Northern Ireland Electricity plc (NIE) is currently implementing a major IT program to support and improve its business requirements, this includes the implementation of a Trouble Management System and the creation of a new centralised Distribution Control Centre.

On 26th December 1998 Northern Ireland experienced the worst storm in a generation; as a result of its impact - both in terms of damage to the electricity network infrastructure and public perception - the implementation of several projects within this overall IT program was accelerated.

NIE are aware that customer expectations continue to rise. During fault conditions the provision of accurate, up-to-date information to customers is as important as actual fault repair. In early December 1999 NIE implemented a new Call Handling and Trouble Management System which has made significant improvements to the customer service it provides.

The 26th December 1998 storm also highlighted significant deficiencies in NIE’s call handling ability. Following a review of best practice call handling in the UK and elsewhere, NIE chose to purchase the BT MAS (Message Answering Service). This system allows location specific messages to be played to thousands of simultaneous callers and it was considered to provide the best solution to the problems associated with the ‘avalanche’ effect created after an incident causing large scale losses of supply. This system reduces the need to escalate live call handling resources.

Prior to beginning the Trouble Management project, NIE had begun a project to bring its three existing Distribution Control Centres into one new Distribution Control Centre (DCC). Critical to successful completion of this move is the replacement of the wall boards, currently manually dressed by Control Engineers, with a computer based network diagram. The decision had already been made, following an extended and rigorous procurement process, to implement the CES Centricity product with Compaq as prime contractor. It clearly made sense to also utilise the CES product for Trouble Management as they could both be supported by the same network model.

The focus on achieving the Trouble Management implementation by Winter 1999 caused the DCC project to be delayed, although much of the work carried out in the areas of network data capture and checking was required for both projects. At present the DCC project is being replanned and project resources are being identified and put in place. It is anticipated that the DCC system will be delivered in autumn 2001.

In parallel with the CES implementation, NIE are also introducing a new distribution SCADA system. When the DCC project is complete the ABB SCADA system will be fully integrated with the CES product leading to the most efficient Control Room operation. Remote telemetry units are being installed in 250 distribution substations.

The new Call Handling and Trouble Management system went live in early December 1999, after an extremely aggressive implementation timescale. Early reaction to the new systems has been very positive and it clearly represents a step-change in NIE’s ability to respond to system emergencies. The time constraints surrounding the initial implementation meant that limited ‘NIE specific’ configuration could be achieved. A review of the benefits originating from the new systems has been undertaken. This has determined that some additional development and configuration is required to leverage maximum benefit from both new systems. Phase 2 of the Trouble Management implementation went live on October 2000.
IN SEARCH OF WORLD CLASS PERFORMANCE DURING FAULT SITUATIONS

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Northern Ireland Electricity (NIE) is currently implementing a major IT program to support and improve its business requirements. On 26th December 1998 Northern Ireland experienced the worst storm in a generation; as a result of its impact - both in terms of damage to the electricity network infrastructure and public perception - the implementation of several projects within this overall IT program was accelerated.

NIE are aware that customer expectations continue to rise. During fault conditions the provision of accurate, up-to-date information to customers is as important as actual fault repair. In early December 1999 NIE implemented a new Call Handling and Trouble Management System which will make significant improvements to the customer service it provides. This is the first step on its journey to achieving World Class performance during faults.

Introduction

NIE recently carried out a review of the way it was delivering its Fault and Emergency service. A number of new processes were identified, along with requirements for supporting IT systems, which would streamline and improve the way in which NIE interacted with customers during fault situations. The results of a benchmarking analysis of Trouble Response performance also indicated the need for improvement as NIE’s benchmarking score showed higher than average costs with average service levels when compared with other utilities world-wide.

It was accepted that NIE did not achieve world-class performance when providing service to its customers during fault situations and this shortfall was underlined during major system emergencies or periods of severe weather. A review of NIE’s response to major system emergencies indicated problems in the following areas:

Identification of a Major Incident
Managing a Major Incident
Resources
Information
Call Handling

It was accepted that a fundamental change was required if NIE was to provide a high quality service, covering the whole range of faults from individual outages to major system emergencies.

Following on from the recommendations, a 24 Hour Response Business was established to provide a focus for improvements in customer satisfaction and cost efficiencies. Its objective was to provide a rapid restoration service for faults on the LV (and eventually 11kV and 33kV) networks.

