



CASE STUDY

CREATE2 - Sustainable 5G standalone network enhancing public services

Executive Summary

[Liverpool 5G's CREATE2](#) project demonstrates how 5G standalone networks can deliver vital public services in urban areas.

As sustainability and energy efficiency become increasingly important considerations for network operators, Liverpool 5G needed visibility into their network's energy consumption and environmental impact.

NetZeroNet (NZN) provided a comprehensive, equipment-agnostic modelling solution that revealed previously invisible energy flow patterns, identified optimization opportunities, and enabled data-driven decisions about future network investments—all while supporting Liverpool 5G's sustainability reporting objectives.

The Customer

Liverpool 5G Ltd. is a not-for-profit organisation, dedicated to bringing the right people together to enhance connectivity for public services, people and businesses.



Create 2, set out to demonstrate 5G stand Alone network can be used for delivering public services using low-cost and unobtrusive small cells to provide coverage in high-density areas. The project had both a technical innovation and social services focus.

On the technical side:

- Exploit specific innovative features of 5G NR Stand Alone (SA) technology (notably end-to-end Quality of Service and segregation of traffic)
- Demonstrate cost-effective use of mmWave mesh back-haul for small cells

On the social service side:

- Reduce digital poverty for vulnerable people in need, providing safe, free and accessible connectivity to services including health, social care and education.
- For people with long-term health conditions - enhance and extend cost effective independent living through 5G enabled services

This 5G testbed project was in the Kensington area of Liverpool and consisted of small cells connected to lamp posts, providing connectivity to various premises like homes, GP surgeries, and pharmacies. These small cells were connected via millimeter wave line-of-sight backhaul to a data centre in the Liverpool Innovation Park.

The Challenge

Overall the project faced and overcame a wide range of technical and user adoption type challenges. However, specific to the NetZeroNet (NZN) tool, Liverpool 5G were looking to develop a clearer and more accurate assessment of the energy and subsequent carbon footprint associated with the data traffic load.

As telecommunications networks come under increasing scrutiny for their environmental impact, and with energy costs representing a significant operational expense, Liverpool 5G needed greater visibility than conventional tools could provide. The organization faced several specific challenges:

- Quantifying the energy consumption of each network element in their heterogeneous infrastructure
- Understanding how different service types and traffic patterns affect overall energy consumption
- Identifying potential inefficiencies or redundancies in the network design
- Establishing a baseline for sustainability reporting and cost allocation
- Informing future procurement decisions with energy efficiency as a key criterion

As well as providing a solid baseline for better attribution of costs based on use, Liverpool 5G were looking to assess network efficiency and identify opportunities for operating cost and carbon savings .



Our Approach

Working closely with the customer, the NZN team gathered detailed information regarding the network architecture, components and typical use scenarios. Supplemented with power ratings from the equipment manufacturers, this was uploaded to the NZN data base and used to develop a model of the network and again working with the customer used to simulate and validate the network's operation

This involved the following structured methodology:

Network Discovery and Data Collection

- Detailed mapping of all network elements and their interconnections*
- Collection of manufacturer specifications for power consumption across different operational states*
- Documentation of typical traffic patterns and service types*

NZN Modelling

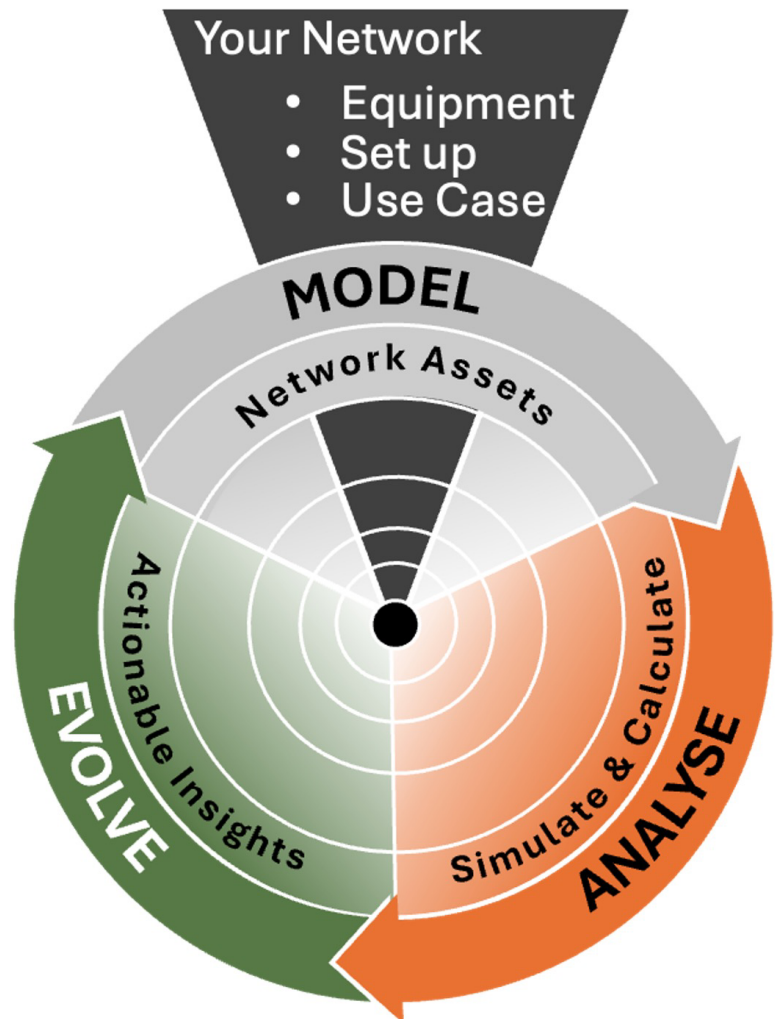
- Creation of a comprehensive model reflecting the CREATE2 network topology
- Integration of equipment-specific energy profiles into the model
- Configuration of the model to reflect actual deployment conditions

