

a GE perspective on

# Energy Efficiency & Security



imagination at work

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GovEnergy 2010

Framing the Issue

Internal Debate

External Customers

Moving Forward

# Framing the Issue

## Definitions:

Energy Efficiency

Endurance

Energy Security

Resilience

## Scope:

## Elements:

Culture

Military Missions

Regulatory Requirements

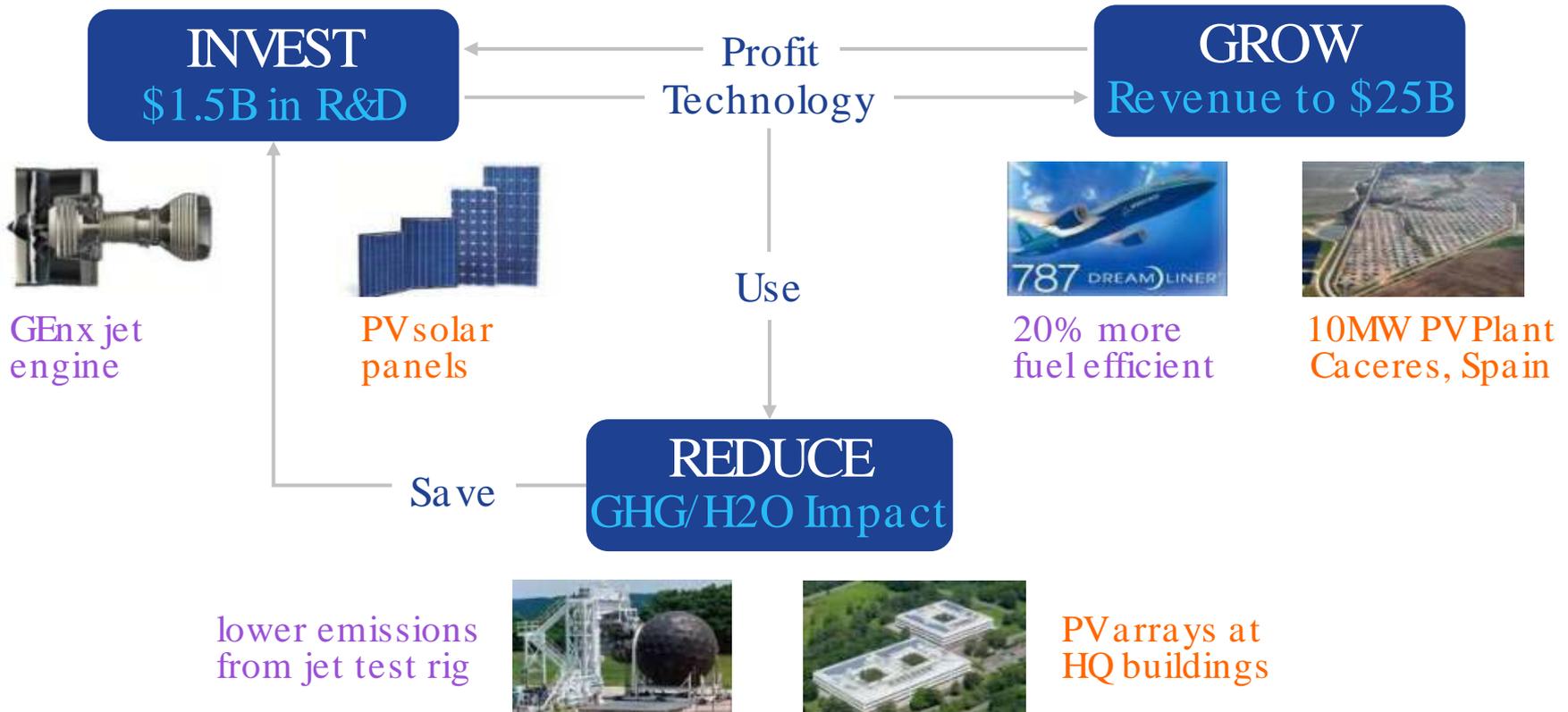
Scale & Commercialization

Funding

# Internal Debate

## ecomagination<sup>SM</sup>

A business strategy driving innovation & growth of profitable energy & environmental solutions