The principles adopted in establishment of the new business were:

- development of a centralised, trained and highly skilled workforce, dedicated to the fault restoration process
- utilisation of the most appropriate and cost effective restoration resources.

Introduction of a 24 Hour Response Business

Northern Ireland Electricity (NIE) is the major subsidiary of Viridian Group PLC. Viridian is the largest private sector organisation in Northern Ireland and other subsidiaries include:

Sx3, the business process outsourcing company supplying IT enabled business service solutions, including call centre services

Nevada tele.com, a telecommunications and Internet joint venture with Energis

NIE was privatised in June 1993 and it is responsible for power procurement, transmission, distribution and supply of electricity within Northern Ireland. The transmission voltages in NIE are 275kV and 110kV; the distribution high voltages (HV) being 33kV, 11kV and 6.6kV and the distribution low voltages (LV) are 400V three phase and 230V single phase, 50 Hz.

NIE supplies electricity to an area of approximately 14,000 square kilometres. It supplies 684,000 customers across 40,000 kilometres of distribution network.
The diagram represents the new Emergency Response process which has been implemented within NIE.

The new process addresses the problems experienced with the previous arrangements through a combination of new roles, skills and technology.

**Call Handling**
Customer Call Handling is provided to NIE by Sx3. Call Handlers are supported by a new Call Handling system which is scripted to ensure a consistent approach and provides customer history information to the agent.

**Trouble Analysts**
24 Hour Response Trouble Analysts are the main users of the Trouble Management system and its introduction was vital to the successful establishment of the role. The technology allows information about faults on the network from Customer Calls and information input by the Control Engineers to be brought together and analysed to predict probable outages. It allows Trouble Analysts to ensure that appropriate resources are scheduled and mobilised as quickly as possible.

**Trouble Operatives**
Analysis of fault statistics identified that 70% of all faults can be handled by single individuals, with the appropriate skills and equipment. This led to the development of a new role of Trouble Operative (TO), who provide first response to emergency calls on the distribution network. A team of TOs has now been recruited and is operational across Northern Ireland.

**Engineers / Technicians**
One of the key principles of the new emergency response process is the dispatch of the most appropriate resources to faults. In the past, many faults were attended by Engineers when other, less costly resources could have been used. This has been addressed by introduction of the improved dispatch function and establishment of the TO role, leading to less Engineering input and reduced cost.

It was recognised in establishing the 24 Hour Response Business, that delivery of an effective Trouble Management system was central to successful operation. The combination of a new business focus, streamlined processes, appropriately skilled and motivated employees and leading edge technology would deliver significant financial and customer satisfaction benefits.

Therefore, the decision was made to proceed with the implementation of a ‘state of the art’ Trouble Management system, integrated with the planned Distribution Control Centre system. A detailed procurement process was undertaken and completed in October 1998 which resulted in NIE selecting Configured Energy Systems (CES) International’s Centricity Operations Resource Management system, with Compaq Computer Corporation in Belfast as prime contractor.

**Benefits**
The benefits achieved through the implementation of the 24 Hour Response business and the new Trouble Management system included:

- quicker, more accurate fault analysis leading to faster restoration and a reduction in Customer Minutes Lost (CML)
- provision of accurate, timely information to customers during faults
- ability to generate customer history information and allow Call Handlers to provide a more personal service to customers
- ability to quickly escalate call handling capacity during storm situations
- step change in ability to effectively manage storm situations including provision of information on restoration times to large volumes of customers and the media
- reduced engineering involvement leading to cost reduction
- centralisation of the Dispatch function by reducing the need for local knowledge of the network, leading to efficiency gains
- delivery of an IT infrastructure which will support cross-functional, customer focused teams (Call Handlers, Control Engineers and Trouble Analysts)

**Impact of 26th December 1998 Storm**
NIE has an HV electricity distribution network that is 86% overhead, and as such, is susceptible to damage during extreme weather. The extreme storm conditions experienced on 26th December
1998 were the worst in 70 years and the damage to the electricity network was beyond anything previously experienced in Northern Ireland. Wind speeds in some areas were classified as Hurricane Force 12, with a maximum recorded gust of 109 mph. The most violent period of the storm lasted about 6 hours and it was not until 27th December that the winds eased.

On average, NIE experiences 8 HV faults per day, however on 26th December 1998 it experienced in excess of 700 HV faults and more than 2000 LV faults. During the day 162,000 customers (24%) had their electricity supplies interrupted for some period of time, and at the height of the storm 110,000 customers (16%) were simultaneously off supply.

