Open Innovation at GE

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“I find out what the world needs. Then I go ahead and try to invent it.”

Thomas Edison, Co-Founder of GE
A History of GE Innovation

- Electric fan (1902)
- Glareless glass (1927)
- Monitor Top refrigerator (1927)
- Steam Turbine (1890's)
- LEXAN® Polycarbonate (1953)
- Optical fiber (1920)
- Medical X-ray (1913)
- US Jet Engine (1942)
- Digital X-ray (1999)
- Hybrid Loco (2007)
Most of world R&D is outside of your company

Total R&D expenditures (US$ billions) and percentage of world total, by region: 2000

Europe
$203 (27.9%)

Asia
$209 (28.7%)

North America
$285 (39.1%)

Africa
$5 (0.6%)

Oceania
$9 (1.2%)

South America/Caribbean
$18 (2.5%)

GE R&D expenditures in 2007 ($5.7B) were small percentage of world total
GE Global Research - local presence

- Global Research Center
  Niskayuna, NY

- J. F. Welch Technology Center
  Bangalore, India

- China Technology Center
  Shanghai, China

- Global Research – Europe
  Munich, Germany

• Bringing R&D closer to the customer
• Synergy with local science community
• Linking into local tech initiatives
Addressing today’s major challenges

FROM

Healthcare                    See and treat
Energy, Oil & Gas, Water      Scarcity threatening
Aviation & Rail               Incremental progress
Security                      Limited & obtrusive

TO

Predict, diagnose, inform & treat
Abundant & cleaner sources
Breakthrough in efficiency, emissions & noise
Fast, simple & safe

...requires more integrated approaches
Open innovation contexts

I) Needs Pull
- Identify needs in GE
- Identify capable partner
- Negotiate work scope
- Execute agreement*

II) Technology Push
- Identify companies
- Identify needs/champion within GE
- Evaluate feasibility
- Execute agreement*

III) Value-chain innovation
- Identify joint needs
- Negotiate commercials
- Clarify joint work scope
- Execute agreement*

*agreement – marketing, joint development, licensing, OEM, …
Needs Pull Example
OLED - collaboration accelerates productization

roll-to-roll manufacturing
Value-chain innovation
Advanced bulk energy storage

Compressed-air A-CAES plant

• Fitting innovative systems into integrated environment
• Component & operations challenges
• Getting technology & economics right (tight margins)
Carbon capture and storage (CCS)

- Approaching a new space from different angles
- Broad array of options – downselect the most promising one
- Large-scale demonstration essential
Carbon capture & storage

Post Combustion
- Coal
- NG
- Oil
- Air

NGCC or Boiler/ST
- CO₂ Separation
- CO₂
- N₂, O₂ & H₂O

Pre Combustion
- Coal
- Waste
- Air/O₂ & Steam

Gasification
- CO₂

Reformation
- NG
- Oil
- H₂

Combined Cycle
- CO₂ Compression
- H₂O
- N₂, O₂ & H₂O

Oxyfuel
- Coal
- NG
- Oil
- Air
- O₂

Air Separation
- Steam

Boiler
- CO₂
- H₂O

Steam Turbine
- H₂O

N₂

H₂O
Tumor Diagnostics
PET$^{13}$C molecular imaging

R&D triangle:

- Clinical Customer
- GE Healthcare
- GE Global Research

pre-NPI
Clinical evaluation
feasibility
Rationale for partnerships in R&D

• far-reaching integration
• innovation spanning multiple disciplines
• diminishing cycle times for innovation
• risk & revenue sharing
• leveraging best-in-class technology
• enhancing creativity, thinking out-of-the-box
• access to unique capabilities
Challenges / success factors

• intellectual property rights, confidentiality
• exclusivity
• commercialization plan, business model (win-win)
• conflicting business relations (supplier? customer?)
• alignment of objectives (knowledge vs. product)
• openness, mutual trust, credibility (NIH)
• project time lines / duration
• cultural fit
imagination at work