The Role of the Utility in Advanced Energy Technology Development

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Christopher A. Cavanagh
National Grid US

Ian M. Welch
National Grid UK

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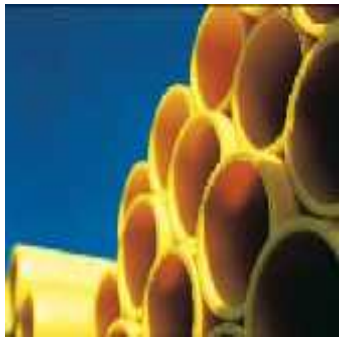
A 50:50 Company

50:50

UK

US

Transmission



Distribution

Electricity

Gas

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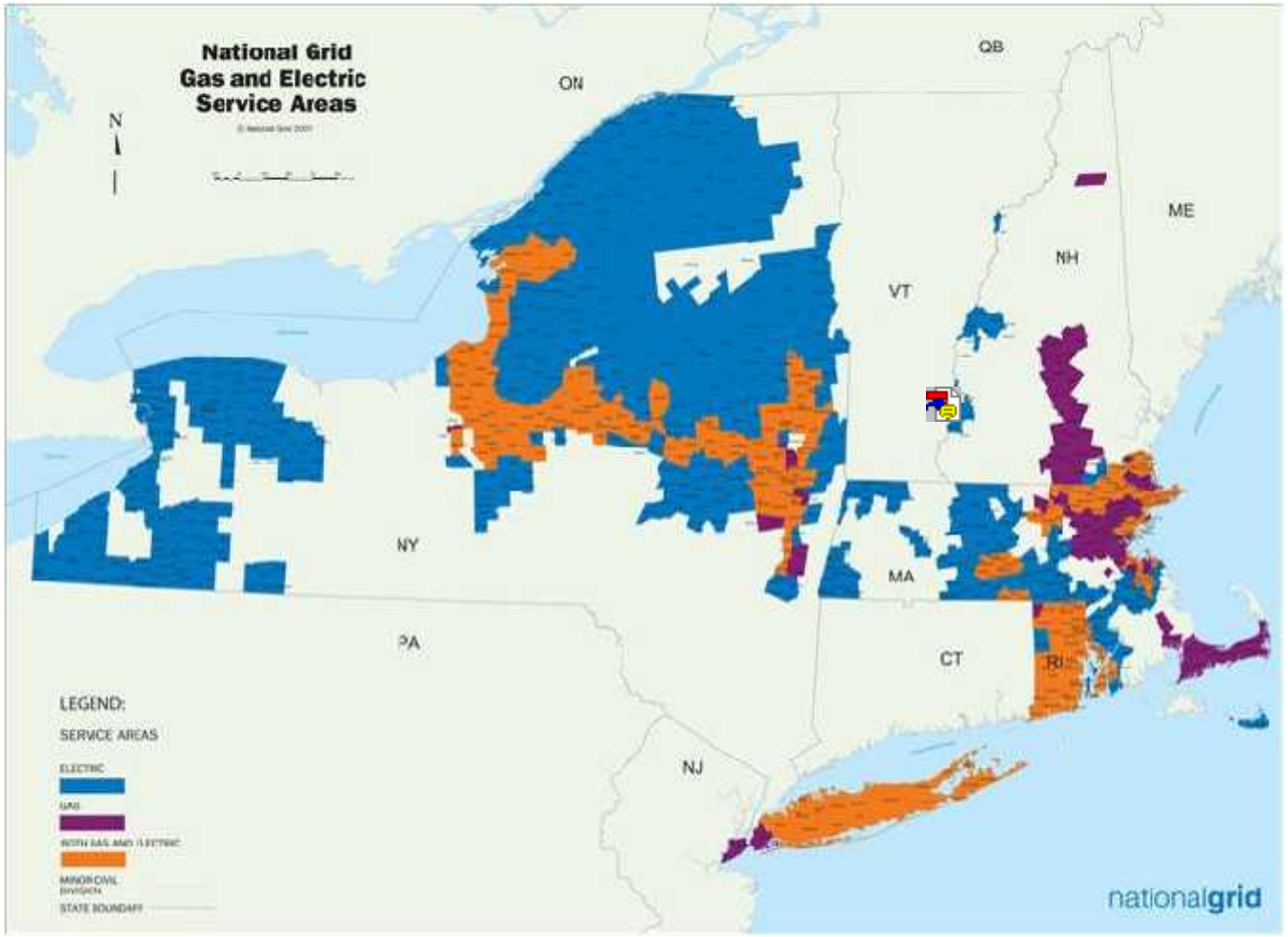
National Grid:
An international electricity and gas company

