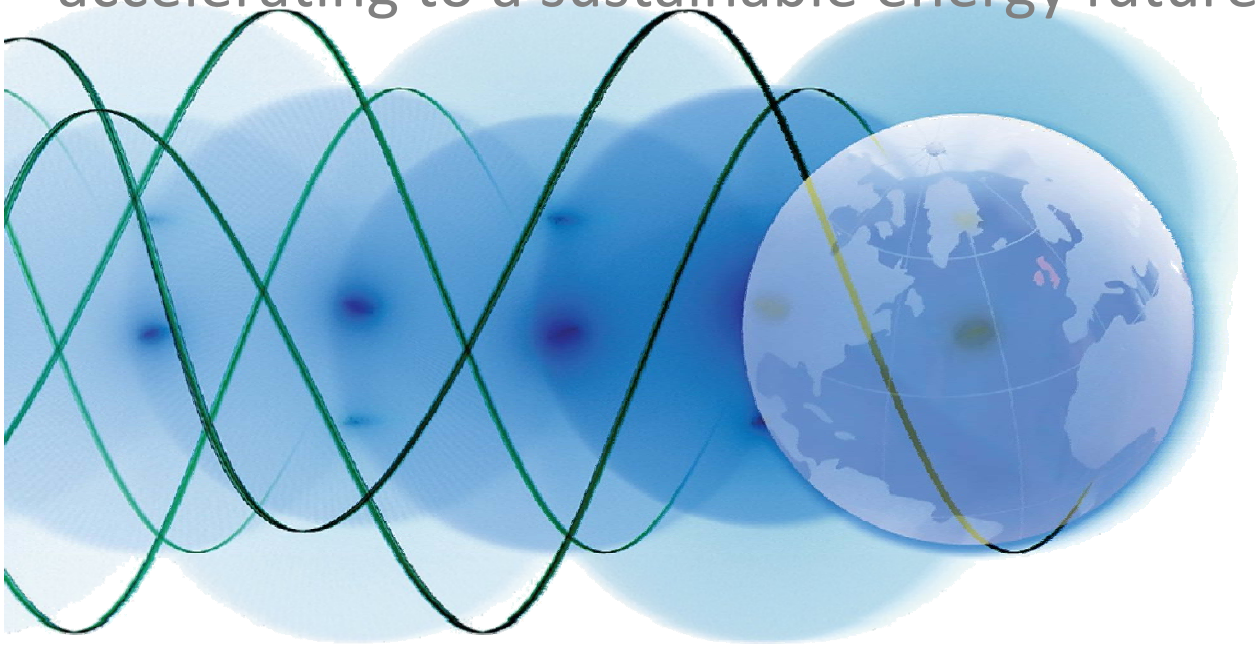
Technology Strategy Board
Driving Innovation

Knowledge Transfer Network

Energy Generation & Supply

Together…

accelerating to a sustainable energy future



Energy Sector Overview

12 Nov 2009

Chris Bagley

KTN Network Manager

UK Energy Generation & Supply KTN

“A dynamic network delivering strategic value to the UK energy sector”

by enabling

- accelerated innovation
- access to funding
- partnerships
- international engagement
- cross-sector links
- technology deployment

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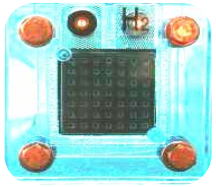
Priority EG&S Areas & Stakeholder Landscape

- Offshore Wind

- Wave & Tidal

- Carbon Abatement Technologies
  - Large Power Stations

- Fuel Cells & Hydrogen



- Maximising Oil & Gas Resources

- Future & Emerging Opportunities

- Utilities/Operators
- Equipment Suppliers
- Trade Associations
- Site owners/planners/EPCs
- Universities
- Research Institutes
- Investment Firms
- Certification Bodies
- Regulators
- Gov Funding Bodies
- RDAs/DAs
- Other KTNs

