



# Smart Networks for Scottish Power

Radius provides a smart network, distribution automation system to assist Scottish Power, Energy Networks to achieve their regulatory requirements.

**Over the past decade Scottish Power, Energy Networks (SPEN) has been able to provide their customers with an optimum quality of supply, through the use of Radius' highly technical and reliable Distribution Automation products and services.**

## WORKING PARTNERSHIP

Radius has been at the forefront of one of Scotland's and Northern England's most important utility schemes, the goal to reduce the impact of power outages to the high voltage electrical network.

Before utilising the Radius products, SPEN were reliant on customers calling their centres and informing the operator about the problem. They would then send teams of line engineers out into the field to search for the fault, based on the information from customers. This process was not only time consuming, considering the vast scale of the electrical network, but also very cost ineffective.

## POST FAULT RESTORATION

The utility turned to Radius, experts in data radio communication and distribution automation systems and smart networks. The goal was simple: a reliable and cost effective system to increase efficiency and quality of supply. The system

should be able to monitor both the electrical network and handle any fault on the network automatically. The system should also be able to be controlled and monitored via the utility's own SCADA system back at their control centres as well as at key locations and locally at each site.

## AUTOMATION EXPERTISE

The ongoing project is a highly collaborative one, with both companies bringing their expertise to the continual development of the scheme. One of the key staff on the development team for SPEN stated "Radius has been a key player in helping us provide a better service to our customers. Their in-depth knowledge has helped to significantly reduce the number of customers who have down time on our network".

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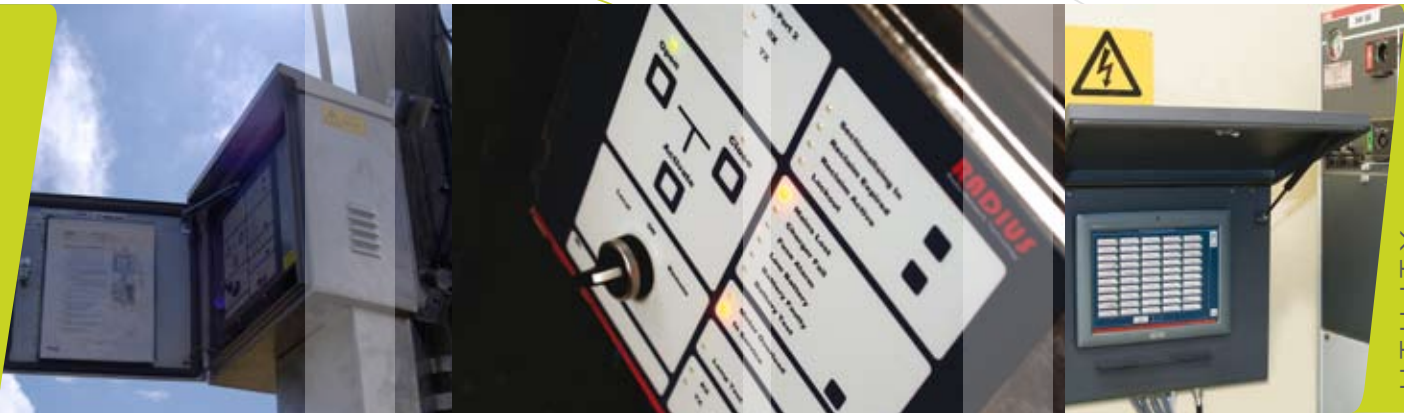


## SIMPLE AUTOMATION DEPLOYMENT

The utilities network utilises a number of Radius products from CCU's (Central Control Unit) in the primary substation (which provides the link to all the remote outstations, SCADA interfaces and logic routines) to the NMS 100 (switchgear motor control) which provides a very flexible interface to a range of remotely located switchgear. Radius even developed a specific SCADA protocol (DSP4 and Ferranti MkIIa) for the utility. This protocol is now part of an increasing protocol library which also includes DNP3 & IEC870.

## SIMPLE APPROACH

One key to the success of Smart Networks and Distribution Automation is to keep the complexity simple in



order to maximise the time to roll-out the benefits. Faults are detected by utilising equipment fitted with current transformers and either manufacturers original protection devices or the Radius FPI (Fault Passage Indicator).

This information is passed very quickly back to the Central Control Unit (CCU) and then commands are given automatically to the remote devices to minimise the affected zone and bring as many people back on supply as possible. This is helped by the design of the SPEN network which is generally well interconnected and a large number of 'open' points in the network, allow load to be easily picked up.