National Grid Electricity and Gas Service Areas - US



- Northeast US
  - Distributes electricity to 3.3 million customers
  - Services 1.1 million customers of Long Island Power Authority (LIPA)
  - Provides natural gas to 3.5 million customers
  - Currently owns over 4,000MW of generation
  - Blue – Electric
  - Purple – Gas
  - Orange – Gas & Electric

•*Based on customer numbers; includes the servicing of LIPA's 1.1 million customers*

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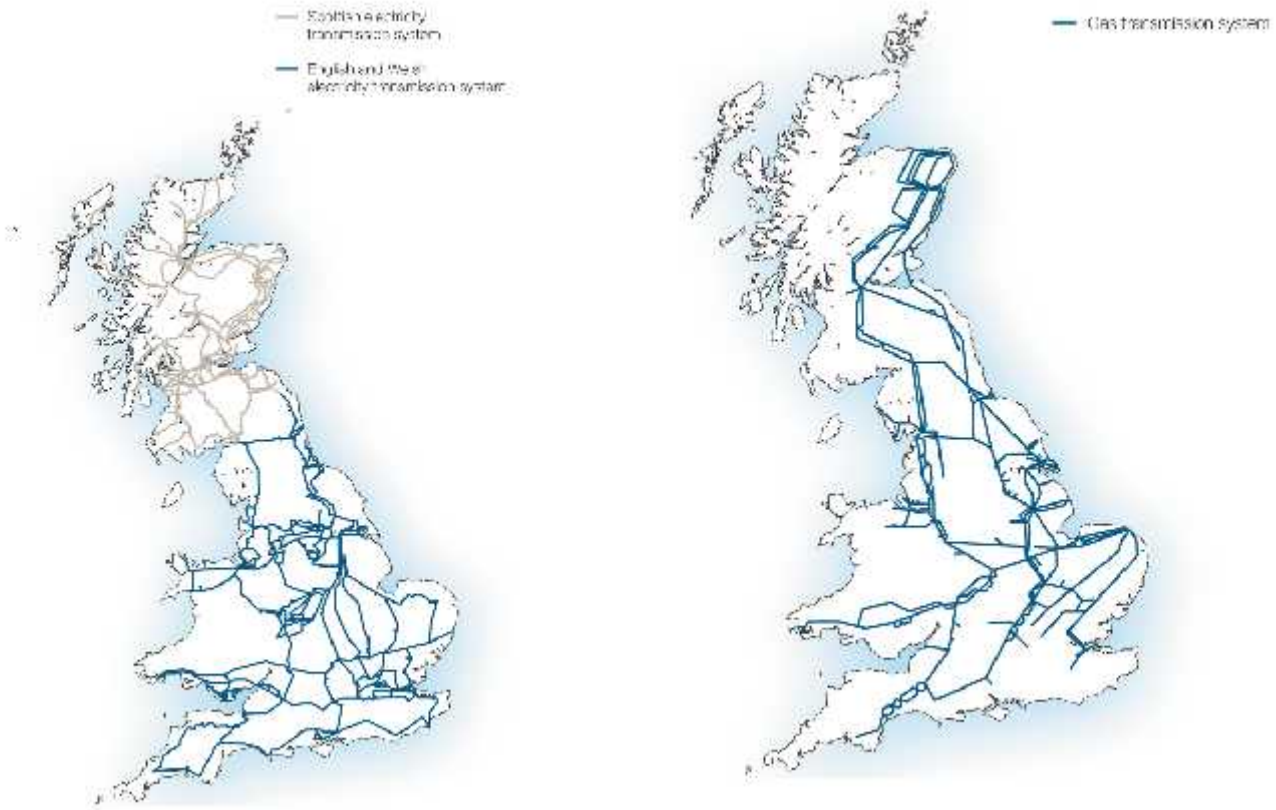
National Grid:
An international electricity and gas company

Gas Distribution - UK

Operates the UK gas distribution system; distributes gas on behalf of shippers and suppliers to 11 million consumers.