The restoration effort began immediately, and 99,000 customers were restored by midnight. There was further bad weather over the next few days - but in the period 26th - 31st December 81% of affected customers were restored within 24 hours. All customers were restored by New Year’s Day.

As a consequence of this storm, and the extremely negative public reaction, a series of improvement measures were implemented. These included
- increased expenditure on communications capacity and on technology to enhance NIE’s call-handling capability
- an acceleration of the multi million pound planned investment in Customer Service IT programs, including the new Trouble Management System.

**Project to Implement the Trouble Management system in NIE**

Following the 26th December 1998 Storm, enormous political, media, regulatory and customer pressure was placed on NIE to ensure that our performance in any future incident would be significantly improved.

A dedicated project team was formed and they were given the task of ensuring that the new TroubleMAN system, integrated with a new Call Handling system, was in operation prior to Winter 1999. A very aggressive project plan was developed which indicated a go-live date of early December.

During the course of the implementation it became clear that training staff in all NIE Customer Service locations to use TroubleMAN was on the critical path and that this could not be achieved by December 1999. Therefore, a phased transition plan was developed which allowed several locations to migrate from the old fault handling system to the new system, beginning in December 1999.

The most significant project activity proved to be system testing. The Factory Acceptance Test (FAT) took place at the CES offices in Minneapolis and extended for a period of 5 weeks. A team of 3 NIE staff and 3 Compaq staff were present for most of this time.

Following successful completion of FAT the software was shipped to NIE and installed in the live environment for Site Acceptance Testing (SAT). This included full integration testing with the Call Handling system, failover testing and Year 2000 testing. SAT took 10 weeks to complete and involved a major CES and Compaq resource commitment on site.

Prior to the ‘go live’ date, several ‘storm simulations’ were undertaken using upwards of 50 volunteer call agents. Using pre-prepared customer and fault report details, NIE simulated major storm activity, and achieved a call handling rate in excess of 4,000 calls per hour by live call agents. These simulations were an enormously significant part of the testing programme and a number of problems in both the Call Handling and Trouble Management systems were identified and rectified prior to the ‘go live’ date.

Northern Ireland Electricity went into production with the Centricity Operations Resource Management product on 8th December 1999.

**Data Communications Infrastructure**

To ensure that the system would operate successfully, and with adequate performance, significant changes had to be made to the existing NIE telecommunications infrastructure.

A new infrastructure was developed, that would ensure there was no single point of failure between the Call Handling Server location, the Trouble...
Management Server location and the primary Customer Service Centre locations.

**Hardware and System Configuration**

Customer calls are input into the GT-X Call Handling system (which also went live on 8th December 1999). Utilising an InterSys EAI CORBA gateway, customer calls are passed into the Trouble Management system, assessed as new events, or grouped as appropriate to existing events. This system allows NIE to integrate the GT-X Call Handling system in a two way, real time integration with the Trouble Management system. This provides call handlers with up to the minute outage information, which can then be relayed to customers.

NIE also have the capability of utilising the CES Web based Call Entry product (*Direct Call Entry*) to take customer calls - this system will be utilised as a back up to the main GT-X call handling software.

**Operating Model Issues**

The electronic model of the distribution network is built from an InterSys based integration to the Intergraph FRAMME Geographical Information System that NIE has been developing for the past decade.

The operating model, and the corresponding data issues are critical to successful operation of any Trouble Management system. Many man years of effort have been spent by NIE in ensuring that their network data information is inherently sound.

The model is incrementally updated through InterSys while the system remains fully operational. The current operating model contains almost one million electrical objects and this is being constantly increased as more network and customers are added.

**Customer Data**

The successful prediction of system outages based on customer calls is dependent on having accurate information linking customers to the distribution network.

By 8th December, NIE had 95% of its rural customers on its PCR (Premise-to-Circuit-Reference) database.

**Completion of Phase 1 Implementation**

As expected with an implementation of this size and complexity, there have been a number of process and technical issues to resolve. The implementation timescales were extremely aggressive and we have introduced a fairly basic version of the software, with a minimum of configuration. However, early reaction to the system has been very positive and it clearly represents a step-change in our ability to respond to system emergencies.

The first phase of the Trouble Management implementation was completed in April 2000. Preparations for phase 2 of the implementation began almost immediately, and included:

- Resolution of known system issues.
- Delivery of user requests to improve system operation.
- Full implementation of the Centricity Java-based, Direct Call Entry product.
- Improved management reporting, utilizing the Centricity PerformanceMart.

