THE VALUE OF POWER QUALITY CUSTOMER FORUMS IN A REGULATED ENVIRONMENT

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SUMMARY

Since 1996 power quality has been regulated in South Africa. The responsibility to improve power quality does not lie with only the utility, the customer or the equipment supplier. This paper explores how Forums between the utility and large power consumers have added value to all parties, and why they are necessary in a changing regulatory environment.

INTRODUCTION

Perfect sinusoidal, uninterrupted voltage and current waveforms are theoretically possible but seldom practically achievable in power networks that cover significant distances, are inter-linked, and have large loads attached.

It is generally accepted that the electricity delivery network will experience a certain amount of unplanned interruptions and voltage dips. These interruptions and dips are caused by both uncontrollable external factors (such as storms and fires), as well as factors within the utility’s control (such as certain types of equipment failure and system inadequacy).

The Utility, Municipalities, and Customers alike are keenly aware of non-ideal Power Quality (PQ, also referred to as Quality of Supply or QOS), and have to continuously deal with the problems that arise therefrom. This problem cannot be left at the door of only the utility, the customer or the equipment supplier. Most solutions involve cost, and somebody has to pay.

All parties share aspects of the problem, and hence all should be involved in seeking solutions. This is embodied in the supply agreements (contracts) between utility and customers, and the National Electricity Regulator (NER) Power Quality Directive [1]. However if there is little or no communication between the parties, frustration usually results, leading to a variety of behaviors including angry phone calls, threatening letters, or lodging a dispute with the Regulator for mediation or arbitration. Often this unpleasantness could have been avoided if there was better understanding of the problems, causes, and solutions by all parties involved.

The purpose of this paper is to demonstrate how better understanding and cooperation between utility and customers can be achieved, and examples of the increased value that can result.

BACKGROUND

Eskom. Eskom, South Africa’s national electricity utility, is among the top seven utilities in the world in terms of generation capacity (41 GW), and among the top nine in terms of sales (178 TWh). Eskom received the 2001 Power Company of the Year title at the Global Energy Awards ceremony in New York. This was in recognition of Eskom’s success in “providing the world’s lowest-cost electricity while at the same time making superior technological innovations, increasing transmission system reliability and developing economical, efficient and safe methods for combustion of low-grade coal”.

Eskom continually looks at ways to limit the severity of voltage dips and supply interruptions to customers, as well as ensuring that interruptions and voltage dips caused by controllable factors are kept within acceptable levels. This is accomplished by planning, designing, constructing, operating and maintaining the electricity delivery network to efficiently meet the needs and expectations of our customers.

Key Customers. Eskom has a classification of Key Customers who in total contribute more than 80% of its revenue. Typically they are large industrial and municipal customers who consume more than 100 GWh per annum at one site or contiguous sites. For these customers electricity is a significant portion of total input costs, and many of them have processes that are highly sensitive to quality of supply. Therefore electricity is a key factor in competitiveness and they cannot sufficiently be protected economically against poor quality. For many industries, electricity is fundamental to both international competitiveness and business survival.

Eskom provides a professional service to Key Customers to enhance their growth and prosperity by offering an internationally competitive price, excellent service, and a reliable electricity supply. To achieve this Eskom has several Key Customer Executives, usually experienced Engineers, to manage the commercial, technical and corporate relationships with its Key Customers. Through its specialist service channel of Key Customer Executives, Eskom is geared to giving its Key Customers individual attention and customised solutions in order to meet their unique requirements.
Energy Intensive Users Group. The EIUG was established a few years ago as a voluntary, non-profit association of several large (or key) electricity consumer industries in South Africa such as steel and alloys, chemicals, non-ferrous metals and mining. These members represent almost 50% of all electricity consumption in South Africa.

The main requirements of the members of the EIUG are: an internationally competitive cost of electricity; an appropriate quality and reliability of supply; and the ability to negotiate mutually beneficial contracts with their electricity supplier. They want to see an efficient and effective Electricity Supply Industry (ESI) in place in South Africa that is supplying suitable quality electricity on a reliable basis to its customers at lowest cost.

POWER QUALITY CUSTOMER FORUMS

For some industries, interruptions of supply may have serious safety implications, e.g. the mining industry where supply problems could result in miners being trapped underground and ventilation systems not delivering air to them. Many Key Customers have numerous points of connection (or supply) to utility networks at different voltages, with complex metering systems, multiple tariffs, inter-linked protection systems, remote switching and load control systems. Such customers require sophisticated management of their electricity systems.

Most Key Customers have relevant or sufficient Power Quality expertise and a desire to work together with the utility to talk about such issues with a view to understanding and enabling the resolution of many of the Power Quality problems experienced by both or several parties. This is clearly the desired relationship between customer and utility.

One effective solution to the communication gap is that of holding Power Quality Forums between Utility and Customers. These are not new in concept and have been in operation by Eskom and some Municipalities in various parts of South Africa for some time. This paper attempts to demonstrate how Eskom has applied this concept with specific reference to the coastal town of Richards Bay where the combined customer demand is about 2 000 MW.

