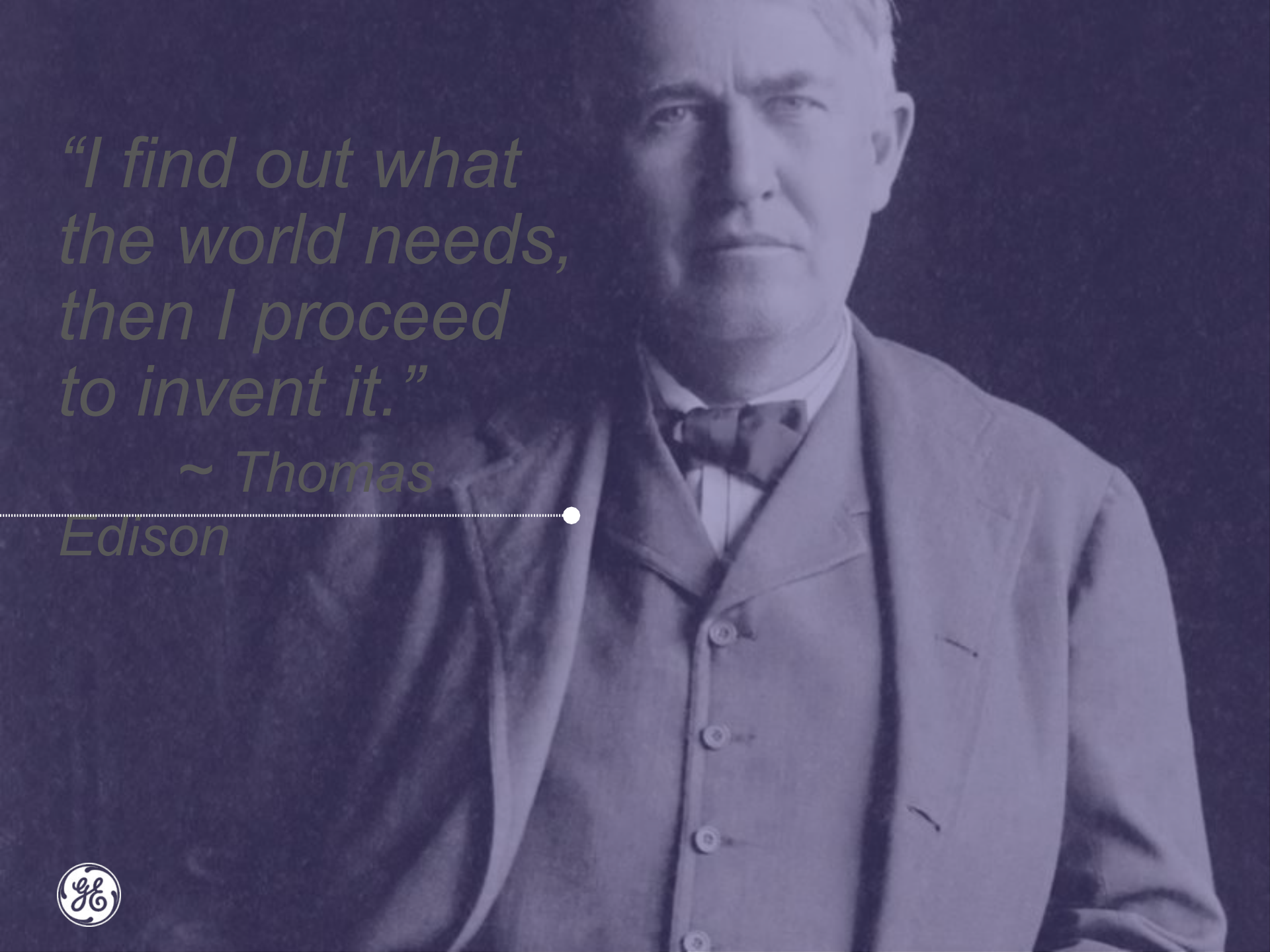
RESILIENCY & CHP FOR HOSPITALS

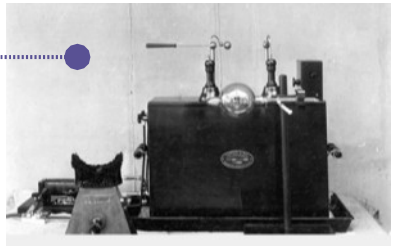
(Photo: Chang W. Lee/The New York Times)


“I find out what the world needs, then I proceed to invent it.”
~ Thomas Edison

A company with a history of innovation

1879 First carbon-filament incandescent lamp

1913 First commercially practical X- ray device



1930s First gas engine

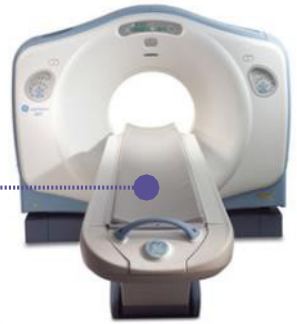
1942 Aircraft jet engine

1963 First electric drive for haul trucks

1983 Magnetic resonance imaging

1995 World's most powerful jet engine

One of the environmentally friendliest locomotives ever designed



2005 World's first true 64-slice combination PET/CT medical imaging system

2007 World's first 24-cylinder gas engine

2010 First omnidirectional LED bulb

GE's portfolio … structured for growth

- 8 businesses operating in more than **100** countries … **125+** years
- **>300,000** employees worldwide
- 2013 revenue **$146B***

Power & Water — $24.7B

- Power Gen Products
- PG Services
- Renewables
- Water
- **Aeroderivatives**
- **Jenbacher**
- **Waukesha**
- Nuclear

→ **Distributed Power**

Oil & Gas — $17B

- Drilling & Surface
- Global Services
- Measurement & Control
- PII Pipeline Solutions
- Subsea Systems
- Turbomachinery

Energy Management — $7.6B

- Digital Energy
- Power Conversion
- Industrial Systems

Aviation — $21.9B

- Commercial
- Military
- Service
- Avionics/ Systems

Healthcare — $18.2B

- Healthcare Systems
- Life Sciences
- Healthcare IT
- Molecular Diagnostics

Transportation — $5.9B

- Locomotives
- Services
- Propulsion Systems

Home & Business Solutions — $8.3B

- Appliances
- Lighting
- Intelligent Platforms

GE Capital — $44.1B

- Commercial
- Consumer
- Real Estate
- GECAS
- EFS

*After Corporate items and eliminations as they pertain to NBCU

Power & Water portfolio

~$25B '13 revenue >37,000 employees >120 countries

Power Gen Products

Power Gen Services

Distributed Power

Renewables

Water & Process Technologies

Nuclear

Diverse Technology & Services Solutions … Over 1,000GW installed globally

Distributed Power

Overview

GE's distributed power solutions provide businesses and communities the ability to generate reliable and efficient power anywhere, anytime—whether on or off the grid.

