing job opportunities to the local population.

Global Research Centers have been established by GE at 7 locations around the world, staffed by approximately 2,900 PhDs, scientists, and engineers. Each center specializes in core technologies while sharing their knowledge and expertise seamlessly. The focus of the research centers is positioning GE for the long-term, making the world a better place and partnering with our business teams who are serving our customers.

2015 GEOGRAPHIC REVENUES

- US: 45%
- Europe: 17%
- Asia: 14%
- Americas: 14%
- Middle East & Africa: 10%
“You never change things by fighting the existing reality. To change something, build a new model that makes the existing model obsolete.”

Richard Buckminster Fuller
Author, architect, inventor
GE has been at the core of the electricity industry since its earliest days and is continuing to invest to lead in its transformation.

Reinventing Energy
We are transforming the electricity industry with the digital power plant, the world’s largest and most efficient gas turbine, full balance of plant offerings, and upgrades and service solutions to improve the performance of GE’s and other OEM’s installed base. In addition, we are working on Reverse Osmosis (RO) membranes for water treatment solutions to improve performance and reduce cost through novel chemistry, manufacturing processes and module designs.

Digital Twin
An engineering model that continuously increases insights in assets to deliver specific business outcomes. These models are continuously tuned with data to create models which track the running state and remaining useful life of each asset.

Delivering Digital Capabilities
GE is transforming itself into a digital industrial company, coupling domain expertise in the most important industrial segments in the world with world-class digital capability at our flagship Digital Foundry in San Ramon and additional foundry locations in Paris, Shanghai, and Saudi Arabia (Q4 2016). Predix, developed by GE, is the world’s first industrial operating system.

Predix
An operating system and platform for building applications that connect to industrial assets, collect and analyze data, and deliver real-time insights for optimizing industrial infrastructure and operations.
Imagine a factory that never stops and constantly optimizes itself, continuously improving products and how they are made. A factory that is linked to our product designs and services, executing for our customer needs as well as continuously providing feedback to make our offerings better. GE is implementing this vision across its factories globally, using Predix to integrate disparate data streams from machines, factories, supply chain partners and service shops.

Brilliant Factory
A factory enabled by a Digital Thread that marries virtual tools with physical tools and connects every part of the manufacturing supply chain from product designers to workers on the factory floor.

Investing and Inventing for the Future
We invest through economic cycles to position our businesses and customers to be successful in the future. In 2015 we invested more than $5B in R&D. Our scientists, engineers, and technologists channel their innovation to deliver disruptive breakthroughs that matter, at the right time.

Microsystems
High value Micro Electro Mechanical Systems (MEMS) that differentiate GE products through sensing, actuating, and embedded processing.
Driving Thought Leadership

GE is a leading sponsor and participant at global thought leadership events

Now in their fifth year, the GE-sponsored Minds & Machines events bring together a global community of GE customers, developers, partners, industry luminaries, and technology thought leaders to explore the digital transformation of industry, the state of the Industrial Internet, and what this means for your business.

We are also key contributors and speakers at major energy ecosystem events such as CERAWeek, the World Economic Forum, and World Energy Congress, where we share our views on the biggest challenges facing the world today.

†CERAWeek is a trademark of IHS Global Inc.
‡World Economic Forum is a trademark of World Economic Forum

Engaging Policy Makers

GE serves as a resource to global policy leaders, educating them about leading edge technologies and collaborating on sound policy that will drive global energy innovation.

GE practices a customer-centric approach to global policy advocacy. We partner with our global customers on policies that will drive mutual growth.

With the digital transformation of the energy industry, traditional policy thinking must transform as well. The future of energy is cleaner, more efficient and more connected. GE advocates for policies that support our energy vision.
We hope this portfolio shows the breadth and depth of GE’s solutions across the entire energy ecosystem, and demonstrates GE’s commitment to working with our customers as they navigate structural transformations in their industry. This commitment has never been stronger, and was strengthened considerably by the Alstom acquisition which brought new products and services, great talent, and a more global footprint into the GE family. GE believes that energy access is a basic human right and we are committed to providing more affordable, reliable and sustainable energy to every person and industry on the planet.

GE is also undergoing a transformation into a digital industrial company; pairing its domain expertise in multiple industries with world-class digital solutions built upon Predix, the foundation for the Internet of Things. No other company has this combination of technology domain expertise and home-grown digital capability.

Despite the transformations in the industry and at GE, technology leadership will always be at the core of GE’s commitment to its customers. It’s what enables us to take on the world’s biggest challenges and deliver solutions that help our customers and society as a whole.

We want to help you navigate the transformative changes in your industry. Contact us to help solve your most challenging energy ecosystem problems.

GE’S COMMITMENT TO
LEADING
in the transformation of the Energy Ecosystem

Steve Bolze
SVP, President & CEO
GE Power

Jérôme Pécresse
President & CEO
GE Renewable Energy

Sue Siegel
CEO
GE Ventures

Lorenzo Simonelli
SVP, President & CEO
GE Oil & Gas

Russell Stokes
SVP, President & CEO
GE Energy Connections

Maryrose Sylvester
President & CEO
Current powered by GE

Beth Comstock
Vice Chair
GE

John Rice
Vice Chair
GE

Vic Abate
SVP & CTO
GE
Visit www.geenergyecosystem.com for additional information