# Internal Debate

DOUBLE INVESTMENT  
IN R&D

INCREASE  
R&D TO  
**\$10B**



REDUCE WATER  
USE AND IMPROVE  
WATER REUSE

**25%**  
REDUCTION  
IN WATER  
CONSUMPTION



CONTINUE TO INCREASE  
REVENUES FROM  
ECOMAGINATION  
PRODUCTS

**17**  
PRODUCTS



2005

**90+**  
PRODUCTS



2009

GROW AT  
**2X**  
GE REVENUE  
2010 - 15



REDUCE GREENHOUSE  
GAS EMISSIONS &  
IMPROVE ENERGY  
EFFICIENCY OF GE



**50%**  
REDUCTION  
IN GE'S ENERGY  
INTENSITY

KEEP THE  
PUBLIC INFORMED



INSPIRE  
A COMPETITIVE  
GREEN ECONOMY



The 14-megawatt project at Nellis Air Force base, Nevada, is one of the largest solar photovoltaic parks in operation in the U.S.

# Eco Treasure Hunts

## Objective

Engage employees in an exciting site-wide effort to identify opportunities to reduce waste at their facility, thereby saving money, minimizing greenhouse gas emissions, and conserving natural resources.

## Internal Results

GE has conducted more than 200 Treasure Hunts at its facilities and identified over 250,000 million tons of carbon dioxide reduction opportunities and \$130 million in energy savings.

## External Collaborations

New York City Hospital System

City of Orlando, Florida

City of Atlanta, Georgia

University of Illinois



# Treasure Hunt at Aviation-Lynn

## The Impact

- 8 Teams – ~75 participants
- 113 Kaizens Identified
- 259,540 MMTBU reduced
- \$5.9MM annual savings
- \$5.8MM Implementation cost
- 33,624 Metric Tons of CO<sub>2</sub> reduced
- Equivalent to eliminating 6,475 cars
- Equivalent to planting 9,187 acres of Trees



Less than 1 Year Payback Projects...

\$3.8 MM with an AVERAGE payback of 0.24 Years

# External Customers

## Battery Technology Manufacturing

- \$100M battery technology investment to accelerate technology deployment
- Estimate for 350 manufacturing jobs + supply chain
- High Energy Sodium Batteries
  - ✓ Hybrid Locomotive - 2010
  - ✓ Mining – Off highway vehicles
  - ✓ Utilities – storage & smart grid leveling
- Compliments GE investment in A123
  - ✓ Lithium ion technology
  - ✓ Plug-in electric passenger cars



“Hybrid locomotives, and the battery technology onboard, could be an important part of how we ship goods by rail in the future...and further enhance rails reputation...”

Matthew K. Rose

President & CEO, Burlington Northern Santa Fe Corporation



# External Customers

## Heavy Duty Gas Turbines

### Environment

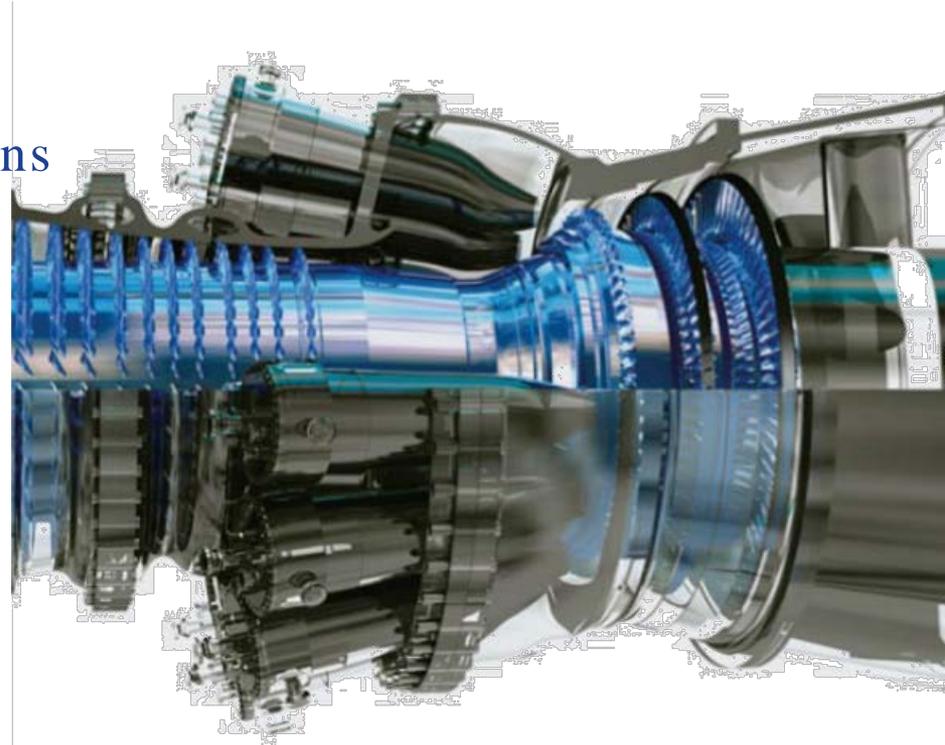
- 1 point improvement ~ 4.4M tons/yr reduction in CO<sub>2</sub> emissions