Our products cover power generation, compression and mechanical and heat recovery applications from 120 KW - 100 MW, featuring fast, flexible and reliable aeroderivative gas turbines and gas engines fueled by liquid and gaseous fuels* **with efficiencies up to 95 percent.**

Key Segment Served

Power Producers

- IPP's, Utilities
- Grid stability, fast start

Commercial, Institutional and Municipal

- Hospitals, Universities, District Heating
- Combined heat and power, grid synchronization

Industrial Manufacturers

- Pulp & Paper, Chemicals, Automotive, Food & Beverage
- Cogeneration, process heat

Oil & Gas

- Exploration, Production, Midstream, Transmission

*Natural gas, biofuels, landfill gas, coal mine gas, special gases

Covering a broad output range with Distributed Power (based on our 50 Hz versions)

Placeholder

0.1 – 5.0 MW | 5 – 25 MW | 25 – 50 MW | 50 MW – 100 MW

Power Generation


TYPE 2
250 kW – 335 kW


TYPE 3
500 kW – 1 MW


Type 4
800 kW – 1.5 MW


Type 6
1.5 MW – 4.4 MW

Type 9
9.5 MW


LM2500*
16 MW – 32 MW


LM6000*
41 MW – 52 MW


LMS100*
100 MW – 115 MW


VGF*
120 kW – 880 kW


VHP*
270 kW – 1.5 MW


275GL+*
1.9 MW – 3.6 MW

Mech/O&G/Mining/Marine


VGF*
120 kW – 800 kW


VHP*
270 kW – 1.5 MW


275GL+*
1.9 MW – 3.6 MW


LM2500*
16 MW – 32 MW


LM6000*
41 MW – 52 MW


LMS100*
100 MW – 115 MW

Mobile/Emergency Power


J320* generator set
1 MW


moblieFlex* J320/VHP*
Gas Engines 860 kW – 1MW

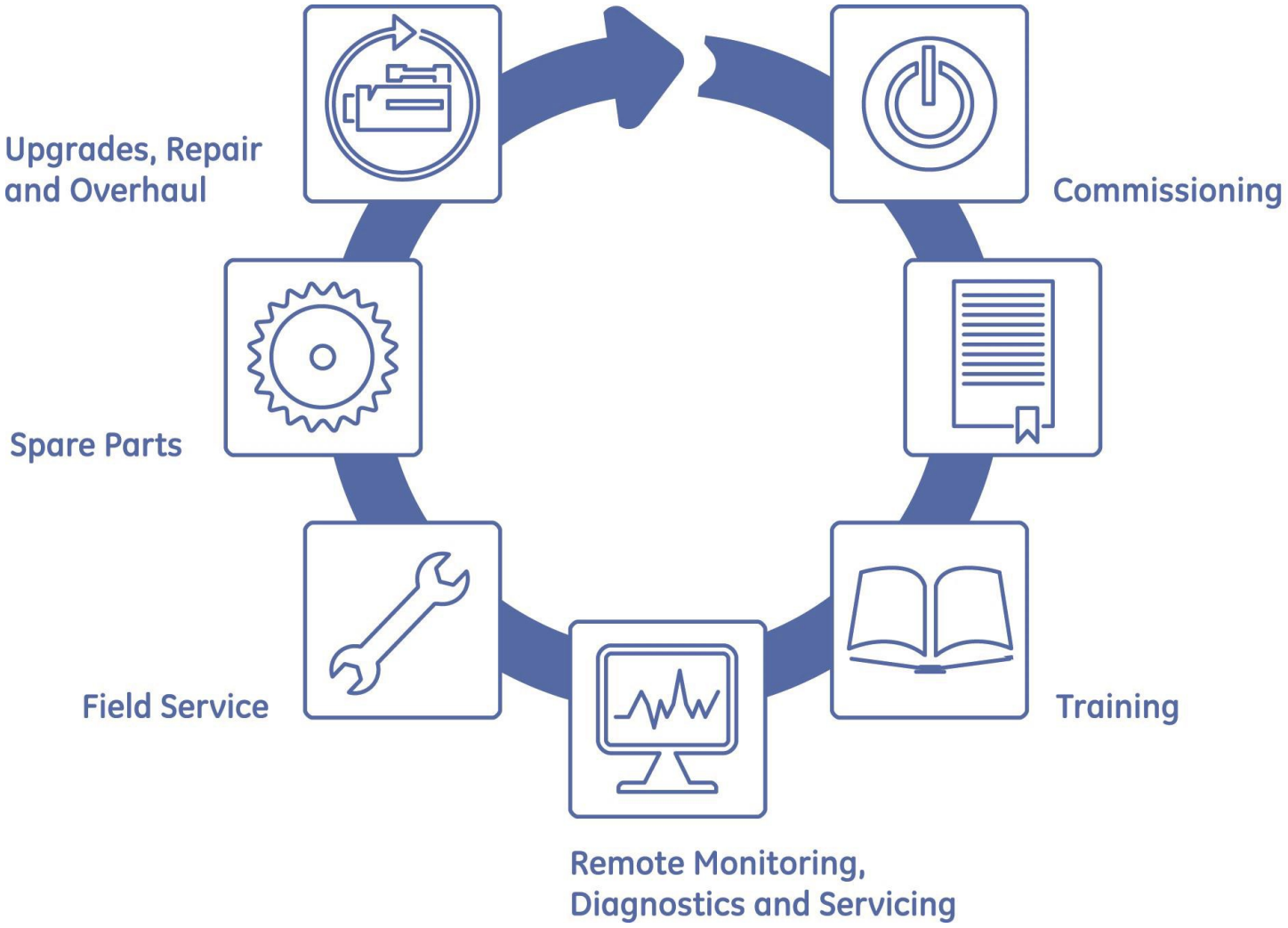

616 Diesel
Genset 2.6 MW


TM2500 Gas turbine*
22 MW – 31 MW

* Trademark of General Electric Company

Lifetime Services

Life cycle management: The right service at the right time – throughout the lifetime of your equipment



UK Background

Customer Challenges
Cost, Carbon, Capacity, Consumer, Competitiveness

Cost

Cost out is paramount

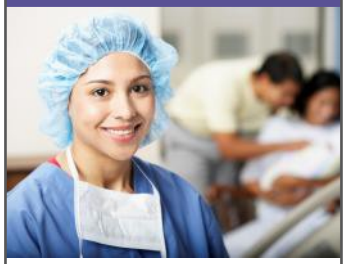
The need to do more with less is critical in economic environment

Carbon

20/20/20 Legislation

Healthcare in the UK a large producer of carbon, CRC imposes fines and penalties

Capacity



Demand > Supply

Healthcare demand outstripping supply, gap is widening

Consumer

Expectation increases

Tax Payer expects better value for money whilst having higher expectations

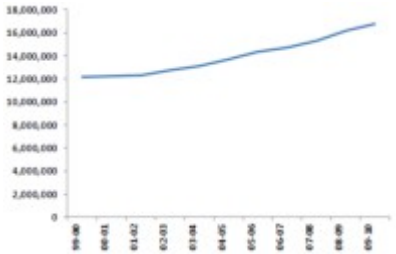
Compete

Economic growth

UK requires effective infrastructure and finance to compete globally

Challenges for the NHS in England
Macro Conditions

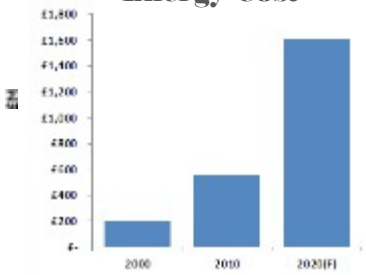
Demand & Ageing Population

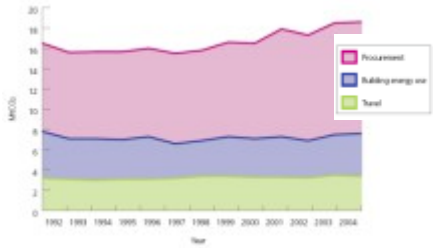


38% Patient Episode Growth

Fastest Increase in "Oldest Old"

Energy Costs & Carbon





Cost almost tripled in 10 years

Future fines for exceeding allowance

Clinician-Led Commissioning

GPs and hospital doctors will be put directly in charge of budgets

BMA

- Newer models of care e.g. care closer to homes, telemedicine
- Increased reliance on fewer but bigger energy intensive acute hospitals