In accord with Technology Strategy Board 2008-2011 EG&S Strategy Document

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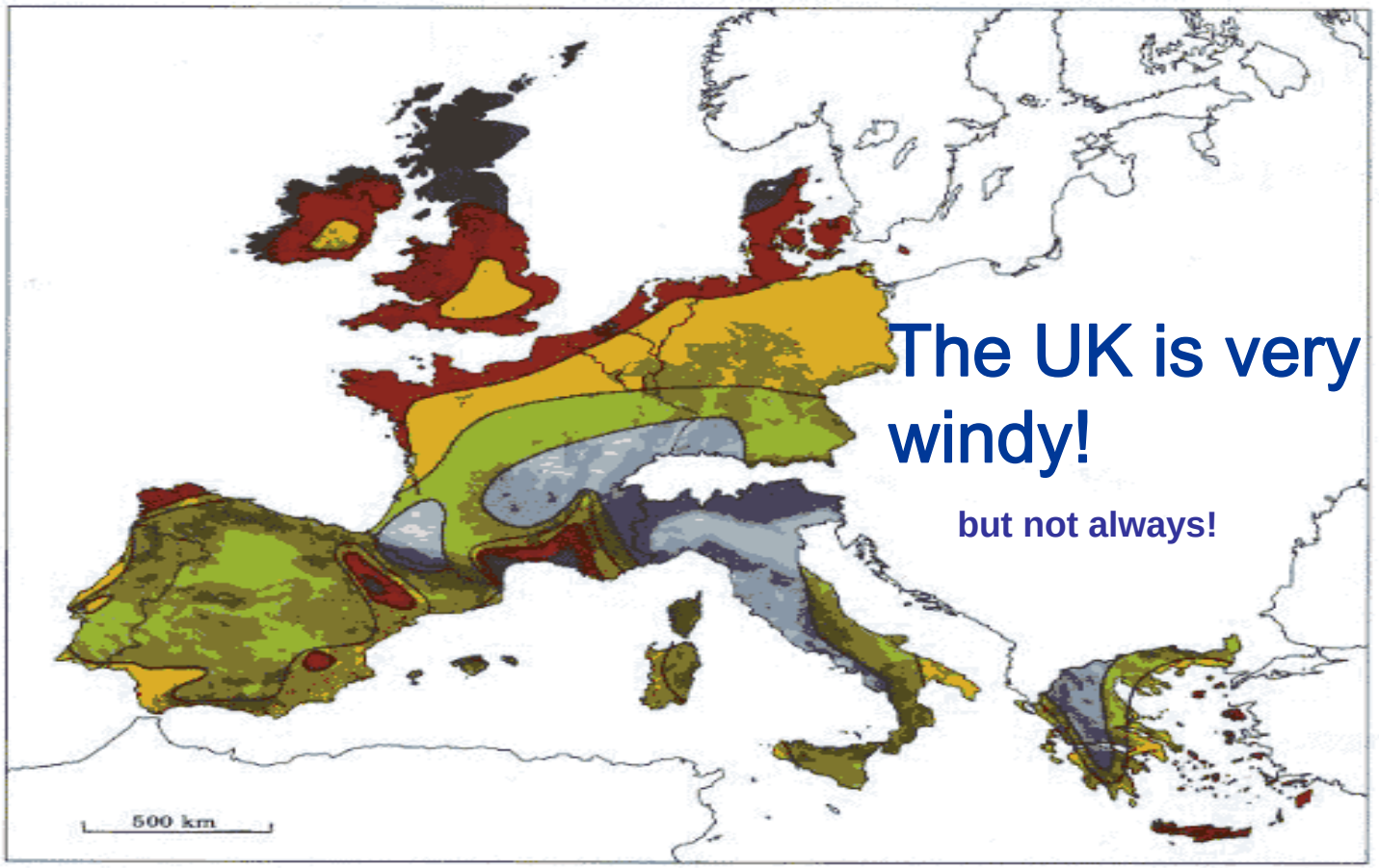
Why Wind Energy?