Transmission – Electricity and Gas - UK



Owns the high-voltage electricity transmission system in England and Wales and operates the system across Britain. Also owns and operates the high pressure gas transmission system in Britain.

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US & UK ……. Common Drivers

- Climate Change Policy
  - UK
    - European Union member countries set binding targets for 2020, 2030 and 2050 based on Kyoto summit.
  - US
    - State Targets (e.g. NY 80% by 2050*)
    - Regional Greenhouse Gas Initiative (northeast power generators)
    - Proposed Low Carbon Fuel Standard (fuel carbon intensity standard)
      - Transportation
      - Heating
- Customer Value
  - Operational Cost Reduction
  - Reliability
  - Competition

** compared to 1990 levels*

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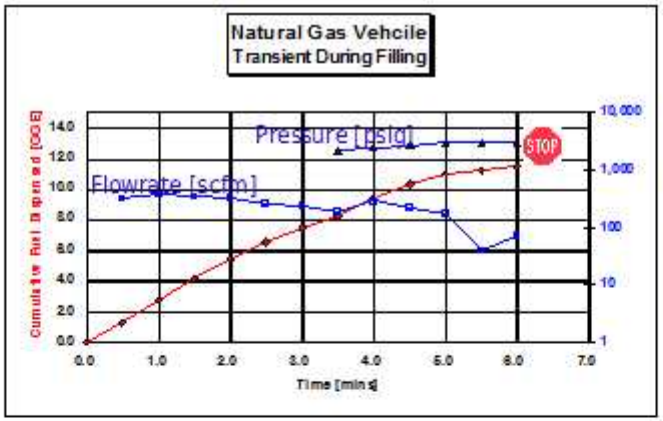
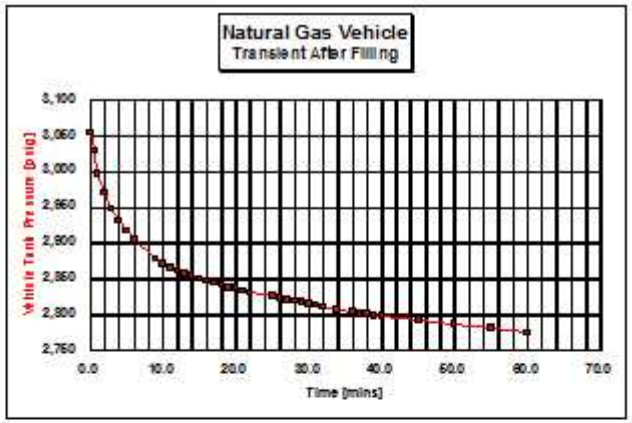
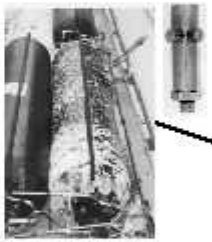
US Example of a Utility Technology Success
Compressed Natural Gas Transit Buses

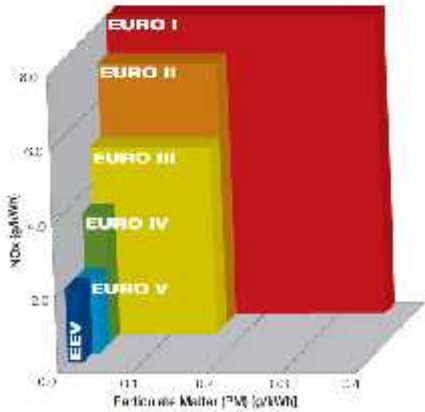
- NY Gas Utilities Directly Supported with NYSERDA
  - Development of the Natural Gas Cummins L10 engine
    - Emissions Testing
    - Fueling Systems
      - Composite Tanks
        - 3,600 psig
        - Temperature Compensated Fill
    - Safety Analysis
      - Roadways Tunnels
      - Repair Garages
      - Storage Garages







