

Making connections

£20m scheme will upgrade power supply for new rolling stock



Welcome to a special edition of *Radius*, the client newsletter of Integrated Utility Services (IUS). This edition has a single focus – IUS's track record and expertise in the rail industry.

You will read about many aspects of IUS's problem-solving thinking and practical capabilities – from innovative design proposals relating to the busy Stevenage area on the East Coast Main Line to the installation of the first high voltage booster in the UK, which led to work elsewhere in Europe for IUS. As you will discover inside, the company has also worked in Ireland on a state-of-the-art tram system.

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A completed Power Supply Upgrade substation near Redhill in Surrey.

The largest rail project ever undertaken by IUS – a £20 million design and build contract with Network Rail to assist in the Southern Power Supply Upgrade (PSU) scheme – is due to be completed by the end of this year.

Work on the contract began in April 2003. The scope of the work completed by IUS involved delivering nine 33kV-750V AC-DC substations, either building new ones or replacing existing ones. Most are on the London Victoria to Brighton route, one of the busiest commuter lines in the world.

The project came about because of the old "slam door" trains in the South East that are being replaced with more modern rolling stock by April next year. The £600 million PSU project is a major investment into the existing

electrical infrastructure, and is the largest project ever undertaken on UK rail-based electrical assets.

The power supply needed to be upgraded because new trains and carriages use more power because of automatic doors, air conditioning, heating and electronic passenger information.

The trains connect to the electrical system using a carbon "shoe" which floats on top of a live 750V DC conductor, the "third rail". The third rail runs parallel to the running rails that the train wheels sit on, and is mainly used in the South East, so IUS had to use all its experience in the industry to deliver the appropriate technical solution.

IUS was responsible for scoping, designing, procuring, installing, commissioning and handing back to the Network Rail "maintainer" the substation assets, whilst

ensuring that essential power and signal supplies remained connected during the build phase of the works. Access was also a problem, with some of the sites being "rail-locked", preventing straightforward road access, particularly for deliveries and off-loading.

The 33kV system, which is privately owned by Network Rail, is located at the side of the tracks and is connected through various grid supply intake points from the local distribution network operator. However, the DC technology and connectivity is relatively new to IUS and, through a highly innovative approach, the company has adapted to this alternative technology, adding an exciting new dimension to its already diverse portfolio.



Consultancy services

IUS has a wealth of experience in providing feasibility studies for electrical infrastructure works. This has included such services for Network Rail (formerly Railtrack) EWS and Corus.

Feasibility studies have been completed for Network Rail at Ardsley and Woodgreen. These studies are good examples of how IUS can be used in a consultancy capacity, making use of its particular strength in determining point of connection requirements with the distribution network operator (DNO) and the National Grid.

IUS is a leading connection consultancy provider, able to manage large scale roll-out programmes or individual single connections on a national basis. Using its expertise and detailed knowledge of the utility connection consultancy market, IUS can cut through red tape, reduce project timescales and keep cost under control.

The company's expertise further extends to cable route design, loading surveys, harmonic evaluations, power factor correction, and asset registers. IUS's in-house skills and experience provide an excellent level of service with professional reporting, risk analysis, cost data, optioneering and recommendations for the best solution.

Open-cut trenchwork with a 25kV feeder cable and associated pilot cable in the Hitchin area.

Thinking outside the box

Network Rail (then Railtrack) required additional power for their overhead lines in the busy Stevenage area on the East Coast Main Line. The recommendation was for a new National Grid supply point at Corey's Mill, near Stevenage.

From Corey's Mill the power would be distributed to Hitchin and Langley Junction via two 25kV feeders complete with associated pilot cables.

IUS was invited to tender, and successfully won the contract to design, install, test and commission a cable route for

two 25kV feeders, both about 6km in length. The cables were to terminate at switchgear and at the overhead conductor.

Thinking out of the box, IUS proposed running as much of the cable within the highway, rather than at the trackside, so minimising the number of possessions needed, and ensuring that inconvenience to rail passengers was avoided as much as possible.

Through IUS's expertise at surveying and planning, together with its experience with local authorities, a suitable

route was determined. IUS was then involved in liaising with the residents about the works and how to keep disruption on the highways to a minimum.

At the same time, it had to follow Railtrack's approved products and their group and line standards. To help keep Railtrack informed, it monitored the project using key performance indicators on safety, quality, environment, people and cost.

The seven-month project was completed successfully on time and within cost.

A pioneering boost

How to increase power on overhead lines in vulnerable areas – for example at the extremities of feeder stations or on inclines – is a problem for the rail industry throughout Europe.

As such, it demands an international solution, which is why a 17-strong European consortium is assessing the capability and value of using high voltage booster (HVB) units as an alternative to the more onerous option of creating more feeder stations.

The consortium, including Network Rail and rail companies from France, Italy and Germany, decided to test an HVB unit for the first time in the UK at Chathill, near Alnwick, in Northumberland.

IUS was chosen by the consortium to both project manage and install this

pioneering solution. The scheme involved civil and LV and HV cable works and installing switchgear, capacitors, inductors, batteries, chargers and control systems. Finally, IUS had to make the connection to the overhead line and test and commission the unit.

