Innovative Approach to an ICT Infrastructure
supporting Smart Grids and Smart Metering for Municipal Electricity Undertakings

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Communication Services within the Utility

We can define four types of Comms Services within a Utility:

- **Operational Communications Services**
- **Business & Market Comms Services**
- **Commercial & U-TELCO Services**
- **Corporate Communication Services**

The Utility as an Enterprise
The Power Utility End-to-End Value Chain

- **Generated Output at 20kV**: Power Plant
- **Transmission Network**: 132kV to 275kV up to 765kV
- **Distribution Network**: 132kV to 33kV to 11kV
  - Often referred to as ‘Primary Voltage’
- **Supply**: 110V/230V/415V

- **Step-up transformer**
- **Transmission Substation**
- **Distribution Substation**

**Industrial Customers**

**Domestic Customers**

- **01100001**
- **01110011**
- **11100011**
- **11100011**

**Distributed Generation**

**Leading the Electricity Distribution Industry**

**AMEU**

**75 Years in Africa**

**Merz and McLellan**
ICT in a Typical Distribution Network

- 132kV: ~100%
- 66kV & 33kV: ~30-60%
- 11kV: ~5%
- 400V: ~0%
- Consumers: 4m+

SCADA
Primary Network

AUTOMATION

CUSTOMERS !!
ICT in a Future Distribution Network

- SCADA Primary Network
- Automation
- Smart Meters

- 132kV
- 11kV
- 400V
- Consumers

- 283 s/s
- 583 s/s
- 90000 s/s
- 4m+

- ~100%
- ~30%
- ~56%
- ~100%
- ~50%
- ~0%

- 66kV & 33kV

- 4m+
• In the near future, utilities will rely upon:
  – Greater visibility of network operation and performance
  – Real-time information capture, processing and analysis
  – Greater automation
Op-Tel Sourcing

• OpTel Services are generally delivered in-house or through a U-Telco*

• Drivers include:
  – Prior to competing PTOs, government owned authorities would not invest in utility needs
  – Utilities are risk averse – reliability, availability, dependability can be controlled
  – ‘Only the industry knows what the industry needs’
  – PTO standard service portfolio may not offer required services or SLAs
  – CNI security concerns over transferring service delivery risk
  – Technology development and implementation more controlled

* Mott MacDonald Benchmark 2011
Challenges of Op-Tel Sourcing

• Building, Operating and Maintaining your in-house OpTel network is challenging:
  – Expensive – with limited customer base or revenue stream to spread cost
  – Network upgrades and extensions can come under the scrutiny of the regulator
  – Slower rate of communications technology change
  – “Mesh of technologies”
  – Resource pool diminishing – skills and retention issues
  – Telecoms is not the ‘core business’ of the utility
The Dilemma

- How does a utility deliver telecoms services that:
  - Meet the demanding performance requirements of Op-Tel;
  - Support the security requirements for CNI;
  - Are scalable to support growth and capacity cost effectively;
  - Support new technical innovation and services cost effectively?
The Co-Operative OpTel Network
A possible answer - The Co-operative Network

• Creating a comms network that:
  – Is owned and operated by a group of utility companies
  – Delivers dedicated services to the industry (Op-Tel. B2B etc)
  – Has the capability to generate additional revenue through leasing spare capacity

• It could be multi-discipline – Electricity, Water, and Gas

• Layered across Generation, Transmission, Distribution and Supply businesses

• Provide a platform for Smart Grid – with a customer centric approach
Case Study Overview

• Case study is from a 2008 MML client engagement in the UK
• It provides an interesting insight into what could be achieved
• It presents a unique approach to communications solutions for the utility industry
• UK scenario is illustrative of the potential across the world
  – Recognition that such a solution may be more applicable to some territories than others
Project Background

- TNO was considering its OpTel Strategy:
  - Reviewing its ageing telecoms assets and platform
  - Updating and upgrading the fibre network
  - Impact of Next Generation Networks Implementation from PTO
  - Reviewing state of readiness for Smart Grid and Smart Metering
  - Sourcing Strategy Review

Fundamental decision – the most flexible platform was fibre based
The Vision

- To create a national fibre network through a combination of TNO and DNO fibre
- UK: 1 TSO, 7 DNOs, 14 Regions = 15 OpTel Networks
- Backbone network created primarily from TNO
- Access networks created primarily through DNO networks
- Leverage the fact that primary DNO substations are located adjacent to TNO substations
- Additional fibre would be installed (either underground or OPGW) to support the closure of rings to enhance network resilience
Challenges

- Opening the discussion – generating the interest
  - Important for a ‘neutral’ party to lead discussions
  - Not everybody has to be convinced from day 1 !!

- Negotiating a fair and equitable deal – with unequal partners

- Managing competing interests

- Ensuring that the solution delivers compatibility between participants
  - Starting point will be from multiple technology platforms and solutions for multiple OpTel services
Assessing Scheme Viability

• Finding time to investigate the opportunity
  – Are there enough assets to share?
  – Imminent and future roll-out plans for new fibre?
  – Refurbishment program for existing fibre?
  – Scale of build?
  – Can the ancillary service market support the project?

Viability achieved through an initial preliminary design exercise
Our Initial Approach
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• **Cost Effective**
  - Many commercial options available for cost sharing
  - Shared cost for infrastructure (cap-ex) and service management (op-ex)
  - Increased customer base (multi-utility) reduces unit support costs through economies of scale
Operating Environment

• Operational and Maintenance Environment has to be created
  – Provides an opportunity for sharing technical resources
• Of course issues will include:
  – Acceptable Operating Standards to all parties
  – Definition of SLAs

May be easier if U-Telco is formed to serve co-operative network
• Purpose built, bespoke network
  – Performance, topology and capability perfectly reflect utility requirements
  – CNI ‘in-house’ / ‘in-community’ solution advantageous – risk mitigation
  – Common industry focus – no exposure to any conflict of interests which may produce issues within a commercial environment (i.e. responding to changes in the market)
  – A platform for the future to support Smart Grid and Smart Metering
Opportunities

• Critical mass for creation of U-Telco service delivery organisation

• May create licence acquisition opportunity to support new services – e.g. Wi-Max?

• Opportunity to offer secure and robust backbone network to other CNI operators – other utility disciplines, civil defence, comms service providers etc.
The Co-operative OpTel network:

- Innovative solution created by sharing existing and new communications assets between utilities
- In South Africa this means collaboration between Municipalities and TSO
- The solution supports current and future initiatives:
  - Providing a level of future proofing...
  - ...whilst reducing overall investment and cost exposure of an individual utility

“Achieved outcome is greater than the sum of its parts”
“Coming together is a beginning.

Keeping together is progress

Working together is success!”

Henry Ford (1863-1947)