- Result
  - 18.5% of US Transit Buses are Natural Gas Powered in 2008



Euro HD Emissions Standards

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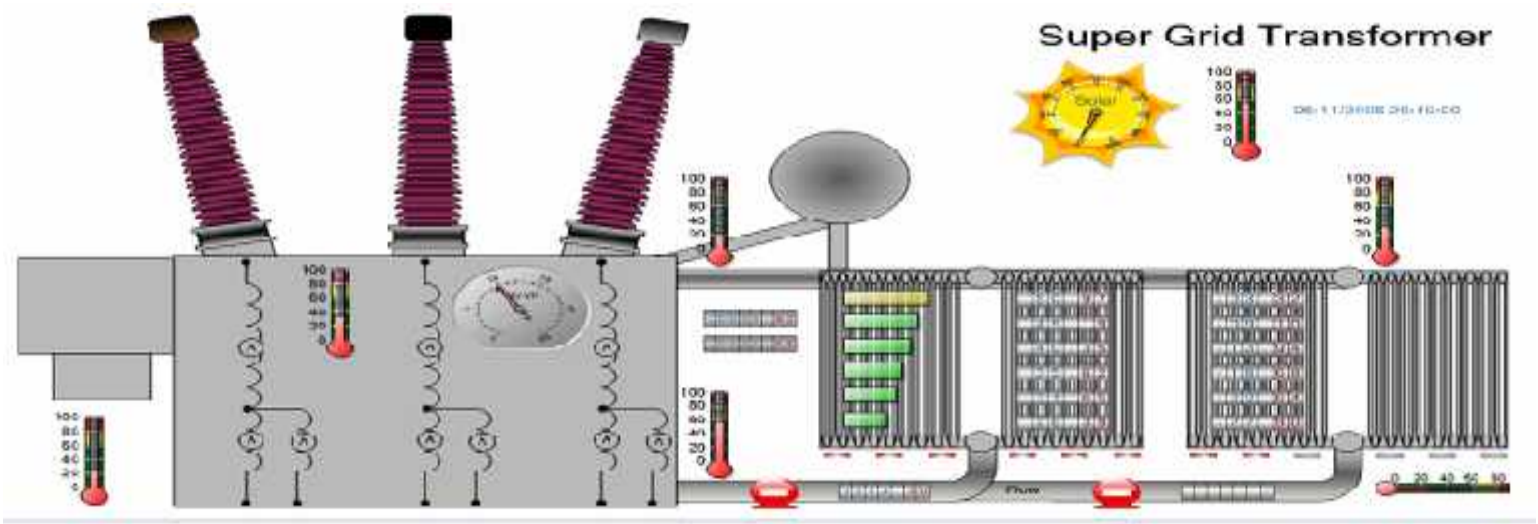
UK Example of a Utility Technology Success
Smart Asset Management

? Development of Smart Asset Management tools to aid investment decisions, improve network reliability

- Common framework for Condition Monitoring applications
- Integration of monitoring with business process & decision making
- Improved visualisation and alert capability
- A system popular with both field & office staff and enables ownership of asset risk issues