20bn Financial Savings Ta

Health Spending Tripled since 1997

NHS management tasked with finding £20bn in efficiency savings following unprecedented spending increases

Macro Conditions applicable to all developed world health systems

Source: UK Department of Health, National Statistics

Hospitals consume 3x the energy of a typical commercial building

Commercial Buildings	
39%	of total energy consumption
71%	of electricity consumption
39%	of CO_2 emissions
30%	of raw material use
30%	of waste output
12%	of potable water consumption

3x

Economic growth

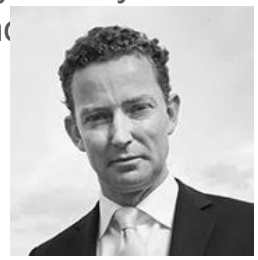
Energy use of ~~commercial building~~

Customer Feedback

Reduction of energy usage is moving up the management agenda

Miles Ayling, Director Innovation and Service Design Department of Health

"I do not want to see any NHS Trust cutting clinical staff until they have addressed the many readily available back office cost savings, one of the biggest of which is energy spend"



Greg Barker, Climate Change Minister

"I am a big supporter of Combined Heat and Power. CHP units are highly efficient at generating energy, which means lower fuel bills and a reduction in carbon emissions. I'm really pleased Guy's and St Thomas' in London is feeling the benefit of their installation, saving £2 million on their annual energy bills."

Hugh Jones, Director of Solutions at the Carbon Trust

"This technology is a proven means of saving money and cutting carbon emissions but we are convinced that many more organisations in both the public and private sectors could be following the example of Guy's and St Thomas' and reaping similar benefits from CHP."

Alexandra Hammond, Head of Sustainability, Guy's and St Thomas' Hospitals Trust

"We looked at many alternatives but it quickly became clear that in terms of both financial and carbon savings CHP was the most effective choice."

Powering Health – Solutions for Healthcare

Powering Health Solution Universe

Powering ✓ Curing ✓ Moving ✓ Building ✓

GE Energy

GE Home & [illegible]

