Global Research: Redefining what’s possible

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Director & SVP

Four segments aligned for growth

- Infrastructure - Technology
- Infrastructure - Energy
- GE Capital
- NBC Universal
Global Research: market-focused R&D

First US industrial lab

Began 1900 in Schenectady, NY

Founding principle ... improve businesses through technology

One of the world’s most diverse industrial labs

Cornerstone of GE’s commitment to technology

Global Reach

- 2,800 employees in four global centers
  - U.S. – 1965
  - India – 500
  - China – 235
  - Germany - 100

- 2,150 engaged in research activities
- 1,175 PhDs
- 620 Masters Degrees
- 12 years average experience
Supporting GE’s diverse technology

**GE Energy**
- Gas Turbines
- Wind
- Solar

**Aviation**
- GE 90
- Genx
- Avionics

**Oil & Gas**
- Subsea multiphase boosting
- High-speed motors
- Combustor nozzles
- Composite risers

**Transportation**
- Evolution locomotive
- Evolution Hybrid
- Marine and mining

**GE Healthcare**
- Diagnostic Imaging
- Medical diagnostics
- Clinical systems
- Healthcare IT

**Enterprise Sols.**
- Security
- Inspection Technologies
- Sensing

**GE Water**
- Purification
- Desalination
- Wastewater to Energy

**GE Capital**
- Asset tracking
- Financial/Risk modeling

**NBC Universal**
- Video on-demand
- Anti-piracy
- Marketing initiatives
- Scheduling decisions

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Role of Global Research
Role of global research

- Delivering core technologies for NPIs & productivity
- Discovering new technology opportunities
- Establishing foothold in advanced technologies
- Spreading technology across businesses
- Developing world-class talent
- Connecting with the world's technology

Delivering core technology for key NPI

LightSpeed VCT

- Built on VCT detector and other advanced technologies
- 1,000+ orders in <2 years
- World's 1st volume CT scanner to scan the heart in 5 beats
- GRC technology key to product and market performance
Discovering new technology opportunities

Electrification

Disruptive technology for O&G ... electric motors replacing gas turbines

Growth opportunity for Aviation ... electric loads increasing, replacing hydraulics

New electrification technology capable of improving reliability, cost, performance & safety

Establishing foothold in advanced technologies

Nanotechnology
Molecular Imaging & Diagnostics
Organic Electronics
Sustainable Energy
Advanced Propulsion
Energy Conversion
Spreading technology across GE

materials & modeling

- new coatings
- new composites
- new metal alloys
- computational fluid dynamics

Aviation | Energy | Energy | Transportation

imaging & analysis

- digital X-ray
- Phased array ultrasound
- Eddy current
- thermography
- optical metrology
- image processing

Healthcare | Aviation | Energy | Water | Oil & Gas | Security
Developing world-class talent

Innovation occurs at the intersection of disciplines

Connecting with the world’s technology

GE Global Research

Governments

Customers

Universities

Other

GE Global Research
R&D structure

GRC leadership structure

SVP, Global Research

Advanced Technology Programs
- Advanced technology
  - Nano technology
  - Sustainable energy
  - Molecular imaging
  - Organic electronics
  - Energy conversion
  - Quality

Global Technology Organizations
- Global technology groups
  - Biosciences
  - Ceramics & metallurgy
  - Computing & decision sciences
  - Power conversion systems
  - Electronic systems and controls
  - Energy & Propulsion
  - Imaging technologies
  - Material systems technologies
  - Micro & nano structure technologies
  - Chemistry & Materials Characterization

Business Program Offices
- Business program
  - Aviation
  - Energy
  - Oil & Gas
  - Enterprise Solutions
  - Financial Services
  - Healthcare
  - Transportation
  - NBCU
  - Consumer & Industrial
  - Water
GRC funding strategy

**GE business programs**
- Next generation product technology
- Short-term technical challenges

**GE corporate programs**
- Advanced Technology programs
- New ideas
- High-risk/high reward

**External partnerships & gov’t. funded**
- Joint technology
- Specific customer focus

![Pie chart showing 60% GE business programs, 27% GE corporate programs, 13% External partnerships & gov’t. funded]

$550 MM

Healthcare solutions
Digital mammography

- Higher dynamic range
- Superior image quality
- Lower dose of radiation
- Better outcomes, lives saved

Surgical optical imaging

- New modality provides enhanced “eyes” for doctor
- Near infrared camera partners with contrast agents to light-up tumors & margins
- Standardizes surgical care in all hospitals
- Reduces need for additional surgeries
Hand-held ultrasound

- Mass adoption through miniaturization and targeted clinical solutions
- Will enable near-continuous monitoring
- From thousands of customers to millions

Energy & environmental solutions
Improve core... GEnx

Provides 15% better fuel efficiency
Reduces emissions by 50%
- 3rd gen composite fan blade ... GE still only composite in industry
- First all-composite fan case in industry
- 2nd gen 3D-Aerodynamics

Improve core... gas turbines

Advanced combined cycle
Provides +2 pts. efficiency vs. today's air-cooled technology
Increases compressor by 30%
Leverages composite blade technology from GE90
Low cost of electricity for customers
**Accelerate new... wind**

- 2.5-megawatt turbine with 55 meter advanced blades
- Advanced composite hybrid of carbon and fiberglass
- Aeroelastic tailored
- Creates higher efficiency and produces lower noise

**1.5-MW Turbine**

40-Meter Blade

**Accelerate new... solar**

GE a partner in U.S. DOE Solar America Initiative

- Developing low-cost silicon solutions, next-generation nano materials
- Significant progress in thin films ... get cost out, increase to utility scale
- Evaluating solar thermal
- Grid & systems integration
Launch game changers... IGCC

GE’s IGCC leading industry in gasifier technology
- Converts coal to synthesis gas ... cleaned prior to burning
- Produces useful by-product
- Packaged system solution reduces water use by 30%
- Much less expensive CO₂ separation... 1/100 of gas flow treated

Launch game changers... hybrid loco

- Sets new standards in fuel efficiency, environmental performance
- Leverages unique GE electro-chemistry for battery... increases power 3x and energy 2x
- Provides additional 10% NOx and CO₂ reduction
- Improves fuel efficiency 10%
GE Global Research

- World-Class Technical Talent
- Diverse Technology Portfolio
- Partnering With Academia
- Business Connectivity
- Direct Customer Impact

Bringing Technology to the World

imagination at work