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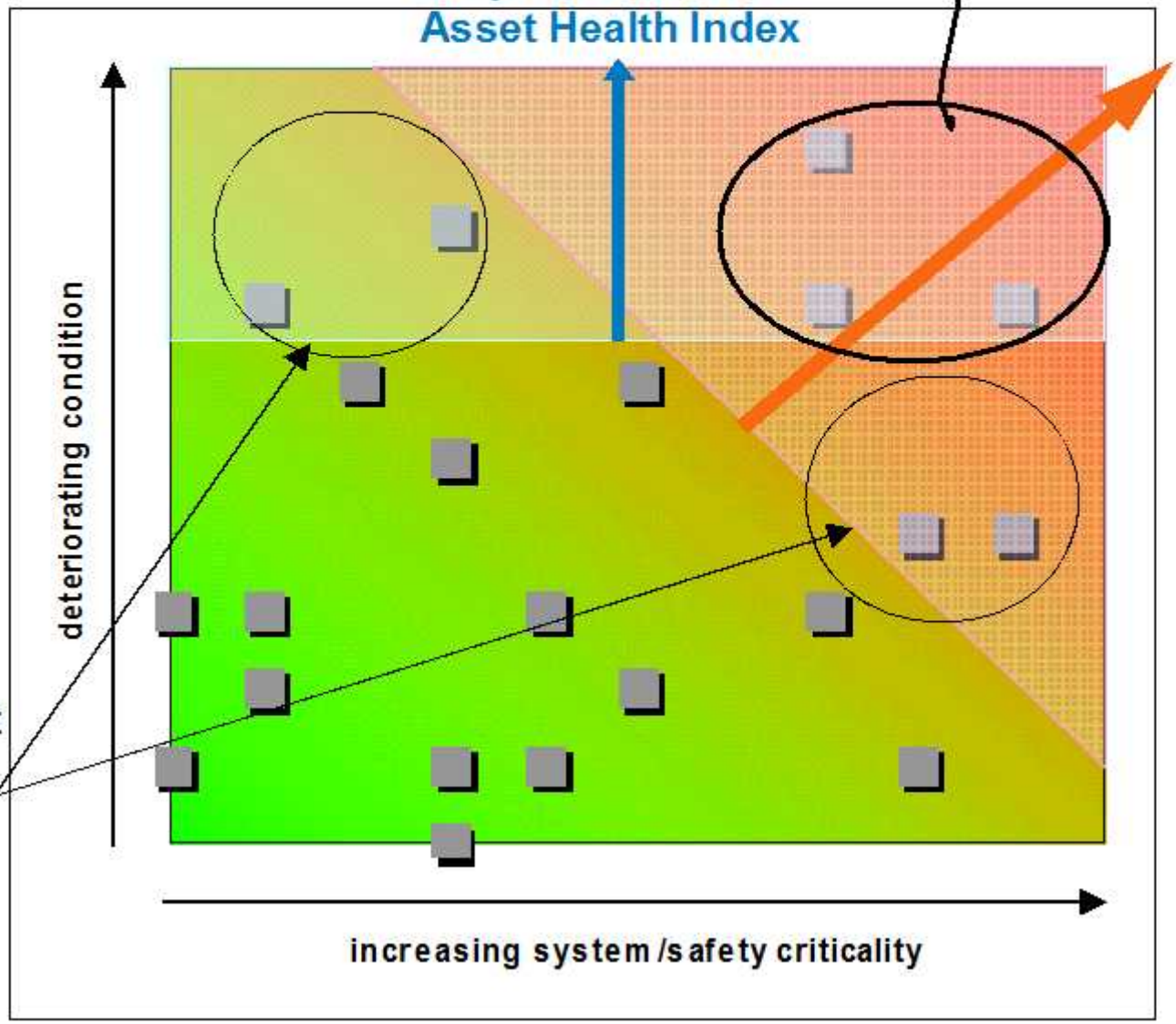
UK Technology success - Decisions based on Condition and Criticality

When constraints mean that we can only replace, say, 3 units, can now better identify *which* 3 units



Now have tools to consider both condition and criticality, ie Asset Replacement Priority. Can remove a greater "quantum of risk" for, say, each 5 units replaced