Simulation and Calculation

- Running multiple simulations with varying user loads and service types
- Validation of the model against available operational data
- Fine-tuning to ensure accuracy of energy consumption predictions

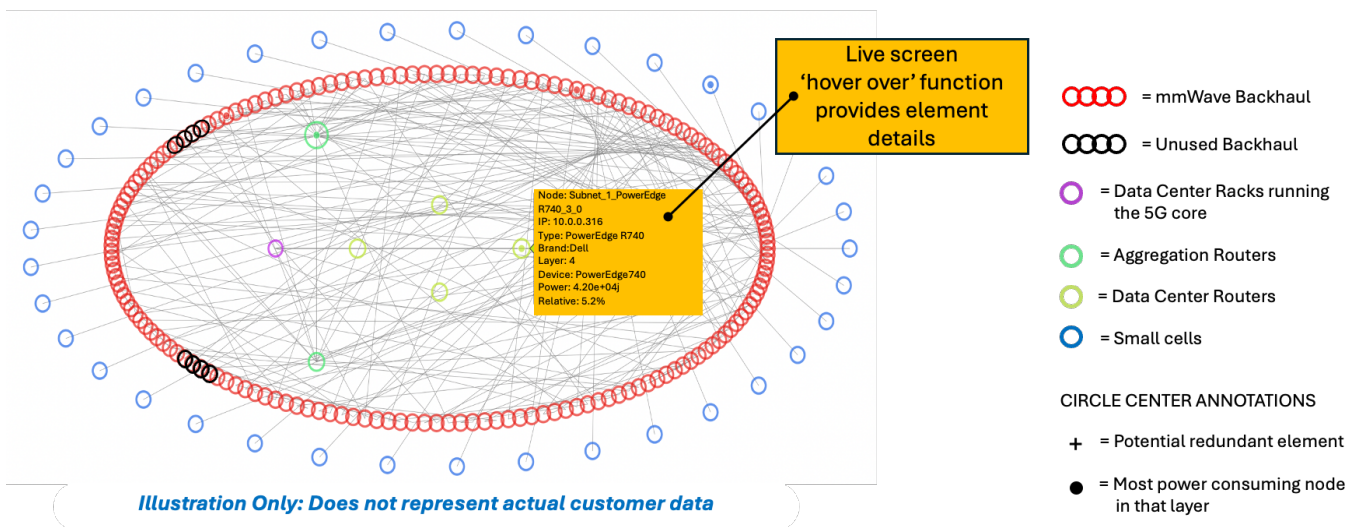
Actionable Insights

- Identification of energy consumption hotspots across the network
- Analysis of potential redundancies and optimization opportunities
- Development and prioritisation of recommendations for network efficiency improvements



What we delivered

- A validated digital twin of the Create 2 network topology and configuration
- A visualisation of the network flows (see below) capturing energy efficiency at the level of the network elements enabling at-a-glance identification of optimisation opportunities



Results and Impact

The NetZeroNet analysis delivered several valuable insights for Liverpool 5G:

1. Energy Consumption Visibility

- Previously invisible energy flows were mapped and quantified
- Energy consumption hotspots were identified across the network
- The relative efficiency of different network components was established

2. Optimisation Opportunities

- Several potentially redundant network elements were identified
- More efficient routing configurations were suggested
- Recommendations for peak load management were developed

3. Business Benefits

- Enhanced ability to allocate energy costs to specific services
- Data-driven approach to sustainability reporting
- Clear metrics to inform future procurement decisions
- Potential energy cost savings through targeted optimisations





Future Applications

Liverpool 5G is now positioned to:

- Incorporate energy efficiency criteria into future network expansion decisions
- Model energy impacts of different service offerings before deployment
- Compare the environmental footprint of alternative network designs
- Contribute to wider industry understanding of 5G sustainability

As 5G deployments accelerate across the UK, the insights gained from this project will help inform more energy-efficient network designs for both public and private sector applications.

“NetZeroNet has shown us a clearer picture where energy is being used across our CREATE2 5G network. For the first time, we can see which parts use the most power and how different usage affects overall efficiency. This helps us better understand and control our running costs and shows how environmentally friendly our network is.

The real benefit of NZN is that it helps Liverpool 5G stand out. We can now look at any network setup, no matter who makes the equipment. This means we can give our clients solid, evidence-based advice about their 5G set up - not just on how well the network performs, but also on saving energy and reducing emissions, which everyone cares about these days”

Ann Williams [Programme Director, Liverpool 5G](#)

More details of the project can be found in the links below, but please feel free to contact us if you have any questions.

L5G project description

- liverpool5g.org.uk/health-social-care-testbed
- liverpool5g.org.uk/resources-l5g-health-and-social-care-testbed

Final report published via UKTIN

- uktin.net/sites/default/files/2023-05/Liverpool%205G%20Project%20Report.pdf

UK Government case study:

- www.gov.uk/government/case-studies/liverpool-5g-testbed

Small cells:

- www.amarisoft.com/public-and-private-networks/deployment-examples/private-network-healthcare-application

mmWave:

www.bluwireless.com/insight/liverpool-5g-create-and-blu-wireless-develop-industry-boosting-ip

