

A Digital Industrial View of the Global Energy Challenge

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GE ... 125 year old start-up



Let's define the Energy Ecosystem

An interconnected system of digital and industrial technologies that delivers affordable, reliable, and more sustainable production, distribution, and consumption of energy to our world.

The energy ecosystem is undergoing unprecedented transformation driven by

- Decarbonization
- Decentralization
- Digitization

Reliable Digitization Sustainable

Affordable



Energy Ecosystem

Digital Thread and Digital Twin



Electrical Consumption

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



GE Current and Lighting

Transmission & Distribution

Getting electricity from the generator terminals to its point of use at the required conditions



GE Energy Connections Electricity Generation

GE

Power

Conversion of fuels to kilowatt-hours at the generator terminals

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GE Renewable Energy

Refining & Processing (Downstream)

Conversion of hydrocarbons to useful products

Fuel Delivery & Storage (Midstream)

Delivery of a fuel of the desired composition and required conditions

Exploration & Production (Upstream)

The extraction of natural resources for use in energy production



GE Oil & Gas

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"New Power Orders" ... the 50 year view



Sources: GE Power & GE Renewable Energy Marketing, IEA, IHS, BNEF, Lazard



What about the next ten years for the power industry?



- Gas & renewables lead growth
- Majority still central power ... coal 1/3 of 2026 generation
- Electrification of Things ... EV's contribute to growth

Energy mix shifting to gas & renewables

Sources: GE Power & GE Renewable Energy Marketing, IEA, IHS, BNEF, Lazard 1) Generation excludes oil recip & battery generation. 2) Efficiency gain results from electricity intensity reduction, Battery LCOE based on 2025 projected costs

Levelized cost of electricity (LCOE)



- Gas is the most economical energy source today
- Renewables approaching LCOE parity ... not dispatchable
- 2025 storage costs in line with peaker LCOE

Market pays premium for dispatchability

What about the next ten years for the power industry?

Generation Mix

Average GW/year orders '17-26



Slow growth, volatile world ...

Pockets of growth, localization wins

Energy demand ~2-3% ... 1.2B people without power

Majority still centralized power ... Fossil fuels continue to play key role

Growth of renewables and storage ...

Driving need for operating flexibility

Industry in transition ... COP21, diverse technologies required



Renewables are mainstream power generation



Gas plants ... HA efficiency growth with technology

Model & efficiency Technologies ~2013 14 stage 3D compressor 4-stage turbine 9HA.01, 7HA.01, 7HA.02 "Staged" combustion Flowpath sealing investment **62 → 63%** \$1.8B In operation Titanium S1 comp blade Turbine aero Micromixer* Micro-channel Advanced Cooled LSB Ultra-Low k TBC >600C bottoming 9HA.02 cooling sealing cvcle Being manufactured Today **63 → 64%** +25% "Skin" cooling lowe investment Tested 7HA.01 Alstom Tech Tested 7HA.02 \$400MM Combustion High-temp Advanced Rotor cladding Forward leaning HAs Unsteady CMCs blade cooling additive aero → 65% Being +3000F developed fire Maximum 20-40% flow reuse less cooling ~2020F

64% by the end of the decade, 65% early/mid next decade, HA "architecture" change not required



Steam plants ... modernizing the fleet











MODERNIZING THE WORLD'S COAL-FIRED POWER PLANTS

Channeling GE's cross-business capabilities together to help steam plant customers lower emissions without sacrificing performance



Digital transformation of electricity

Reimagining electricity ... intersection of energy & digital

More data than any other industry

- ✓ 2TB data per plant/day
- \checkmark 2% of all data is being utilized
- ✓ 75% of plant downtimes are predictable
- ✓\$10 trillion by 2060









Building a new digital Energy Ecosystem



Delivering outcomes to the **global energy ecosystem**

Driving incremental productivity by combining **physics + analytics** Winning from **edge to cloud** ... Predix operating system for industrials

Leading in enterprise digital transformation



Key messages

- People across the world need power that is **affordable**, **reliable**, and more **sustainable**.
- The power industry is undergoing unprecedented transformation, and navigating it requires a full understanding across the entire Energy Ecosystem.
- **No SINGLE technology** is the answer ... a broad combination of power technologies is needed, based on resource availability, distribution systems, regional dynamics and evolving customer needs.
- Tremendous value can be created for our customers from their installed base, and created through new grid, plant and system investments ... digital will be a key enabler.
- GE is committed and uniquely positioned to support our customers through this unprecedented industry transformation.

A digital industrial company solving the global energy challenge



GE POWER

We'll never be satisfied until the entire world has power.