Need more "dynamic asset management" to manage these units

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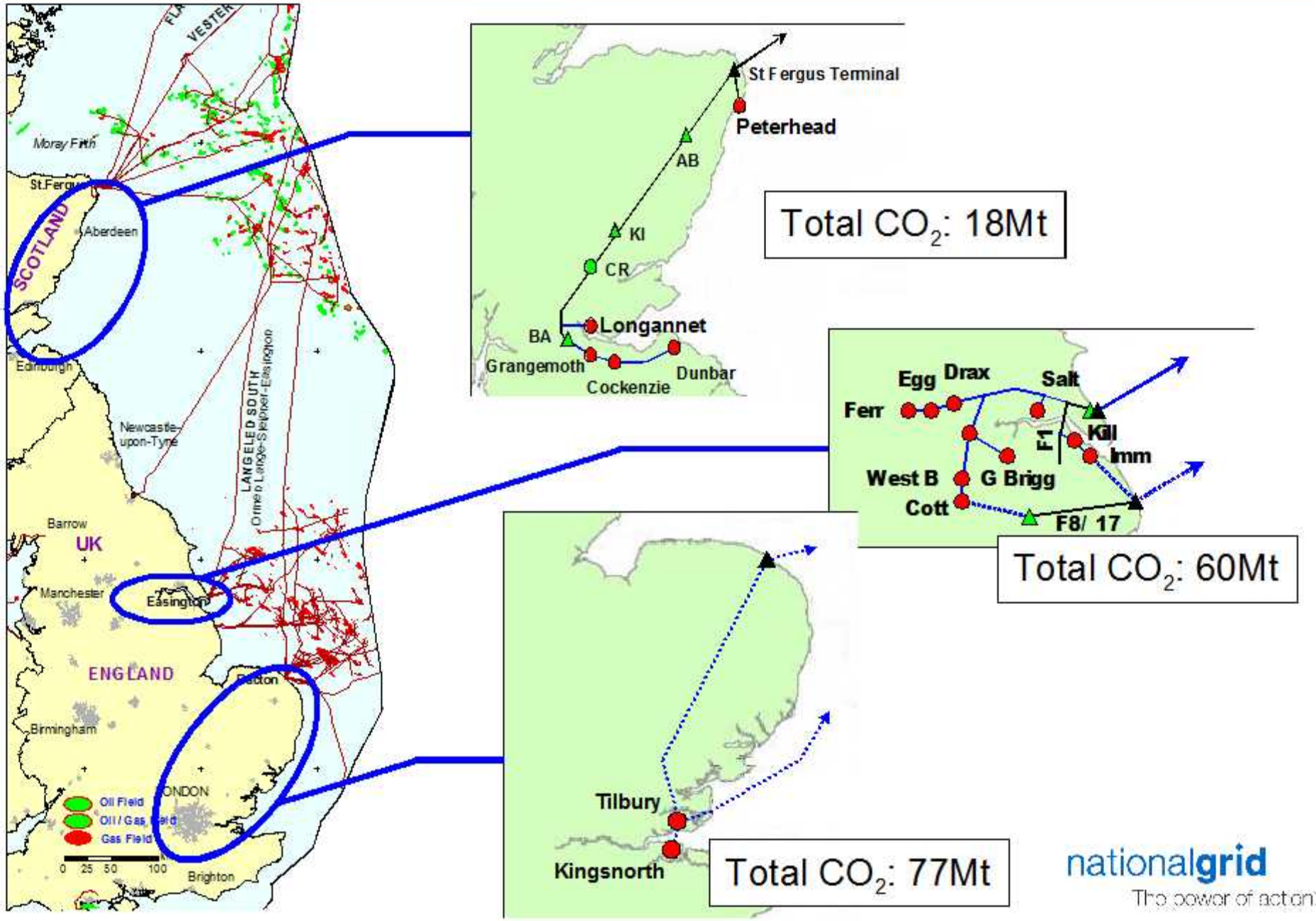