- Projects 254
- Turbines 2697
- MW 3905
- ~2.18 m homes



Wind resources[1] at 50 metres above ground level for five different topographic conditions

	Sheltered terrain[2]		Open plain[3]		At a sea coast[4]		Open sea[5]		Hills and ridges[6]	
	m s^{-1}	Wm^{-2}	m s^{-1}	Wm^{-2}	m s^{-1}	Wm^{-2}	m s^{-1}	Wm^{-2}	m s^{-1}	Wm^{-2}
	> 6.0	> 250	> 7.5	> 500	> 8.5	> 700	> 9.0	> 800	> 11.5	> 1800
	5.0-6.0	150-250	6.5-7.5	300-500	7.0-8.5	400-700	8.0-9.0	600-800	10.0-11.5	1200-1800
	4.5-5.0	100-150	5.5-6.5	200-300	6.0-7.0	250-400	7.0-8.0	400-600	8.5-10.0	700-1200
	3.5-4.5	50-100	4.5-5.5	100-200	5.0-6.0	150-250	5.5-7.0	200-400	7.0- 8.5	400- 700
	< 3.5	< 50	< 4.5	< 100	< 5.0	< 150	< 5.5	< 200	< 7.0	< 400

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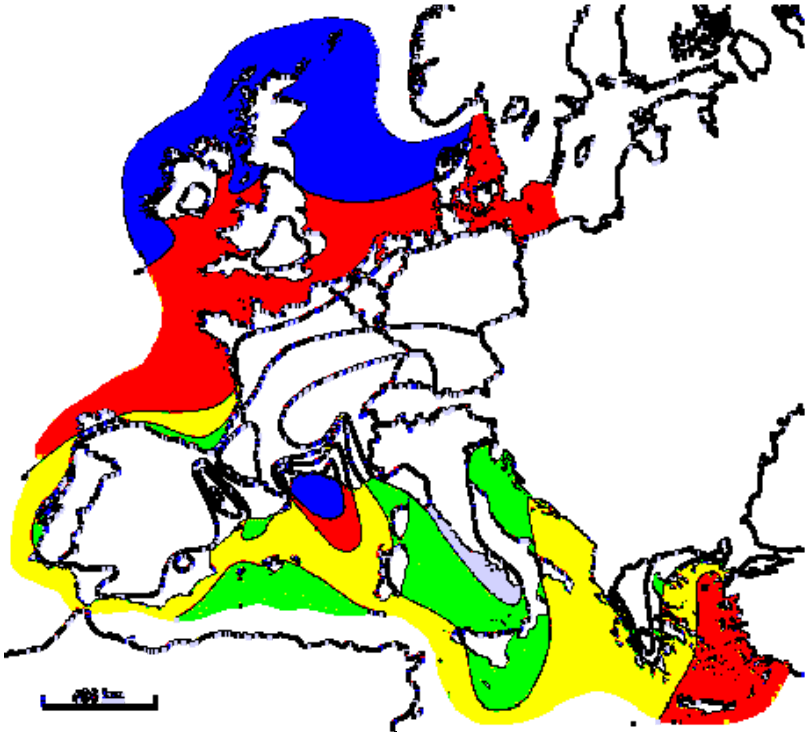
Why Offshore?

- Excellent wind resource
  - High mean figures
  - Low turbulence
  - Estimated 33% of ‘useful’ wind resource in Europe
  - In relatively shallow waters
- Reduced NIMBY effect
- Larger turbines possible