In addition to the usual hurdles to be overcome, for example minimising possessions and liaising with interested parties, the international element of this project provided extra challenges. The unit, for example, was provided by Ansaldo of Milan, which led to design issues which had to be resolved internationally.

After the trial, which proved successful, IUS dismantled the unit, and transported it to Villnoy, near Paris, so



The HVB unit at Chathill.

it could be put through its paces in France. Given IUS's experience at Chathill, it was

also contracted to project manage the installation of the unit in France.

A fast solution to a deep-down problem

Strategic thinking by IUS has helped clear the way for Dublin's new state-of-the-art light rail transit system.

The system, known as Luas (the Irish word for speed), faced several problems before the first trams were able to run in June this year.

One of the difficulties in the planning stage was how to divert LV and HV underground electricity cables, telecommunications cables and both gas and water mains. Unless they were moved, their integrity would have been at risk from the trams, which run every five minutes in peak periods. They would also have been inaccessible for future maintenance due to the close proximity of the tracks.

Luas needed a solution that combined first-class project management with effective civil engineering. And, in keeping with its name, it needed that solution fast.

It chose to award the 18-month contract, worth €10

million, to a joint venture of IUS and a Dublin-based civil engineering firm, SMC Group.

"In very simple terms, IUS performed the project management and SMC executed the engineering requirements," said IUS's Ian Harding, who was project manager for the JV. Ian, who moved to live in Dublin throughout the project, put together a bespoke team of IUS professionals that included a health and safety professional, operations manager, programme manager, commercial manager and a traffic management officer.

The solution delivered by IUS involved moving all underground services into newly installed ducts and pipes at the side of the road or under the footpath. In some cases, services also had to be buried deeper than before so they would not be damaged by the trams.

The IUS team was also responsible for ensuring that essential utility services were

maintained for major industrial and commercial customers in the area for the duration of the work. In particular, the water supply to the high profile Guinness factory had to be maintained and uninterrupted at all times despite the level of work being delivered by the JV.

The contract also included IUS devising plans to have sewerage and manhole access chambers along the route either rebuilt or altered without disrupting the flow of very heavy traffic in and around Dublin city centre. This was the reason for IUS appointing a dedicated traffic management officer, who devised innovative plans and traffic management method statements together with Dublin Corporation to achieve this.

The area for which IUS was responsible ran from St. James Street in the west, past Sean Heuston Station and on towards Phoenix Street in the city centre.

Lowdown on Luas

- Luas is operated by Connex;
- The first 26 Citadis 301A vehicles were ordered from Alstom;
- The trams are European standard gauge, unlike rail lines in Ireland which are wider;
- The scheme involves building two depots to house the trams;
- After the opening of the first line in June, a second line opened in September; and
- IUS installed, diverted and connected over 100 km of ducts, pipes and mains as part of the initial construction phase of the project.

A devil of a job

Anthony Gormley's giant sculpture, the Angel of the North, may look down on the EWS freight sidings at Tyne Yard, near Gateshead, but it couldn't protect the depot from a range of devilish problems.

The HV cable had faults, switchgear was showing signs of deterioration, oil in transformers was acidic and the Solkor protection system was not working as effectively as possible. EWS had also had to resort to the use of a portable generator at a lighting tower due to the loss of system flexibility.

Not phased by updating ageing assets or curing historical faults, the IUS team swung into action to deliver a comprehensive range of services starting with a site and substation survey and finishing with the production of an asset manual.

Between these start and finish points, four ring main units and two transformers were replaced, 364m of HV cable were laid, the Solkor protection system was converted to overcurrent and earths fault and two



An 11kV ring main unit at Tyne Yard.

substations were overhauled.

The project wasn't always easy – most of the cable had to be laid using trenchless directional drilling technology and 24-hour freight train workings meant that safety was of paramount importance.

This involved not just following EWS rail safety standards but also complying with IUS's own safe systems of working.

The result – EWS now have a fully-functional HV system which is flexible enough to restore supplies

quickly should a fault occur.

To give them peace of mind about the future, EWS also signed a maintenance agreement with IUS. So, if problems do arise, it will be IUS "angels", and not Anthony Gormley's creation, who fly to the rescue.

Keeping the station lights burning bright

It's no good running the trains on time – Mussolini was said to have done that – if the station lights go out.

Non-traction power maintenance is vital for the rail industry, if everything is to run smoothly, and it's a field in which IUS has particular expertise.

When Network Rail (then Railtrack) wanted to be sure that power supplies for important stations on the East Coast Main Line – including Newcastle, Darlington, York and Peterborough – were in good shape, IUS won the inspection and maintenance contract.

The work required extensive pre-planning followed by inspecting substations and

writing a survey report. It also involved remedial repairs, sampling and, where necessary, replacing oil in transformers, checking the condition of batteries and chargers and connections to generators and removing PCB contamination. The final piece in the jigsaw puzzle was the production of a detailed hand-back report on the state of these assets.

By the end of the contract, Railtrack knew that the power supplies to the ticket offices, refreshment areas and electronic timetables had been professionally maintained.

IUS has also carried out substation inspection and maintenance work in the rail



An 11kV circuit breaker which has been isolated for maintenance.

industry for EWS, Jarvis, Serco and Balfour Beatty Rail.