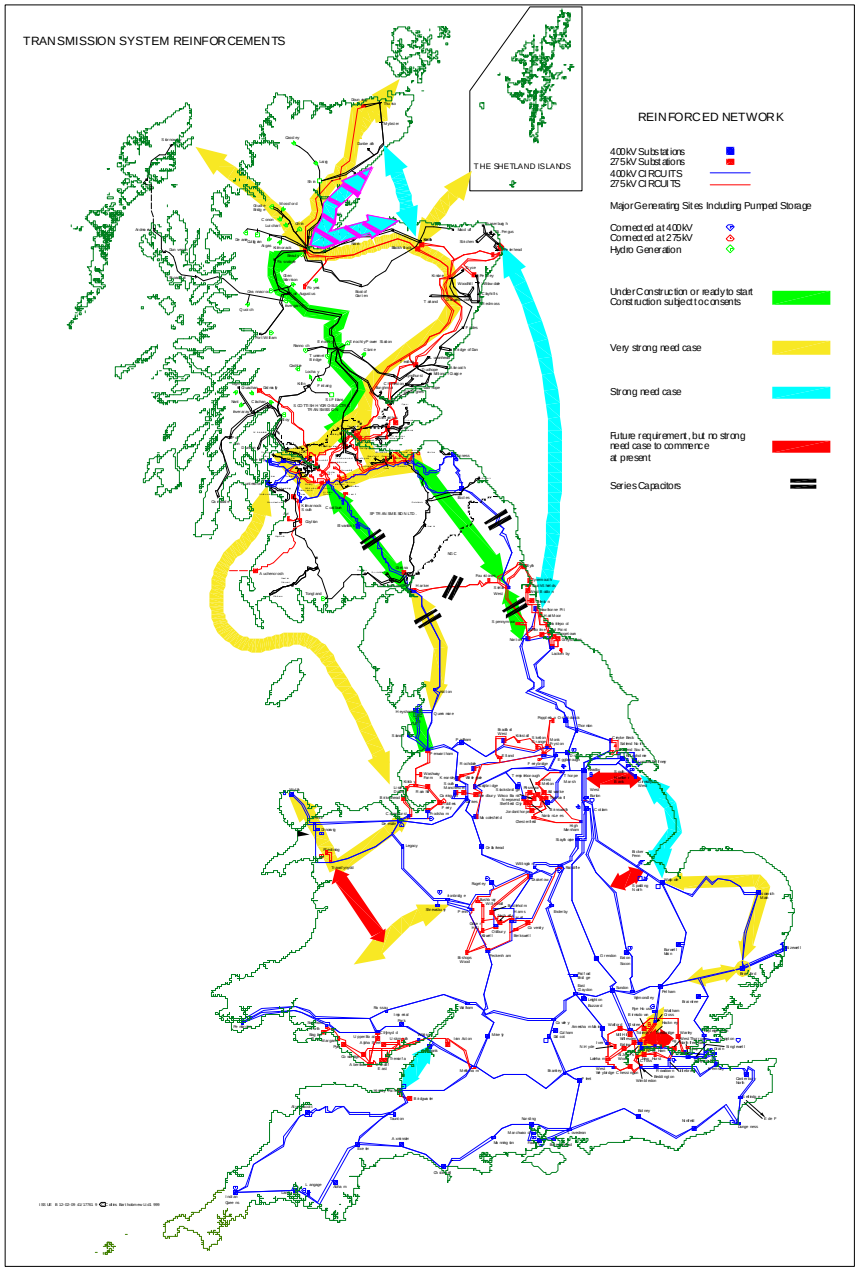
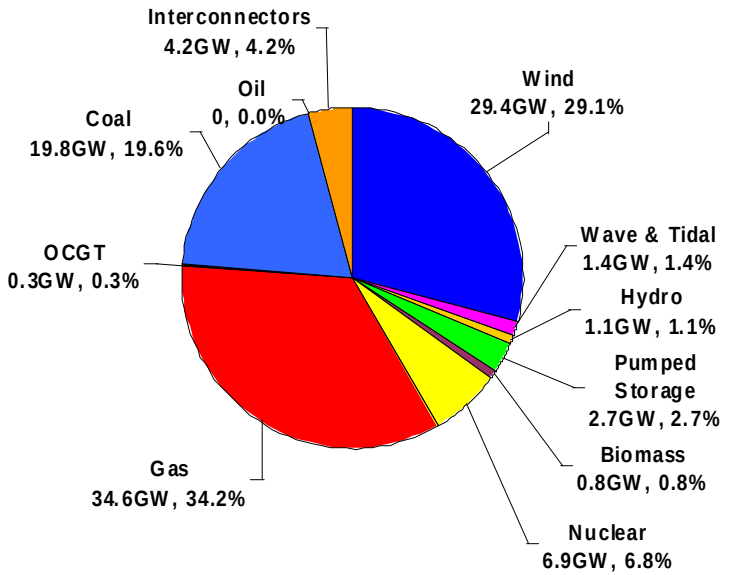
Future UK Gas Initiatives – CO_2 networks