Wind Speed
10km offshore
Height 100m



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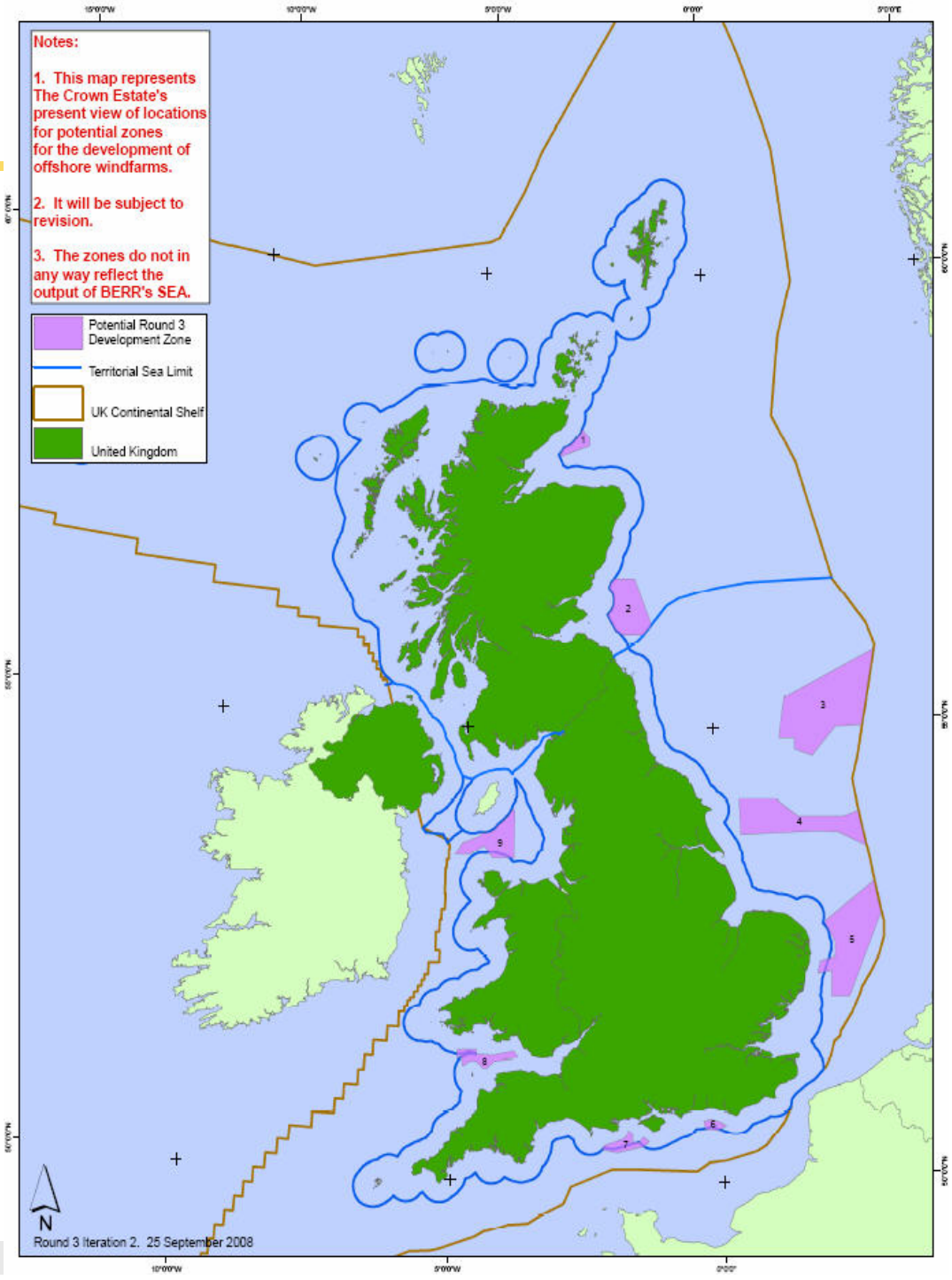
Round 3

- Development and delivery by 2020
- 9 Zones
- Single developer for each zone
- Government target of 25 GW *additional* offshore wind
- Around 5000 turbines
    - First site construction 2014
- Further ~10 GW planned and consented onshore
    - >2000 turbines



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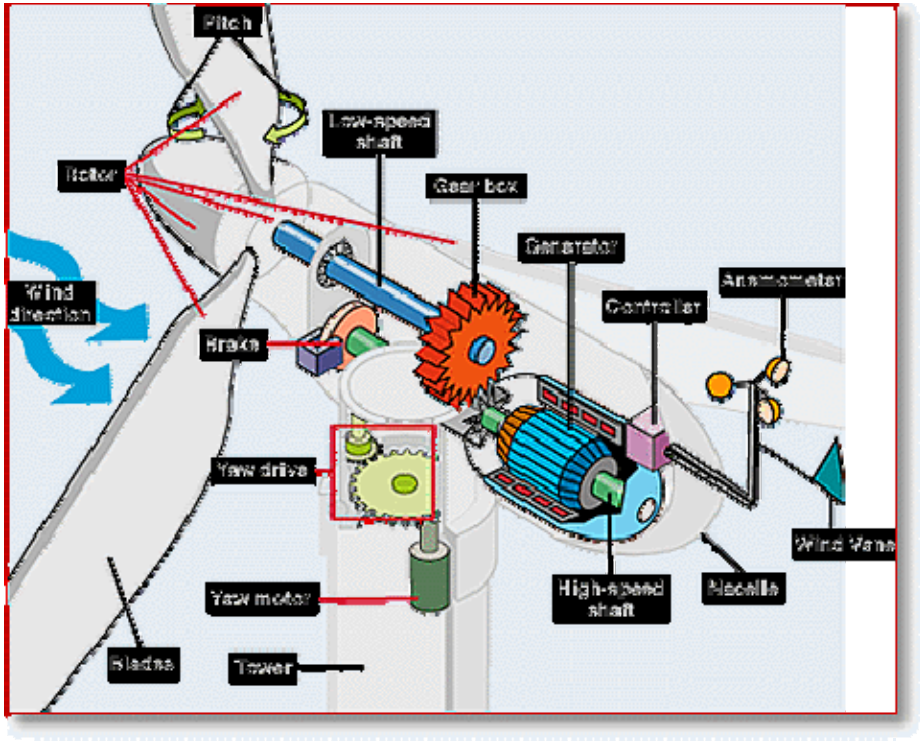
Condition Management issues