GE Healthcare

Care Innovations

- Telemedicine & remote care
- Enables independent living & early discharge

Lighting

- Range of energy efficient lamps

Intelligent Platforms

- Proficy & Habiteq solutions
- Provides energy usage data & automated controls

Healthcare IT

- Patient information available quickly at the point of need

Performance Solutions

- Technology enabled consulting and automated asset management tracking

Solar

- Self generation to take advantage of renewable subsidies

Electrical Infrastructure

- Supporting the safe distribution of electricity

Combined Heat & Power

- Distributed co-generation of heat & power
- Significant ROI

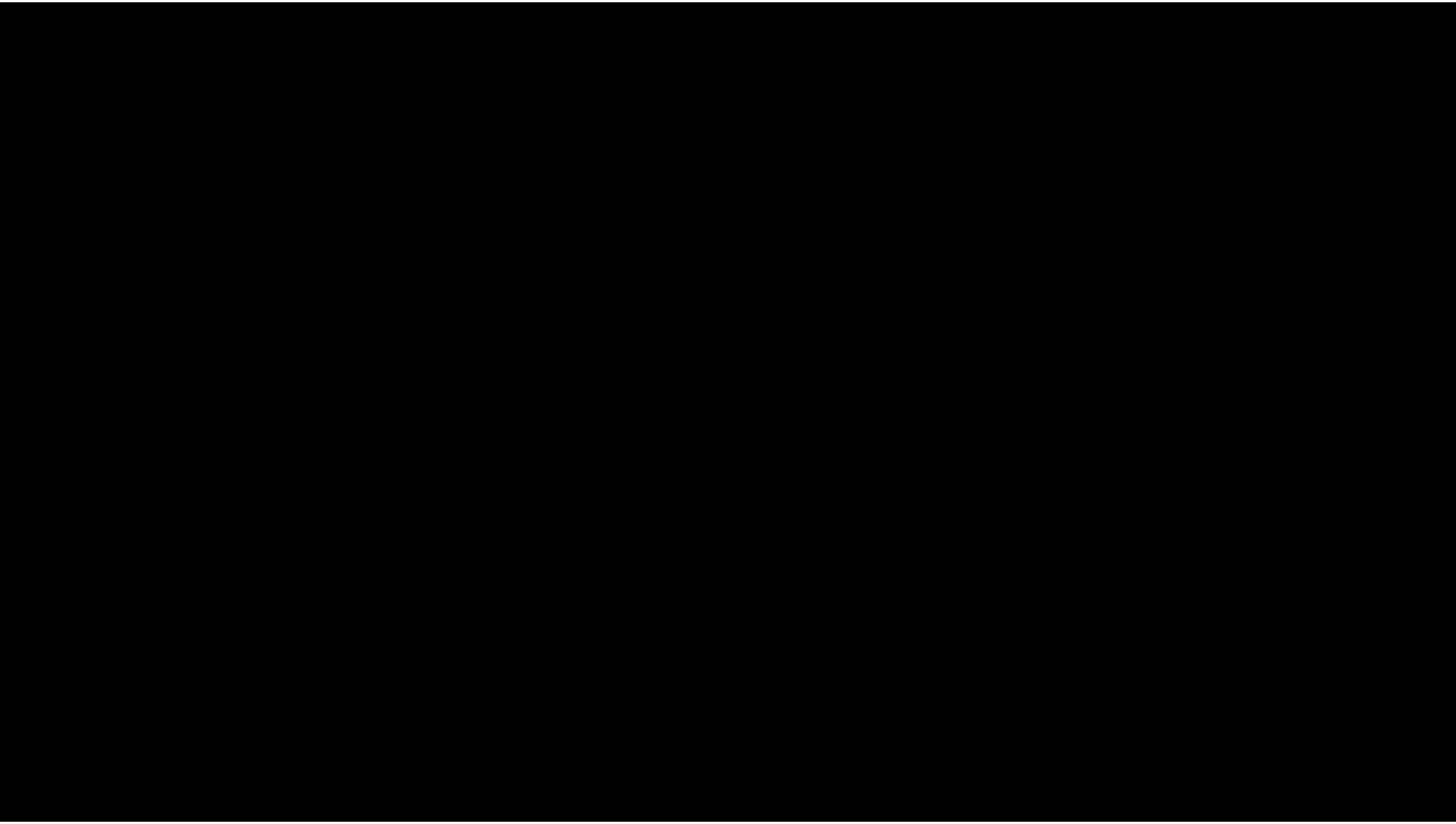
Electric Vehicles

- Energy efficient fleet management solutions

Diagnostics & Imaging

- Traditional diagnostic products including MRI, CT, ultrasound & xray

Guy’s and St Thomas’ Hospitals London UK



Guy's and St Thomas Hospitals, London UK

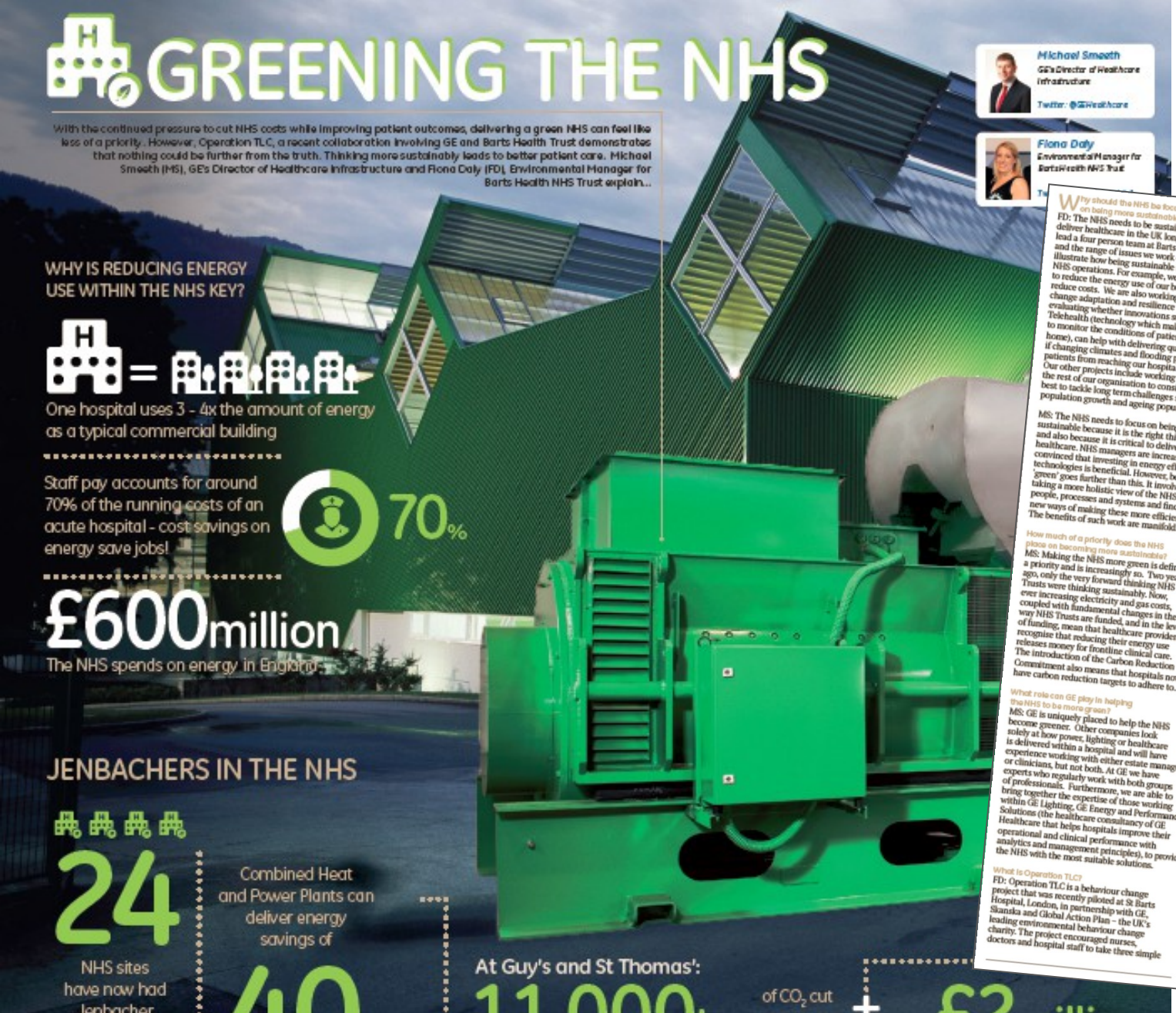
Solution

- Installed a 3MW Natural gas GE Jenbacher engine to provide heat and power at each hospital

Results

- £1.5m energy savings a year initially now over £2m
- Over 11,000 tons of CO2 saved each year
- First Trust to get Mayor of London Green500 Platinum award
- Enabled Trust to exceed its 20% emissions savings target in the first year
- Finalist for international sustainability award

What our customers are saying…



Why should the NHS be focussed on being more sustainable?

FD: The NHS needs to be sustainable to deliver healthcare in the UK long term. I lead a four person team at Barts Health, and the range of issues we work on helps to illustrate how being sustainable is critical to NHS operations. For example, we are working to reduce the energy use of our buildings to reduce costs. We are also working on climate change adaptation and resilience projects, evaluating whether innovations such as Telehealth (technology which makes it possible to monitor the conditions of patients at home), can help with delivering quality care if changing climates and flooding prevent patients from reaching our hospital in future. Our other projects include working with the rest of our organisation to consider how best to tackle long term challenges such as population growth and ageing populations.

MS: The NHS needs to focus on being more sustainable because it is the right thing to do, and also because it is critical to delivering quality healthcare. NHS managers are increasingly convinced that investing in energy efficient technologies is beneficial. However, being 'green' goes further than this. It involves taking a more holistic view of the NHS, its people, processes and systems and finding new ways of making these more efficient. The benefits of such work are manifold.

How much of a priority does the NHS place on becoming more sustainable?

MS: Making the NHS more green is definitely a priority and is increasingly so. Two years ago, only the very forward thinking NHS Trusts were thinking sustainably. Now, ever increasing electricity and gas costs, coupled with fundamental changes in the way NHS Trusts are funded, and in the level of funding, mean that healthcare providers recognise that reducing their energy use releases money for frontline clinical care. The introduction of the Carbon Reduction Commitment also means that hospitals now have carbon reduction targets to adhere to.

What role can GE play in helping the NHS to be more green?

MS: GE is uniquely placed to help the NHS become greener. Other companies look solely at how power, lighting or healthcare is delivered within a hospital and will have experience working with either estate managers or clinicians, but not both. At GE we have experts who regularly work with both groups of professionals. Furthermore, we are able to bring together the expertise of those working within GE Lighting, GE Energy and Performance Solutions (the healthcare consultancy of GE Healthcare that helps hospitals improve their operational and clinical performance with analytics and management principles), to provide the NHS with the most suitable solutions.

What is Operation TLC?

FD: Operation TLC is a behaviour change project that was recently piloted at St Barts Hospital, London, in partnership with GE, Skanska and Global Action Plan – the UK's leading environmental behaviour change charity. The project encouraged nurses, doctors and hospital staff to take three simple actions: turn off unused equipment, switch off lights and close hospital doors. The aims of the project were to achieve: energy efficiency savings with a short term payback, demonstrate that partnerships help to deliver efficiencies, prove that human behaviour rather than technological solutions can deliver energy efficiencies, and develop a model that can be rolled out more widely within the NHS.

> "Healthcare providers recognise that reducing their energy use releases money for frontline clinical care"

What did Operation TLC deliver?

FD: Because of the programme, staff became far more aware of their built environment and the number of lights left on in wards was reduced by up to 40%. This cut energy bills by £100,000 in the first four months of the project. Moreover, the costs of the programme were recouped within the first four months. However, most excitingly, the project also delivered patient benefits. Closing doors allowed for better temperature regulation, and patients in wards where the pilot took place reported improved experience through better sleep, a 1/3 fewer incidences of sleep disruption and a 1/4 fewer privacy disruptions than in non-pilot wards. The project proves that looking at challenges from an environmental point of view can deliver better patient experiences.

Why did GE collaborate with Barts Health Trust on this initiative and what was GE's role?

MS: GE Healthcare has a long standing relationship with St Barts, as we provide medical technology which is used within the hospital. In addition, GE sees the NHS not just a customer for its technology but seeks to work with the organisation as a partner – GE wants to help the NHS deliver better clinical outcomes and this project sounded like a great one to support.

FD: As one of the partners of the project GE provided funding. GE also supported with the actual delivery of the scheme. Experts from GE's Lighting team provided technical advice on how energy efficiencies could be delivered using the existing electrical infrastructure of the hospital.

What's next for Operation TLC?

