Power Quality Portal – a Practical Web Based PQ Management System

Port Elizabeth, 28 September 2009

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www.pq-portal.com
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INTRODUCTION (1)

- Eskom: Founded by Electricity Act (1922)
- Widespread proliferation of electrical infrastructure followed during the next four to five decades
- Resulted in an interconnected network comprising Generation, Transmission and Distribution
- South African Electricity Supply Industry (ESI) relatively young
- But, distribution equipment are relatively old in terms of life-time expectancy
- Lately we experience unique operating conditions in South Africa
  - New equipment stresses (load shedding)
  - Exponential change in complexity of loads (solid state drives)
  - Power Conservation Programme (PCP)
  - New operational capabilities (frequency and voltage regulation)

*We now play a new game – who is watching?*
INTRODUCTION (2)

- Limited insight and visibility on the impact of poor quality
- Importance of PQ management not recognised by utility managers

Good quality electricity is as important as proper maintenance!
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PQ MANAGEMENT

The Game Players

✓ The Regulator
✓ Eskom
✓ Regional Utilities
✓ Metros
✓ Smaller Municipalities
✓ End Users
The Regulator

- Tasked to evaluate the performance of role-players in the ESI
- Annual submission of PQ statistics by licensees
- Has the responsibility to:
  - Benchmark the performance of licensees
  - Define and produce characteristic values in PQ parameters
  - Stimulate, educate and guide the ESI
  - Create and promote a self regulating environment
- Limited evidence exists
  - Is the regulator properly equipped?
- To generate PQ performance information of practical value to licensees is not straightforward:
The Regulator

- Convert Data to Information
- Raw/Recorded PQ data is not press-ready

Data sanity checks are required!
The Regulator

✓ Regulator require raw time-stamped Profile and Event data - not processed data (statistics)
✓ Good quality data and a harmonised measurement strategy is required to support Benchmarking
✓ Information needs to be made accessible to ESI to promote a self regulating environment
✓ The ESI is in need of leadership, feedback and assistance from the Regulator
Eskom: Player no 2

- Powerful in-house PQ Reporting tools
- Key performance indexes (KPI’s) generated
- PQ expert per area – PQ Management
- PQ information is readily available
- Self-sufficient – unique in Southern Africa
Regional Utilities

- Nampower, Tanesco, etc
- Require a high level of diagnostic information
- Exposed networks – high incidence rate of PQ events
- Only a few PQ experts required
- Manage root cause per PQ incident
- Do need readily access to PQ information
Metros

- HV backbone with large primary transformers
- Transformers well utilised (loading)
- Require a small number of permanently installed voltage quality instruments
- Require 1 or 2 PQ experts
- Lower number of PQ incidents – compact area
- Buyer and seller of electrical energy
- Ownership: external or internal PQ incidents
Smaller Municipalities

• Transformers loaded to a lesser degree
• Most do not have dedicated PQ management function/system
• Small number of internal incidents
• Traditionally exposed to more external incidents (long radial feeds)
• Outsourcing PQ Management is viable option
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PQ MANAGEMENT PHILOSOPHY

✓ Integrating tools, procedures and people
✓ Continuously disseminate PQ information
✓ Information extracted from data recorded at numerous sites distributed all over
✓ Time-value of information

Solution: A Web-based PQ Management system

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A network incident = \( \sum_{n=1}^{N} Events \)

- www.pq-portal.com = Automated incident classification
- PQ Engineer to investigate incidents – assign root cause and document into pq-portal.com
- Disseminate information = PQ Incident management
  ✓ Not PQ event management
PQ Event Reduction

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Origin? – NRS 048(incident)

Internal

External
Managing Trended PQ Parameters

- Assess 7-day sliding 95% CPF values on daily basis
- Determine NRS 048 compliance
- Pro-actively correct/prevent
- Detect deviations from the norm
- Investigate and understand control variables
- Insight into the character of the network

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Example
Features of www.pq-portal.com

1. On-Line Communication
   • Exploit time-value of information

2. Data Validation
   • Sanity Checks on recorded data

3. Derive additional information/data
   • Power Factor, Voltage as % etc
   • Calculation of daily 95% CPF values

4. Events to Incidents
   • Origin (internal/external)
   • Root Cause

5. NRS 048 report generation

6. PQ Benchmarking
CONCLUSION

- Management of PQ important - supply and demand side
- Limited experience in SA on PQ Management
- Economic benefits to be realised is significant
- Powerful tools are available
- Proper training and on-going mentorship needed
- Creative application of modern technology onto PQ

✓ PQ Management – made easy