### Job Creation

- 180 jobs/yr during design, manufacturing, & testing
- 3700 jobs over subsequent 5 yrs for plant retrofits

### Exports

- Increase the country's largest energy net export product line



“Assuming some form of climate change legislation, deployment of a 65% efficient combined cycle gas turbine throughout the country would result in significant reductions in fuel use, leading to savings in electricity costs of \$180 billion through the year 2040.”

John Reinker

General Manger, Heavy Duty Gas Turbine Combined Cycle Products

# Moving Forward

## Undercurrents

### Culture

Break the “Drive it like I stole it” mentality

### Military Missions

Don't fund both sides of a conflict

### Regulatory Requirements

Costs of non-compliance

### Scale & Commercialization

Greater barriers to entry..for now

### Funding

Lifecycle costs..not just acquisition

## Holistic Systems Approach

# Moving Forward

## Where to begin

### Understanding the costs

Statistical Value of a Human Life – an oversimplified energy perspective

= (\$1M to \$14M/life \* # of beds) / MW  
of onsite power generation

range of **\$143M/MW to \$921M/MW**

***What is the value of energy  
surety for critical mission***



# Moving Forward

## Understanding the endpoints

### Where are we today?

- Available natural resources
- Architecture and condition
- Encroachment
- Available fiscal resources

### What does tomorrow look like?

- Task Critical Infrastructure
- Energy Critical Infrastructure
- Available technology
- Available fiscal resources



## Chart a Course ...

## Not an Either/Or Proposition



imagination at work

# ecomagination<sup>SM</sup> product portfolio

## Appliances

- ENERGY STAR® qualified Dishwashers
- ENERGY STAR® qualified Front-Load Clothes Washers
- ENERGY STAR® qualified Hot and Cold Water Dispensers
- ENERGY STAR® qualified Refrigerators
- ENERGY STAR® qualified Top-Load Clothes Washers
- High Efficiency Water Heaters featuring the GeoSpring™ Hybrid Water Heater
- Homes Inspired by ecomagination

## Aviation

- CFM56 Tech Insertion
- CFM56-3 Advanced Upgrade
- GE90-115B Aircraft Engine
- GENx Aircraft Engine
- TrueCourse™ Flight Management System

## Commercial Finance

- Environmental Performance Services with Telematics

## Consumer Finance

- Australia eco Mastercard
- Energy-Efficient Home Improvement Loans

## Digital Energy

- 750 kVA Uninterruptible Power Supply (UPS)

## Energy

- 7FA Gas Turbine
- AF-6 Series Drives
- Amorphous Transformer
- Coordinated Volt-VAR Control (CVVC) Technology

- DC Data Centers Inspired by ecomagination
- DLN 1+ Combustion System
- DLN 2.6+ Combustion System
- Field Force Automation Software System
- Distribution System
- H-Turbine™ Combined Cycle System
- HEAT™ Steam Turbine
- High Efficiency Motors
- Integrated Gasification Combined Cycle (IGCC)
- Jenbacher™ Associated Petroleum Gas Engine
- Jenbacher™ Biogas Engine
- Jenbacher™ Coal Mine Gas Engine
- Jenbacher™ Combined Heat & Power
- Jenbacher™ Landfill Gas Engine
- Kn³™ Optimization Software for Power Plants
- LM6000™ PF Aeroderivative Gas Turbine
- LMS100™ Simple Cycle Gas Turbine
- Nuclear Energy
- OpFlex™ Turndown technology
- Powerwave+™ Cleaning System
- PulsePleat™ Filter Elements
- QL Ultra Efficient Transformer
- Quadramatic™ Motors
- Solar Energy
- Wind Energy
- Zonal Combustion Tuning for Coal-Fired Boilers