FD: We estimate that if similar behaviour change techniques are deployed across all health trusts in the UK, the NHS could save as much as £35million, and we are currently testing the programme at another NHS Trust.

Members of the Operation TLC team accept an award for the project from the Health Service Journal

USA
Background

Challenges for U.S. Healthcare Sector

Cost, profitability, capacity, carbon, business continuity

Cost

18% GDP cost grows 2X GDP growth

Critical need to do more with less

Profitability

2.9-6.8% operating margin

Cost saving has large impact on bottom-line

Capacity

Demand > Supply by 2030, 1/5 Americans over 65

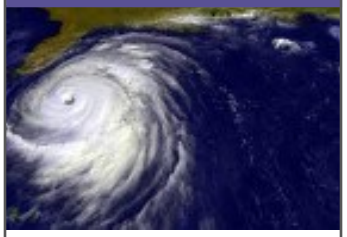
Gap is widening

Carbon

8% carbon footprint

Potential emission Tax; Bill to cut GHG by 80% by 2020

Business Continuity



Increased electric grid disruption

Rising frequency and intensity of extreme weather; grid deterioration

Source: Brookings Institute, July, 2013; Aaron Carroll, the incidental economist, May, 2013. Environmental leader, Nov. 2009; HFMA 2011.

Need for Energy Cost Saving
Bottom-line profit

10%↓ energy costs = 6.6%↑ operating profit margin*

$1 Million energy cost saving = $34 Million a hospital didn't have to raise in revenues to create that profit**

Hospitals = 2.5X commercial energy consumption***

Large hospitals = 5.5% commercial energy consumption***

* Calculation based on New Hanover Regional Medical Center, operating revenue/expenses data from FY2012 Annual Report , Assuming 3% Operation Expenses were energy expenses .
**Calculation based on 2.9% operating margin
***EIA, Aug. 2012. * Hospital buildings with over 200,000 square feet of floor space. Midwest CHP Application Center. 2007

Need for Electricity Resiliency
Hurricane risks and their impact on hospitals

1,450 Number of hospitals exposed to hurricanes from 2002-2011*

$9.2 Revenue losses for a typical 800 bed hospital (in millions of dollars per day)**

78% Percentage of power outages associated with hurricanes that typically last >24 hours

Lower Manhattan went dark
Outcome of Hurricane Sandy, a Category 1 hurricane. NYC was ~ 150 miles from the track of the storm.

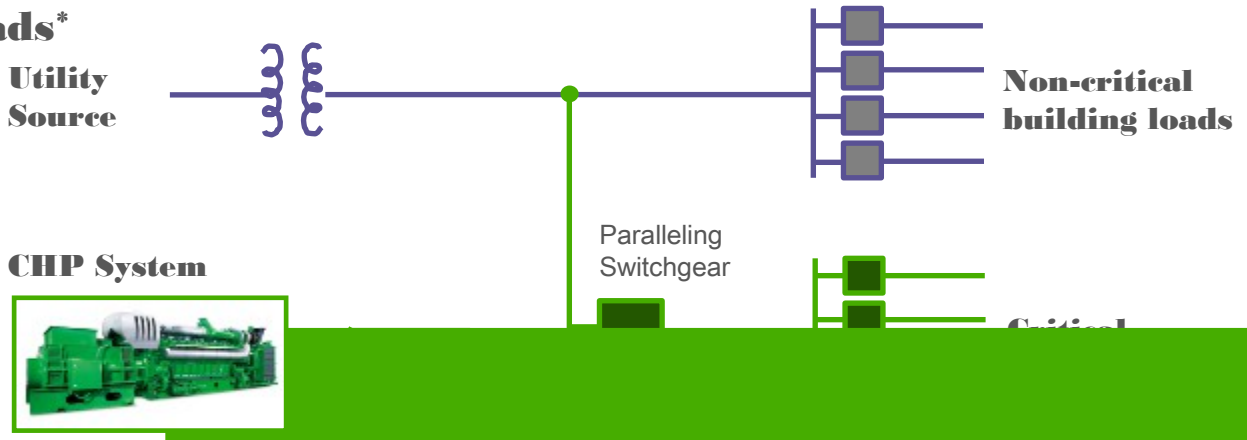
*Hospitals with 100 miles of a hurricane track
**Based on FEMA study of Hurricane Ike
Source: AHA 2012, FEMA 2008 study of Hurricane Ike, DOE's Electric Emergency Incident and Disturbance Reports (OE-417)
Photo: Iwan Baan, New York Magazine, November 5, 2012.

Combine Heat & Power (CHP) Solutions

1. Improved Financial Bottom-line
2. Electricity Resilience
3. Reduced Carbon Emission

Efficiency: 86% CHP vs. 40% Conventional System

Typical CHP System with backup responsibility for Critical Loads*



Thermal Energy for Heat Loads

Thermal is 50% hospital total energy consumption

CHP Advantages Over Diesel Backups

1	**Business as usual** **Electricity & thermal loads**	· Partial power · Electricity only
2	**Natural gas fueled-low emission permanent source of fuel**	· Diesel fueled-high emission · Limited stored fuel for hours/days
3	**Run daily & well maintained** **Rare mechanical failure**	· Seldom used, poorly maintained · Frequent mechanical failure
4	**Ground level** **Less vulnerable to flooding**	· Basements · Vulnerable to flooding
5	**Excellent overall financial return**	· Financial payback only in times of emergency

CHP systems reduce overall size and capacity of diesel generators

rs become backu

Much Higher Reliability

Source: ICF International, 2013.
Midwest CHP Application Center, 2007.

Hospitals went dark despite diesel backups

Hurricane Sandy, 2012

Closed: 6 NYC hospitals, 12 NJ residential care facilities

Unavailable: 8% NYC hospital beds

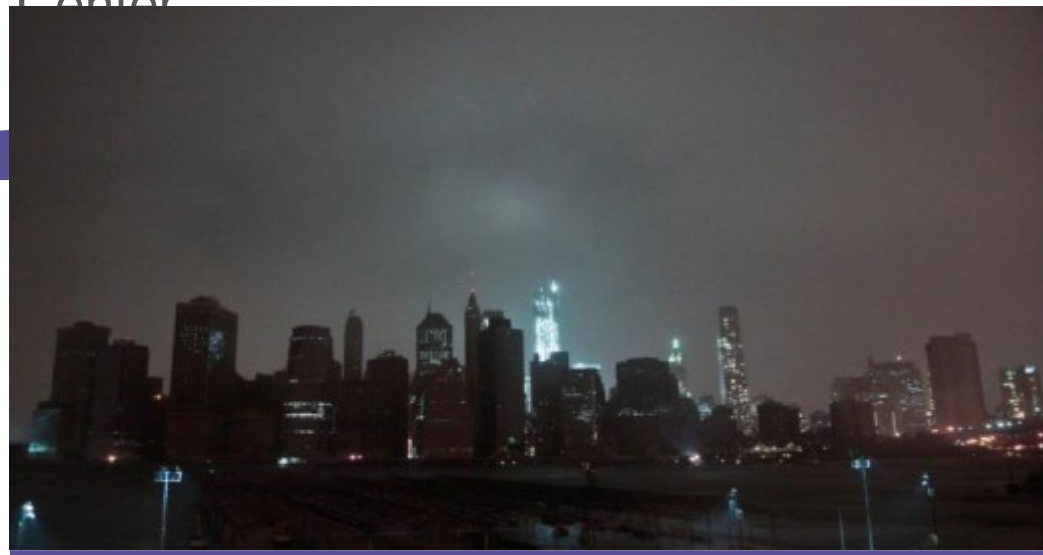
Emergency generators utilization: 100% open NJ hospital

Evacuated: 1408 patients

Loss (damage & lost revenue): **1.2 Billion** - NYU Langone Medical Center

Failed Backup Generators

	Patients Evacuated
NYU Langone Medical Center	200
Bellevue Hospital Center	725
Coney Island Hospital	180
Palisades Medical Center, Hackensack University Health Network	83



Manhattan, New York, Oct. 29, 2012

Lower Manhattan goes dark during Sandy on Monday, viewed from the Brooklyn borough of New York.