- Need to monitor and manage condition and output
- Current inspection methods can only be:
  - performed offline
  - through human intervention
  - with limited volume coverage
  - time consuming
  - hazardous and expensive
- Down time typically >£5k/day
  - Weather dependent access



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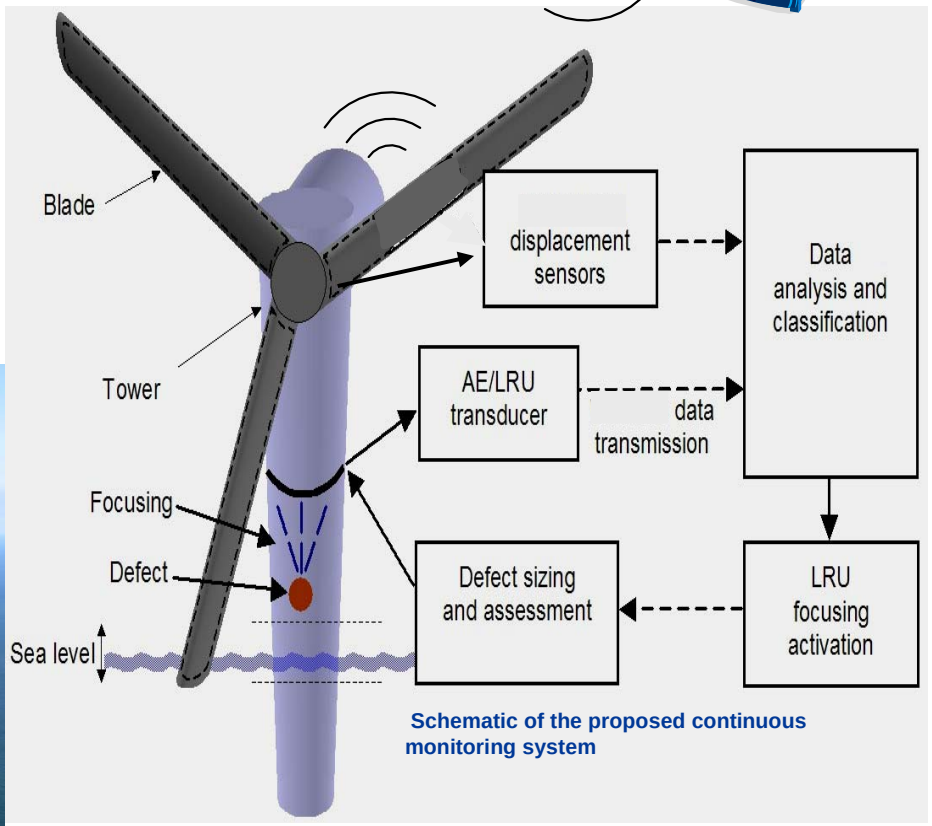
Remote CM

- Wide range of technologies under development
- Data transmission system to links with the shore base/control centre.
  - Direct Line of Sight
  - Repeater station
  - Fibre-optic/cable



Schematic of the proposed continuous monitoring system

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Beyond UK

- 30 GW of projects planned for German waters
- Horns Rev II, Denmark, 200 MW + similar project, location to be decided.
- Mouth of the Western Scheldt River, Holland, 100 MW
- Ijmuiden, Holland, 100 MW
- Lillgrund Bank, Sweden, 48 MW
- Uttgrunden II, Sweden, 72 MW
- Barsebank, Sweden, 750 MW
- Kish Bank, Ireland 250 MW+
- Cape Wind, USA, 420 MW
- Long Island, USA, 140 MW
- Arklow II, Ireland, 500 MW
- Cape Trafalgar, Spain, 500 MW
- Thornton Bank, Belgium, 200

