The opportunities for off grid monitoring of the UK Gas Transmission Network (NTS)

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National Grid Innovation

- **Background**
  - Under the current RIIO regulatory framework, National Grid and other network licensees, were encouraged to invest in innovation activities.
  - To ensure that there was transparency, a set of guidelines are defined:
    - The maximum allowed spend per annum was 0.7% of allowed revenue.
    - Clear set of defined areas would qualify.
    - There is a 9:1 funding leverage.
  - There are two innovation schemes available to each licensee:
    - Network Innovation Allowance (NIA).
      - Small programmes (£10k – £1.5M).
      - NGGT portfolio of ~40 projects.
      - Very diverse range of topics.
    - Network Innovation Competition (NIC).
      - Larger demonstration programmes (£3M – £6M).
      - Recent awards for GRAID, CLoCC.

Introduction

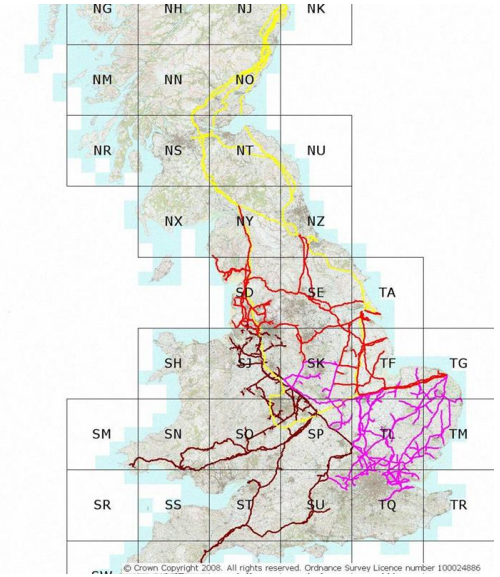
- **Background**
  - The National Transmission System (NTS) is 7654km of high pressure (>40barG) transmission pipelines.

Challenge – Third Party Interference (TPI)

- Numerous issues related to TPI.
- HSE & UKPOA obligations.
- Fly the entire network.

Innovation Solutions

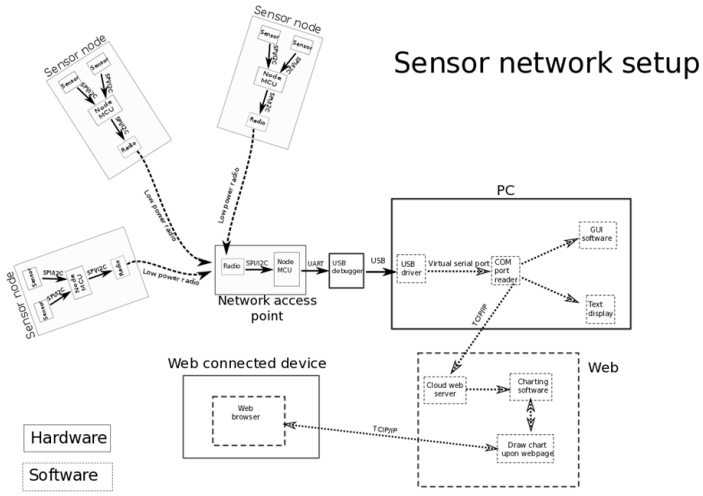
- **Third Party Interference (TPI)**
  - Comprehensive aerial programme with annual figures:
    - 320,000km pipes flown.
    - 6,500 sightings.
    - 2010 flying hours.
  - Business appreciation that there needed to be a more holistic review of the TPI provision.
    - Satellite Surveillance.
    - Alternative aerial options (fixed wing).
    - Ground based monitoring.



Energy Harvesting – TPI Solution?

Innovation Solutions

- **Energy Harvesting – a solution?**
  - National Grid has been looking at Energy Harvesting with a programme with Manchester University.
    - Focus was to marry sensors with EH units:
      - Temperature
      - Vibration
      - Humidity
      - Photographic
    - Initial focus was for Electricity Transmission asset monitoring.
    - Handed over ownership to Gas Transmission……..



Energy Harvesting – NGGT solution

Manchester Programme

- **Objective**
  - To demonstrate a working EH unit with a simple 3 sensor hub and transfer data via short range communications protocol.
    - To develop the necessary sensor power balance.
    - To develop the necessary software/hardware to maximise the utilisation of harvested energy.
    - To provide the algorithms to maximise useful data capture and transmission.
- **Status**
  - The laboratory field testing has been very encouraging.
  - Initial EH sensor hubs have been developed and are to be field trialed at a National Grid Compressor site.

Energy Harvesting – NGGT solution

Future Programme

- **Objective**
  - To develop a dedicated EH unit which will incorporate:
  - The nodes/hubs need to have significant self-configuration potential.
  - It is proposed that the range/number of sensors/hub can be changed without the need for external reconfiguration.
  - The hub network will ‘repair’ in the event of individual hub failure or renewed availability to maintain network continuity.
  - The monitoring software would be able to rationalise the collected data to ensure that interpretation of the results is not compromised as a consequence of senor or hub behavior.
  - The choice of network options is open but consideration of the latest opportunities of narrow band networks (such as the SIGFOX 868 MHz band) is of interest.
  - Data to uploaded to the National Grid ‘Uptime’ asset health data repository.

Energy Harvesting – NGGT solution

- **Status**
  - Currently National Grid are looking to develop a scope and programme with interested parties.
- **Summary**
  - National Grid Gas see huge potential of off grid remote monitoring utilising EH.
  - The company has funding opportunities which allow agile project development.
  - The use of the existing pipe marker community (19,000) as a consistent and wide coverage will ease installation and trial sites.