Future UK Electricity Initiatives





? Proposed 2020 Network

? HVDC links

? Thyristor Series Compensation

? Multiple Quad Boosters

? High boundary transfers

? Complex fault management

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The scale of the storage challenge

NaS Batteries 1MW x 6 hours

Energy Storage – Pumped Hydro = 1800MW x 6 hours

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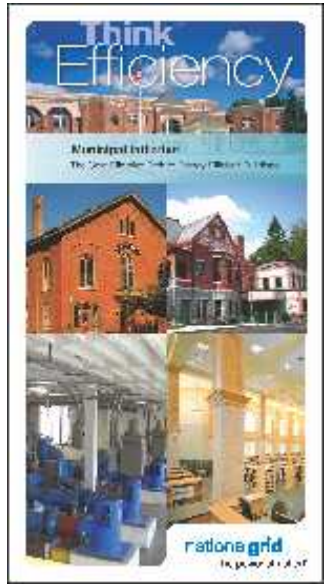
New Products & Services Will Help Drive Our Future Success

- Enhanced and Expanded Energy Efficiency Offerings

- Small/Medium Customer Renewable Energy
  - Solar & Wind
  - Bio-fuel development

- Energy Diversity
  - Reliability
  - Cost
  - Carbon



- Community Green Enterprise
- Transportation Solutions or Alternatives
  - Vehicle Energy Systems
  - Fueling Infrastructure
  - System Impacts

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Example of Current US Technology Initiatives
Energy Efficiency

- Gas Efficiency
  - Commercial Kitchens
    - New radiant burner for commercial wok
    - Gas low-oil volume fryer; controls formation of alkaline contaminant materials in fryer oil.
  - Gas Rooftop Heating (93%)
    - Exhaust Condensate Acidity & Freezing
    - Fan Power Management
  - Super Boiler
    - 94% Commercial Steam Boiler
    - Transport of Exhaust Moisture through a Membrane
- Electric Efficiency
  - High Performance Buildings
    - Advanced Buildings
    - Data Center Efficiency
  - LED Public Lighting

Frymaster Protector®
Low Oil Volume Fryer

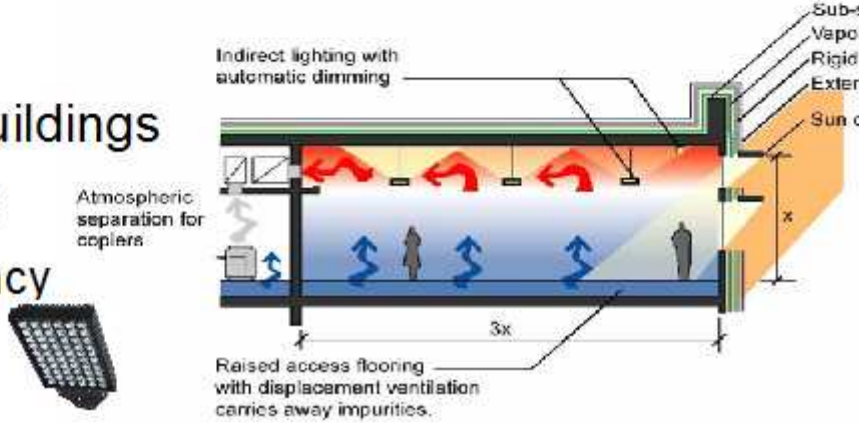

Image courtesy of
The Weidt Group
American Lung Association of Minnesota

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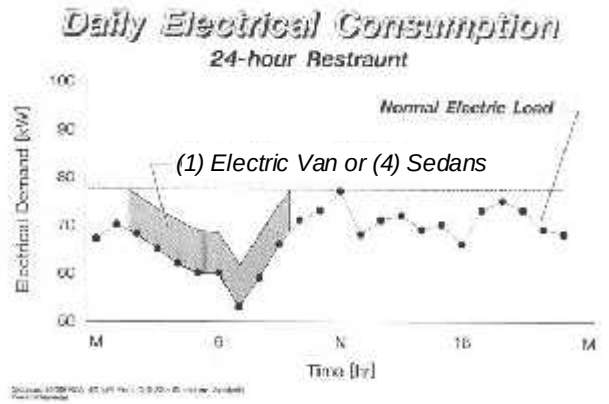
Example of Current US Technology Initiatives: Transportation Concepts

- Transportation Development Goals
  - 40% of Greenhouse gases comes from transportation
  - Dramatically reduced criteria pollutants (NO_X CO & PM)
  - Need Fuel Cost Advantage
    - Uncompressed CNG in NH $0.67/GGE (October 2009)
    - $0.05 / kWh ~ $0.68 per gal eq but $0.19 / kWh ~ $2.57 per gal eq
  - Utility Infrastructure Management ? Smart Grid



- Natural Gas
  - Ultra Low Emission Heavy Duty NG Engine (12 liter)
  - Stoichiometric combustion, cooled EGR, and simple, passive,3-way catalyst

- Hydrogen & Blends

PEM Fuel Cell

HCNG

- Hybrid

Hydraulic Hybrid

PHEV

- Electricity
  - Battery Electric Vehicles
  - Changing Demonstration (Level 1, 2 & 3)

Potential US & UK Technology Collaboration

- Gas Turbo-expander
- Pre-combustion sequestration
- SMART Grid
- Energy Storage
  - Battery
  - Flywheel
- micro CHP
  - Stirling Engine
  - Solid Oxide Fuel Cell

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With your help we can lead the way in creating the climate for change
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Question & Answer

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