Such forums may take on different names (e.g. Technical Liaison Meetings) and formats may vary, but the intention and benefits are more or less the same. The principle is to have Power Quality Forums as stand-alone forums and not fitted into the quarterly liaison meetings that Eskom (or another utility) hold with their key customers, as this may cloud the objectives of such a forum. The target audience may also be different.

Guidelines for implementation in the Eskom context

Relevant stakeholders are invited by the Key Customer Executive, such as:

- Key Customers in his area (including large indirect customers, i.e. behind the Municipality’s meter);
- Utility representation: Transmission, Distribution, and Eskom Enterprises where appropriate;
- Academics and Power Quality specialists; and
- Suppliers of Power Quality-related equipment.

The forum is held 3 to 4 times a year and the venue could remain the same or alternate between Eskom and Key Customers with consensus between all stakeholders. The Key Customer Executive usually chairs the meeting, but the forum may decide to rotate this role with the Key Customers involved. Accountability of organising these meetings lies with the Chairperson.

Minutes with names of attendees should be kept. These provide a good record of all past, current and standing issues with the forum members.

THE BENEFITS

Though not always immediately tangible or measurable, the following is a list of various benefits that Eskom has experienced over time around the country. Other utilities that have implemented similar forums can likely relate to these and possibly other specific benefits.

1. Highlighting Power Quality problems and, more importantly, corrective action.

2. Information sharing on availability of new dip mitigation techniques, global trends with respect to Power Quality, etc. Specialists may give presentations on super-conducting storage devices, Pebble-Bed Modular Reactors, etc.

3. Inexpensive beyond-the-meter solutions that Key Customers use to ride through dips are shared with Eskom and other customers. A large aluminium smelter repeatedly had outages of critical gas treatment plant due to relatively mild voltage dips. After joint investigation it was found that by simply bypassing the dip-proofing equipment supplying the control systems enabled the control systems and gas treatment plant to ride through future voltage dips.

4. Monitoring of Power Quality contracts. e.g. Eskom's performance against its Power Quality contracts with Key Customers as well as national standards (such as the NRS-048 guideline applicable in South Africa, soon to become an SABS code of practice) [2].

5. Advertising how Eskom is investing its money in
addressing Power Quality problems, e.g. Refurbishment, Maintenance (e.g. spray washing), Cane-Fire Management, Bird Guards, etc. Also advertising Eskom (2nd in the country’s favourite brands) as in many areas it has an excellent Power Quality performance record. This also attracts national and international investment.

6. Opportunity to address indirect Key Customers’ queries. Builds relations with all Key Customers and not just Eskom’s customers.

7. Forum has input on Pilot sites such as On-line CT Monitoring.

8. Opportunity for site visits and tours to both Eskom and Key Customers. Visits have been arranged to several Power Stations around the country (Coal, Nuclear, Gas, Hydro and Pumped Storage), Transmission Substations, National and Regional Control Centres, energy-intensive industries such as Hillside Aluminium and Richards Bay Minerals. This aids in understanding the whole network chain.

9. Advertise Power Quality courses and seminars offered within Eskom, Universities, and the Private Sector.

10. Working in unison to address common problems. Eskom contracted to manage a cane-fire programme under Durban Electricity’s power lines. A paper industry contracted Eskom to do maintenance of their substation.

11. Provides useful input to various national Power Quality Committees for further research [3].

12. Integrates the academic world & industry. Representatives from local universities are invited. Stimulates possible research or thesis projects.

13. Analysing where investments to Eskom’s network would be most beneficial with the buy-in of Key Customers.

14. Bench-marking South Africa’s Power Quality standards and performance as we are part of the global market.

15. Forums aid in understanding the relationship of cost vs. quality.

16. The establishment of Power Quality forums under the auspices of the relevant stakeholders facilitates the free exchange of risk management information. Through this process Risk Management is integrated into all facets of Eskom with the entire value chain been considered including the Key Customers.

17. A review of each significant event or loss to Eskom or a customer that has occurred in the last quarter is discussed including details of the anticipated cost of the event, business continuity plans in place and their effectiveness. Details of any risk assessments performed prior to the event occurring need to be reviewed to determine whether any changes to the process would be of benefit. Need to quantify the risk in terms of impact and probability of occurring using latest risk analysis techniques.

18. The focus need not be directly on Power Quality parameters only, but can include developments in:

   - Network changes
   - New operating guidelines (changes to the frequency control)
   - Under-frequency load shedding
   - Maintenance techniques
   - Equipment failures (modes of failure, manufacturer defects)
   - NER / NRS-048 Workgroup feedback
   - Electricity Supply Industry restructuring

CONCLUSION

Information sharing and cooperation strengthen long-term business relationships that inevitably are based on mutual trust and confidence. Irrespective how the future Electricity Supply and Distribution Industries in South Africa evolve, Power Quality Forums between Utilities and Customers assist in keeping such lines of communication open, leading to both intangible and economic benefits to all parties.

REFERENCES


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