The storm on 26th December 1998 highlighted significant deficiencies in NIE’s call handling ability. Following a review of best practice call handling in the UK and elsewhere, NIE chose to purchase the BT MAS (Message Answering Service) product as developed by CIM Systems for another UK utility. This system allows location specific messages to be played to thousands of simultaneous callers and it was considered to provide the best solution to the problems associated with the ‘avalanche’ effect created after an incident causing large scale losses of supply. This system reduces the need to escalate live call handling resources. NIE are interested in implementing an interface between the Trouble Management system and MAS which would allow messages to be created and updated without human intervention.

**Distribution Control Centre System (DCC)**

Prior to beginning the Trouble Management project described in this paper, NIE had begun a project to bring its three existing Distribution Control Centres into one new Centre at Craigavon. Critical to successful completion of this move is the replacement of the wall boards, currently manually dressed by Control Engineers, with a computer based network diagram. The decision had already been made, following an extended and rigorous procurement process, to implement the CES *Centricity* product with Compaq as prime contractor. It made sense to also utilise the CES product for Trouble Management as they could both be supported by the same network model.

The focus on achieving the Trouble Management implementation by Winter 1999 caused the DCC
project to be moved out. The plan calls for it’s completion in autumn 2001.

In parallel with the CES implementation, NIE are also introducing a new distribution SCADA system supplied by ABB (Germany) and their subcontractors Microsol (Ireland). When the DCC project is complete the ABB SCADA system will be fully integrated with the CES product leading to the most efficient Control Room operation. Remote telemetry units are being installed in 250 distribution substations.

Lessons Learned

The last year of the 20th century proved to be a period of major change for NIE. The experience of the 26th December 1998 storm created a crisis within the business and provided the focus which allowed us to achieve great things in terms of process and technology change.

The main areas in which NIE gained experience include :-

Project Resources
The core of the project team must be full-time, and this was not easy to achieve in an organisation which has been undergoing significant change.

Data Quality
The quality of the network data, customer to network connections and customer name and address data is critical.

People and Processes
The activity during 1999 was not only technical but involved the establishment of a new business, introduction of 2 completely new roles, recruitment and training of staff and the design, documentation and implementation of new processes. It was extremely important that all these activities were planned together as one plan to ensure that all the elements of the programme came together to deliver a successful result.

Staff Communication
Attention which must be given to proper communication, particularly when the implementation is extremely rapid and the project team are focused on delivery rather than communication.

Process and Technology
The systems introduced during 1999 had minimum customisations. However, the products had been selected based upon detailed statement of requirements, therefore they largely met NIE’s requirements. It was only on delivery to NIE of the final versions of software that we were able to finally design the detail of the new dispatch processes.

System Integration
In an IT programme involving multiple suppliers the relationship between these suppliers is critical in achieving successful system integration.

Conclusions

In conclusion, NIE considers its efforts during 1999 to have been successful and we believe we have moved a considerable way towards world class performance during fault situations. Much remains to be done and we have yet to understand how to get the very best out of the new systems and processes.

However, the new Trouble Management system is a huge improvement over the old, paper based system and first impressions from customers and staff have been very favorable. The challenge now is to ensure we reap all the operational and customer service benefits achievable from the new processes and systems.

Biographies

Caroline Murphy joined NIE in 1985, and currently has the role of Technology Manager. She has a Masters Degree in Computer Science and Applications from Queen’s University, Belfast. She is responsible for managing an implementation program which includes systems for Distribution Control, SCADA, Trouble Management, Call Handling, Appointment Scheduling and Job Management.

Rodney Ballentine is the Distribution Control Center (DCC) Systems Project Manager with NIE which he joined in 1993. He has a Masters Degree in Electrical and Electronic Engineering from Queen’s University, Belfast and a MSc in Corporate Leadership. He is responsible for ensuring the successful implementation of the DCC project within NIE. Mr. Ballentine is a Chartered Engineer and Member of the Institution of Electrical Engineers.

Hugh Rooney joined Compaq Computer Corporation in 1986, and has held various senior technical IT roles since that time. He has worked on the NIE Distribution Control Centre and Trouble Management projects since 1994 throughout both the pre-sales and delivery phases of the projects. Hugh is the Compaq Senior Solution Architect with overall technical responsibility for the implementation of both projects.