## Energy Financial Services

- "Greenhouse Gas Services, LLC a GE AES Venture"

## Healthcare

- +PLUSPAK™ Polymer Bottle
- Centricity™ Enterprise Electronic Medical Records
- Digital Mammography
- Digital X-Ray
- High Efficiency CT (Computed Tomography) Systems
- High Efficiency MR (Magnetic Resonance) Systems™
- Hospitals Inspired by ecomagination
- Voluson™ E Series Ultrasound
- Wave™ Bioreactor for Biotherapeutics Production

## Lighting

- ENERGY STAR® qualified Compact Fluorescent Lighting
- High Efficiency Evolve™ LED Fixtures for General Lighting
- High Efficiency Halogen Lamps
- High Efficiency Lighting Control Systems
- High Efficiency Linear Fluorescent Lamps & Ballasts
- LED Light Sources

## Oil & Gas

- BCL 300 Series Centrifugal Compressor for Sour Gas Reinjection
- DLN-1 IBH for FR5-2 gas turbines
- Expanders for Power Recovery Systems
- Integrated Compressor Line (ICL)
- ORegen™ System for Waste Heat Recovery
- PGT25 DLE Products
- UltraScan™ Duo Pipeline Inspection Tool

## Transportation

- 1033 Locomotive Emission Kits
- China Mainline Evolution Locomotive
- Evolution™ Hybrid Locomotive
- Evolution™ Series Locomotive
- Kazakhstan Evolution ES44ACi Locomotive
- Locotrol™ system
- PowerHaul™ Engine
- Russian-Built Locomotive Modernization Skids
- SmartBurn™ technology
- Trip Optimizer™ Software

## Water

- ABMet (Advanced Biological Metals Removal)™ system
- Advanced Membrane
- Desalination
- DusTreat™ Control Treatment Programs
- E-Cell® MK-3 Electrodeionization (EDI) System
- Electrodialysis Reversal™ (EDR)
- Entrapped Air Flotation (EAF)
- GenGard™ Cooling Water Solution
- Homespring™ Central Water Purifier
- MetClear™ Metals Removal Chemistry
- PRO/Titan™ Reverse Osmosis System
- SAGD Produced Water Evaporator
- Waste-to-Value solution
- ZeeWeed® Membrane Technology

# ecomagination<sup>SM</sup> as a partner

## Brand



### Top 10 U.S. Green Brands

1	WHOLE FOODS MARKET	6	SUB-ZERO
2	WILD OATS	7	IKEA
3	TRADER JOE'S	8	THE BODY SHOP
4	TOYOTA	9	GE
5	HONDA	10	AVEDA

## Reputation



Prudential Equity Group, LLC

## Scale

### FORTUNE 500

Rank Company Revenue (\$millions)

144 Xerox 17,228

145 CHS 17,216

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146 US Steel 16,873

147 Weyerhaeuser 16,871

148 Fluor 16,691

149 Anheuser Busch 16,685

# External Customers

## Smart Grid

- \$200M smart grid initiative
- Proposal for economic stimulus funds
- Estimate for 800-1,000 “green collar” jobs
- Public/private alliance
  - ✓ GE
  - ✓ City of Miami
  - ✓ FPL
  - ✓ Cisco
  - ✓ Silver Spring Networks
- ~1M Customers involved
  - ✓ Smart Meters
  - ✓ Demand Management
  - ✓ Distribution Automation
  - ✓ Substation Intelligence
  - ✓ Distributed Generation
  - ✓ Enterprise Systems



“It’s time for action. With projects like Energy Smart Miami, we can stimulate the economy today and build a brighter, cleaner tomorrow. It’s truly a win-win for Miami and for America.”

Carol Browner

Assistant to the President for Energy and Climate Change