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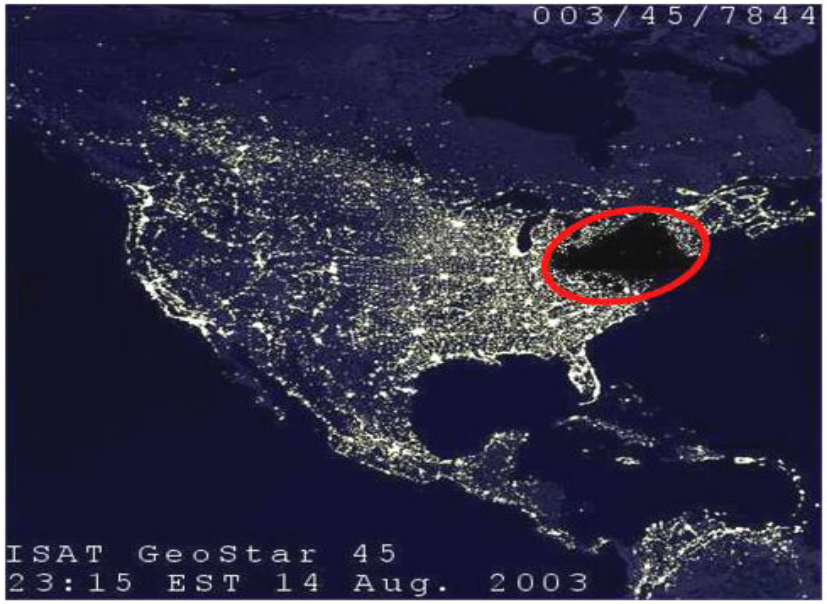
When the lights go out



Tuesday 10 November 2009

Sao Paluo, Rio de Janiero

17 GW lost, massive outage at hydro plant

14 August 2003

NE USA

Multi GW lost, cascade failure of grid

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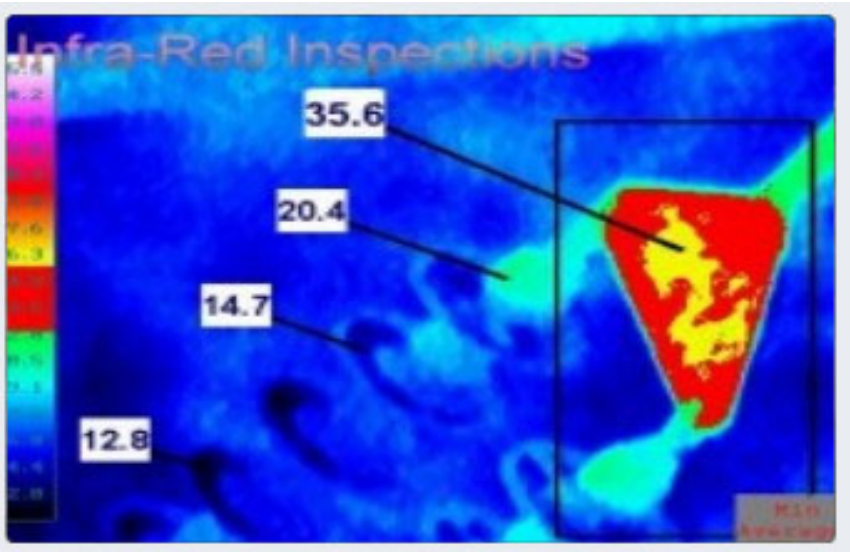
Failure detection and management



- Nil or very limited failure warning
  - No real-time load affect information
  - Expensive
  - Too exciting!
- Vulnerability of DG grid
  - No DG management
  - Hinders Smart Grid

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Summary

- Highly accurate weather forecasting for wind energy dispatch prediction
- Data transmission for WT condition management
- Mapping (and monitoring) of sub-sea cables, warnings to mariners
- Grid condition management
- Distributed Generation management

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Thank you

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www.innovateuk.org/energyktn