Source: Hurricane Sandy Rebuilding Task Force, 2013; (AP Photo/Bebeto Matthews)

CHP Kept Hospital Running During Disaster

Among the sites where the CHP unit was designed to operate during a grid outage, all of the CHP system did perform as expected during Sandy.

There was not a single site that lost grid power.

--NYSERDA survey of CHP sites affected by Hurricane Sandy, 2013

South Oaks Hospital

Amityville, NY: 245 bed + 420 certified beds
Operated normally for 2 weeks after Sandy 2012
1.25 MW: five 250kw gas-fired recip engines

GREENWICH HOSPITAL
YALE NEW HAVEN HEALTH

Greenwich, CT; 175 beds, 500K sqft.
Operated normally for 7 days after Sandy 2012
Two 1.25MW gas recip engines

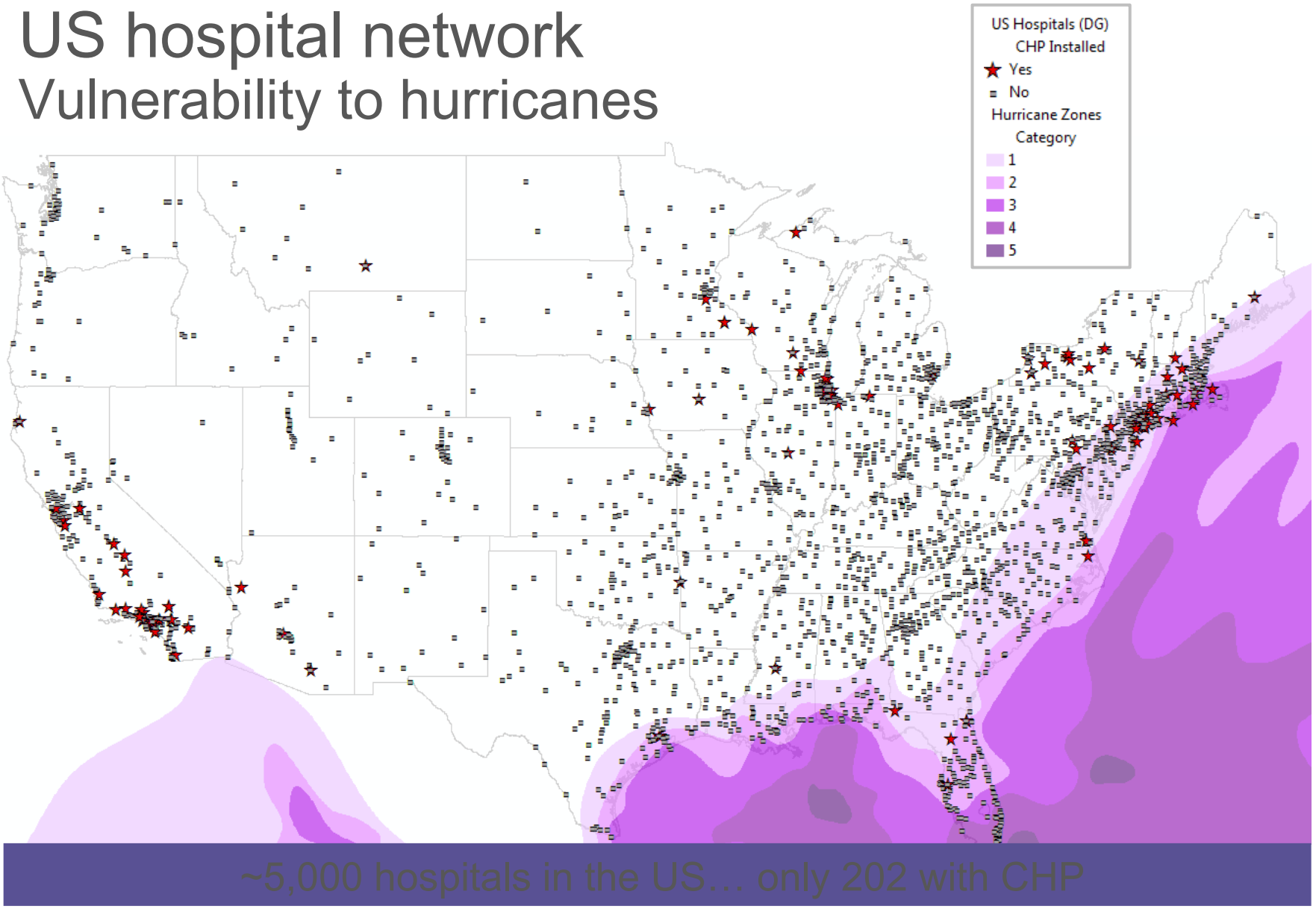
Baptist HEALTH SYSTEMS
Mississippi Baptist Medical Center

Jackson, Miss; 646 beds
Only Jackson hospital 100% operational after Katrina 2005
4.3MW gas CHP; Annual energy cost saving

CHP has served us well for more than 20 years, operating successfully including during the Northeast Blackout of 2003. — *Robert Chester, South Oaks Hospital, 2012*