A refinement of the system is to look at load at various points prior to the fault to ensure that the remainder of the network is able to cope with the

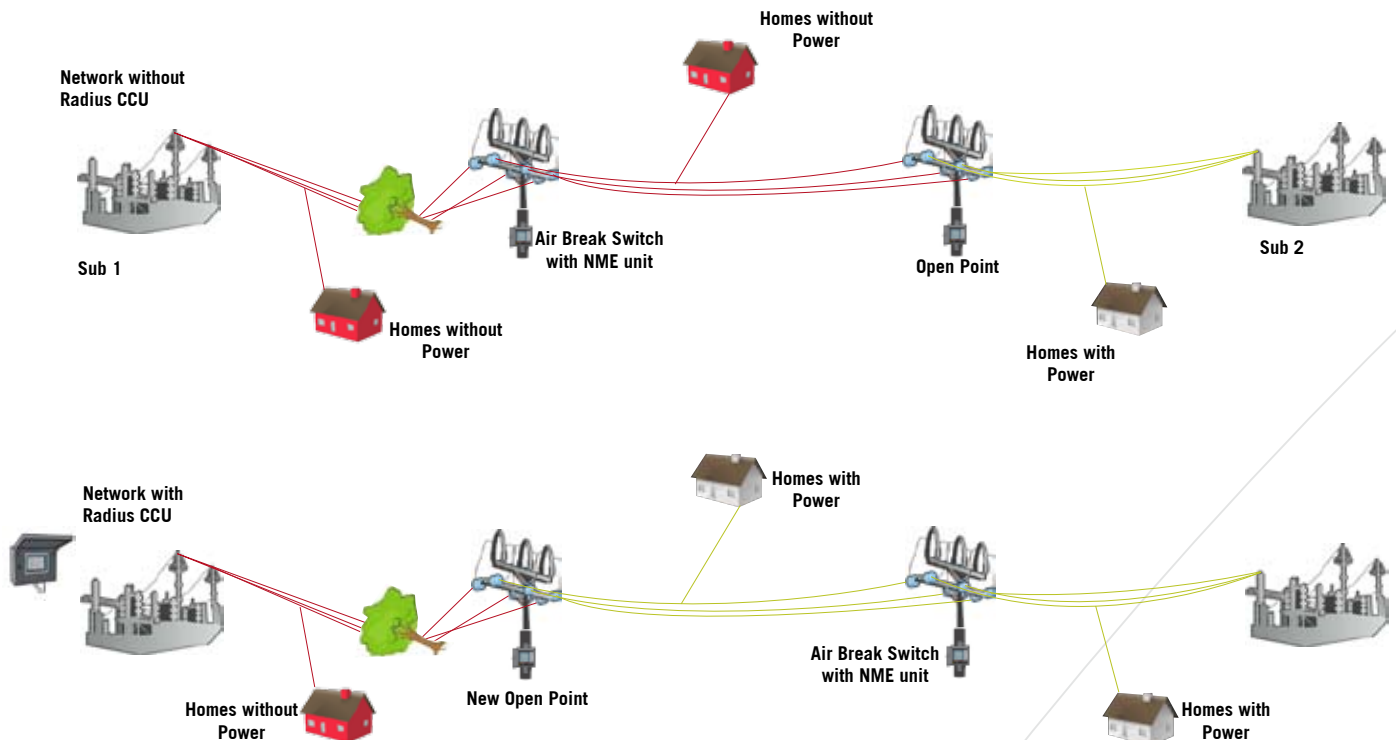
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additional burden. SPEN required that faults on the network should be minimised within 60 seconds and given that many devices are fitted with motor operated actuators, this left little time for the logic and the communications, another reason for selecting the Radius Wireless Data Radio Modems.

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Example of logic string;

- To sub 1, Did you lose Power or see a fault?
- To sub 1, Is your protection switch open and locked out?
- To sub 2, Can you supply enough power for every one?
- To close point go ahead and open!
- To sub 2, get ready here we go!
- To open point, Close!





## AUTOMATIC FAULT RESTORATION LOGIC

Radius worked with SPEN to look at the types of electrical feeder arrangements they had. From this they were able to identify approximately 8 standard types of feeder configuration for the majority of their networks. The Central Control Unit (CCU) was then loaded with these routines and each feeder was assigned one of the logic types. This approach means deployment is very quick since there is no 'bespoke' configuration of logic and the line-staff become quickly familiar with the automatic functions. Furthermore if the network is permanently altered it is very easy to re-allocated a new generic logic type to the new feeder configuration.

## LARGE SCALE DEPLOYMENT

SPEN have received equipment to allow them to remotely control and automated in excess of 4,500 switches, circuit-breakers and reclosers Radius has interfaced to a range

of switchgear both new and legacy, including the Novexia Auguste Switch, FKI GVR Recloser, Noja Recloser, MerlinGerin Ring Main Units and oil switches and breakers from Long & Crawford and Alstom.

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## LARGE GEOGRAPHIC COVERAGE

The geographic area that the project covers is very large with over 65,000km of underground network and 47,000km of overhead. The area is made up of dense urban environments and hilly and mountainous rural expanses. SPEN have utilised the Radius Wireless Data Radio Modems for all these locations, using the VHF spectrum which has given very good results for both types of their geographic network. The ability for any of the Radius devices to forward messages to other units, in any format, with up to 6 forwarding hops in any one communication, means that SPEN have been able to keep their antennas inside buildings in the urban networks to avoid 3rd party interference of the installation.



In cooperation with:

### Scottish Power

New Alderston House  
Dove Wynd  
Strathclyde Business Park  
ML4 3FF Bellshill  
Great Britain  
Website: [www.scottishpower.com](http://www.scottishpower.com)

Do you want to know more about Radius?  
Please contact us:

[www.radius.net](http://www.radius.net) 