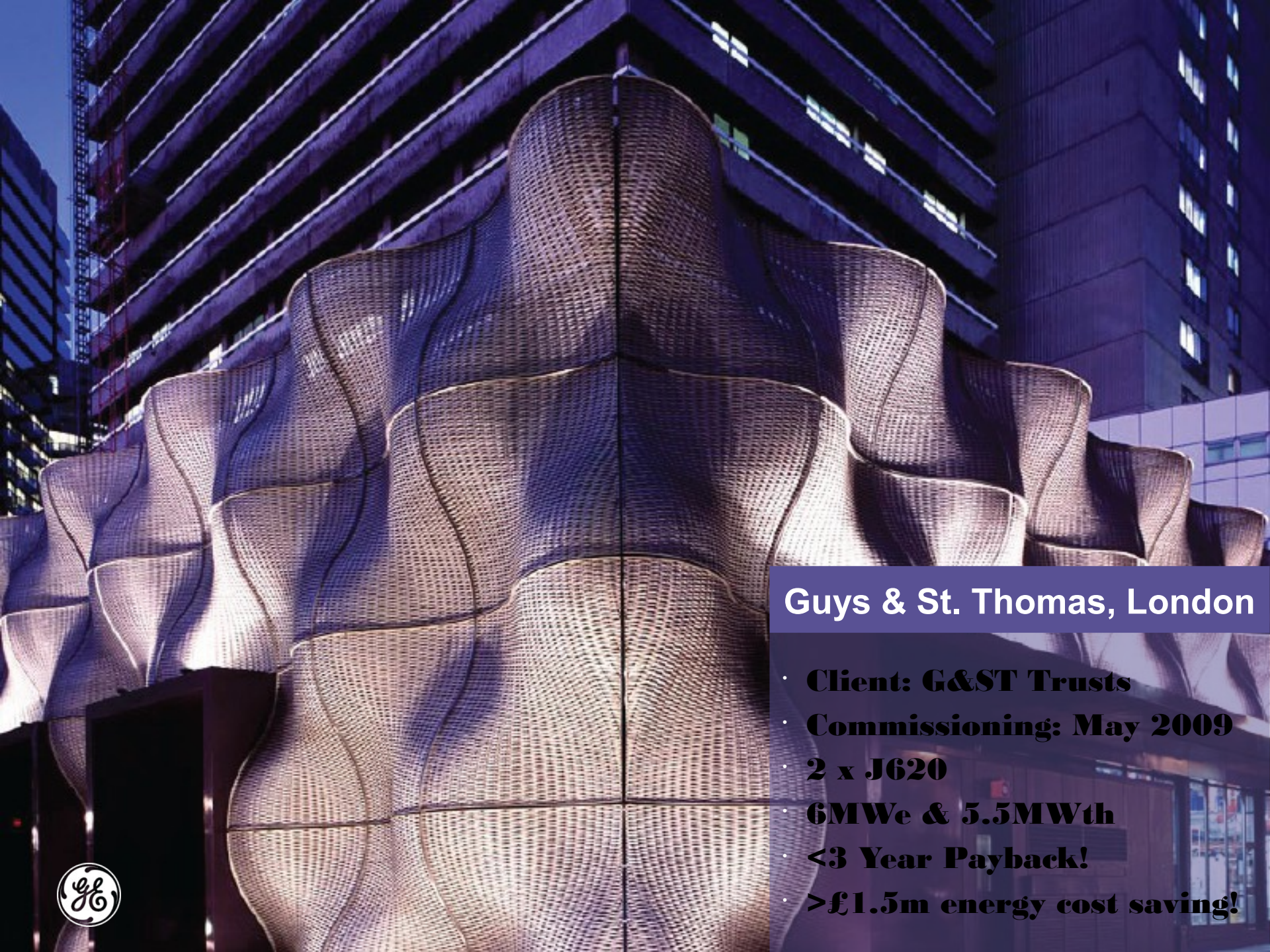
Source: ICF International, 2013. Clean Energy Program, 2012.

US hospital network
Vulnerability to hurricanes



Source: AHA, Munich RE

UK
Case Studies



Guys & St. Thomas, London

- Client: G&ST Trusts
- Commissioning: May 2009
- 2 x J620
- 6MWe & 5.5MWth
- <3 Year Payback!
- >£1.5m energy cost saving!

Great Ormond Street, London

- Client: NG Bailey
- Commissioning: Aug 2011
- 1 x J420
- 1.4MWe & 1.4MWth
- A particularly difficult install!
- Container on the roof!

Broadgreen, Liverpool

- Client: Dalkia
- Commissioning: May 2005
- 1 x J616
- 2.2MWe & 2.3MWth
- £70m redevelopment to improve services including CHP!

Freeman, Newcastle

- Client: Dalkia
- Commissioning: Nov 1997 & Jul 2008
- 2 x J612 & 1 x J420
- 4.4MWe & 4MWth
- 2 replacement sets on order!

Queen Alexandra, Portsmouth

- Client: Carillion
- Commissioning: Feb 2008
- 2 x J612
- 3.3MWe & 2.7MWth
- 1.2MWth as hot water!
- 1.5MWth as steam!

USA
Case Studies

Trust GE & CHP
North Shore-Long Island Jewish Medical Center

Two 1.425MW GE Jenbacher J420

GS gas reciprocating engines

$1 M annual energy costs saving

$1 M incentives NYSERDA

5 Year return on investment

The Jenbacher engines have been very reliable and trouble free. Cogeneration makes us energy independent, so we don't need to worry about losing power during summer months when there are heavy loads on the utilities. And there are huge cost savings. We are very happy with the project.

— George Bird, Director of Plant Operations, LIJMC.

Trust GE & CHP
Texas Medical Center-Thermal Energy Corp.

48MW LM6000 aeroderivative gas turbine

$13 M yearly costs saving **$10 M** DOE funding

12% customer rate reduction FY 2011

Efficiency improvement from **42%** to **80%**

Fossil fuel consumption reduced by **61%**

Real time operating responding to market price・Selling excess electricity to grid

Reducing emissions=removing・52,000 cars=planting 83,000 acres forest

The Power of People.

operation

Turn off - Lights out - Close doors

TLC

Welcome to Operation TLC

Driving efficiencies, improving patient experience

A collaborative partnership

Barts Health NHS
NHS Trust

SKANSKA

GlobalActionPlan
creating the climate for change

Core Aims:

operation
Turn off - Lights out - Close doors
TLC

A collaborative model for Sustainability in the NHS

Barts Health NHS
NHS Trust

SKANSKA

GE

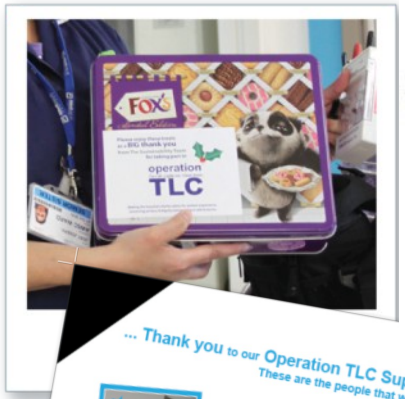
GlobalActionPlan
creating the climate for change

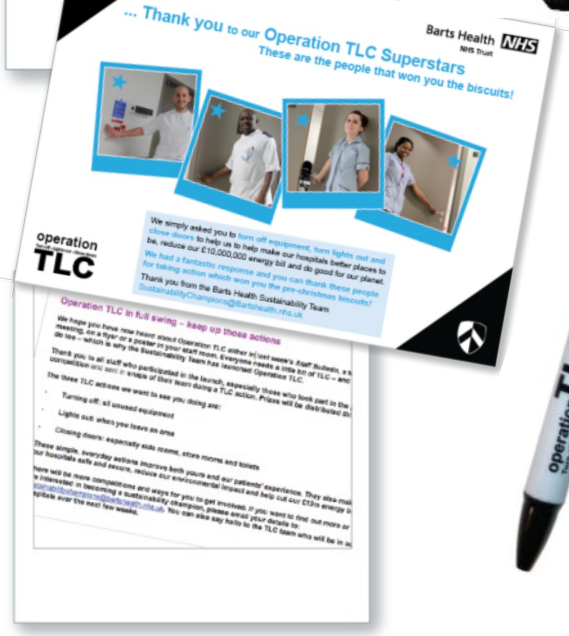
operation
Turn off - Lights out - Close doors
TLC

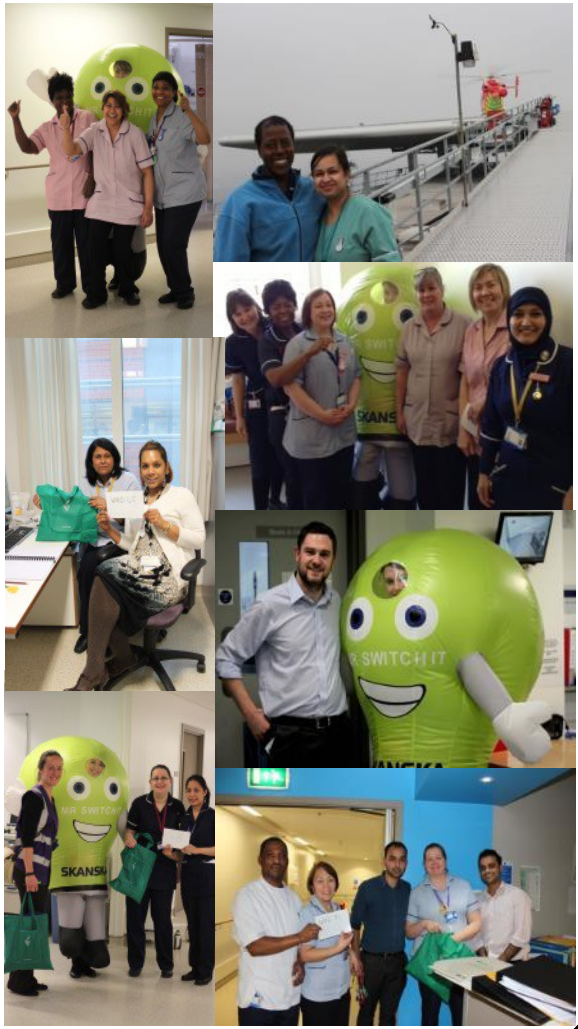
Engagement:

Communication points:

operation
Turn off - Lights out - Close doors
TLC







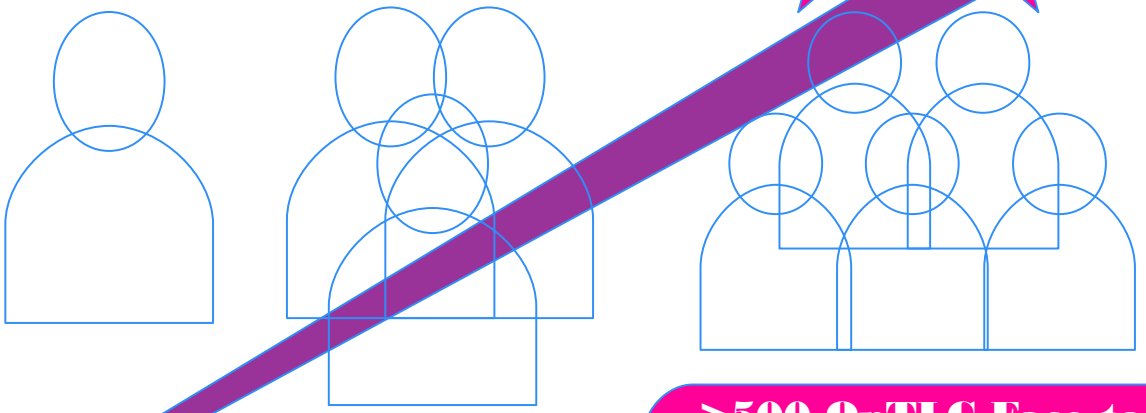
Reach:

operation
Turn off - Lights out - Close doors
TLC

321 Green Ideas

Star team completed 9 challenges

5 Screen Savers
8 Staff Bulletins
1 Intranet Article
1 Video
Reaching 15,000 Staff



138 UNEP Certificates

108 ward Champions

>500 OpTLC Face-to-Face Interactions
delivered by Sustainability Team
(9-12 visits per unit, SBH 108, RLH 400)

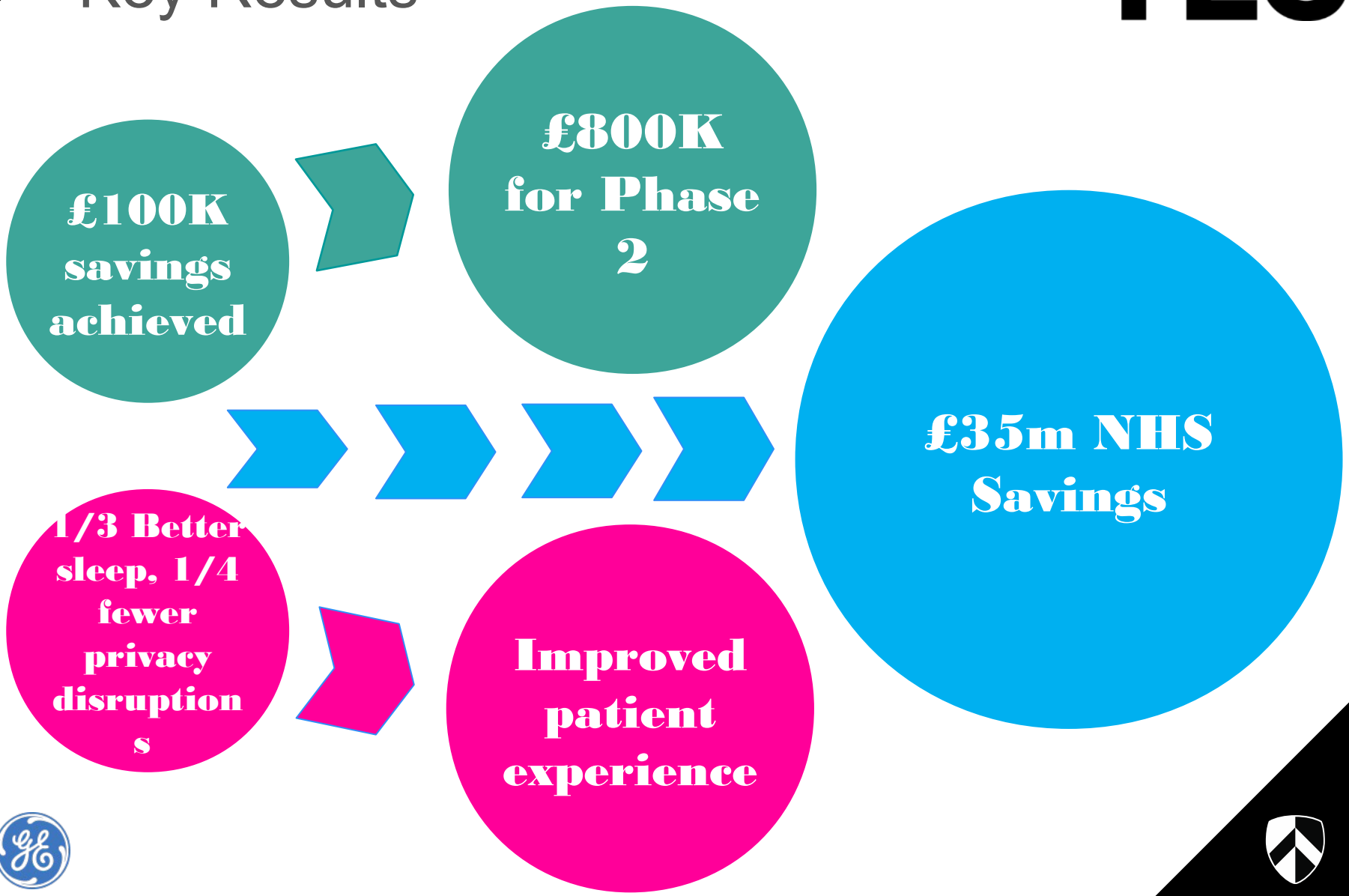
87 Suppliers trained

operation
Turn off - Lights out - Close doors
TLC

Reflecting our Core Values

operation
Turn off - Lights out - Close doors
TLC

Key Results



Wider Benefits

operation
Turn off - Lights out - Close doors
TLC

"We'd never considered the fact that every door was open over night. It makes the ward calmer with doors closed." (ward 7c)

London Evening Standard

BMJ

theguardian

responsible and seen good improvement as a cooperative team. It has made people more aware of their environment, particularly in a new build."

Health Estate
JOURNAL OF THE INSTITUTE OF HEALTHCARE ENGINEERING AND ESTATE MANAGEMENT

FMWorld

"Highlighted being smarter with our practice and the reason why" (ward 7f)

IHEEM
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Thank you.