Quadlogic's Energy Guard™ Reduces Non-Technical Losses

Doron Shafrir

Non-Technical loss of electric power, also known as Theft-of-Service, is a recognized and significant problem for electric power utilities world-wide. In some grid sectors, especially where there is low-income housing, Theft-of-Service losses can reach or even exceed 40% of the distributed power, representing a substantial revenue loss. Technical losses, due to transformer inefficiency and distribution impedance are normally well under 10%. Safety issues can also result from unauthorized power connections. Typical illegal methods include tampering with the utility meter, by-passing the meter, or simply throwing a wire over low-voltage (e.g. 120V - 230V) distribution cables and providing a ground connection to complete the circuit. There are even street vendors who provide illegal connections – Theft-of-Service service providers!

Recognizing this challenge to electric utilities, Quadlogic Controls Corporation USA (sister corporation Quad Logic Israel, Ltd.) developed the Energy Guard™ System, which effectively reduces these Non-Technical losses and provides additional benefits to utilities and customers.

In recognition of this successful product development and deployment, the Wall Street Journal recently named Quadlogic Controls Corp. the winner of their small-business Innovation Competition.

Background

Quadlogic Controls Corporation (QLC) was founded in 1982 by Doron Shafrir and three partners, hence "Quadlogic". Mr. Shafrir was born in Palestine in 1946 and, after serving in the IDF, emigrated to the US. Shafrir earned BS and MS E.E. degrees, and invented microprocessor-controlled, programmable toys (a programmable Corvette automobile model is now a collectible item) and other digital devices prior to founding QLC.

QLC was established in New York City in 1982 to develop and manufacture remotely-readable, digital electric power sub-meters for residential and commercial use, and to provide reading and billing services for those meters. Sub-meters are installed in apartments or commercial facilities after the building master (utility) meter, to measure and bill tenants for their actual use of electric power. When there is no sub-meter, the cost of electricity is included in the monthly rent or maintenance, and therefore no incentive to conserve energy since the monthly cost remains unchanged. It has been shown that when sub-metering is implemented and tenants are responsible for their actual use of electricity, the conservation effect yields a 10% - 30% reduction in kWh consumption.

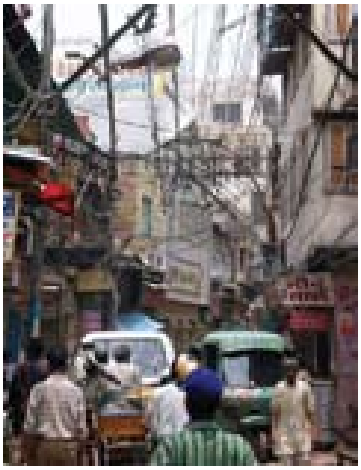
Energy conservation and sustainability – the Green Effect – are the fundamental benefits that submetering provides to the electric grid and environment. Shifting electric utility cost from the landlord to the tenant is another benefit, even when the property is owned by the occupants as in a condo or coop. In new construction, designing for submetering is less expensive compared to the cost in space and material required for traditional utility meter banks.

Since sub-meters are typically installed in places where meter-readers cannot have easy access (e.g. apartments or offices), a reliable method of remote meter reading is required. QLC invented and patented a method known as frequency-agile Power Line Communications (PLC), which utilizes the existing electrical distribution network in a building for meter data exchange. Energized power lines are electrically noisy and hostile to data, therefore a sophisticated solution was required. The QLC frequency-agile PLC protocol actively avoids frequencies in the spectrum where there is interference. This dynamically variable, intelligent system provides reliable data exchange between meters and Transponders, thus enabling remote meter-reading and billing services. It is also the most cost-effective solution since it does not require data wiring, and it does not emit radio-frequency energy.

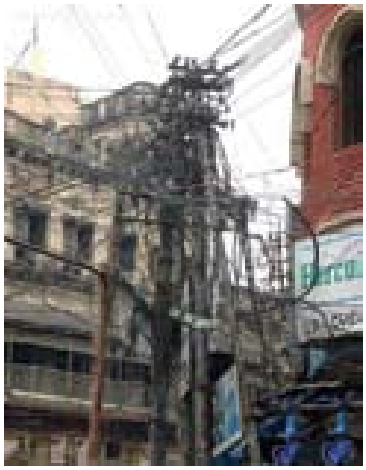
Quadlogic is the leader in providing sub-metering systems in the New York City region (e.g. The Time Warner Center, Empire State Building, Plaza Hotel), and has installed systems around the world (e.g. Torre Mayor in Mexico City, San Jose, Costa Rica, Jamaica, and the Ben Gurion Airport in Israel.)

The Energy Guard™

The Energy Guard™ represents the latest generation of Quadlogic technology, building on the QLC digital meter evolution and proven PLC protocol. The EG™ is a small distribution, metering, and control unit that is typically



וכך זה נראה



כך גונבים חשמל

mounted in a special distribution transformer housing. Therefore, no un-metered low-voltage (e.g.120V – 230V) wires are exposed. Only the medium-tension (e.g. 12kV – 30kV) distribution cables, and the individual, metered and controlled service branch wires leading to each customer are accessible. Since Theft-of-Service by connection to these service connection wires only steals power from the neighbor's metered service, and there is no opportunity to by-pass the meter, this effectively stops Theft-of-Service. Of course, connection to the medium tension cables is not only useless, it is also very hazardous indeed.

The EG™ contains meter and control modules which may be configured for 24 circuits comprising one, two, or three-phase services. Each module incorporates a digital meter, power relay, and PLC capability. Power is conducted on an internal buss and then to each meter and control module. The utility may provide clients with QLC Customer Display Units™ (CDU's) which display, when plugged into any outlet in the residence, usage (kWh), account data, and any other alpha-numeric information the utility may send. The CDU™ communicates only with each specific customer meter module since each EG™ module has a unique digital address and account number. Data between the CDU™ and EG™ module is carried on the energized service connection wire by the QLC PLC system.

אחד הפתרונות נגד גניבת חשמל

Since each EG ™ incorporates a remotely-controllable power relay, the utility can energize or de-energize any branch circuit from the central office. This offers several important benefits. New customer accounts can be remotely energized, and service may be remotely terminated, for non-payment or for emergency conditions such as fires or other disasters. Remote meter reading not only automates billing operations, it also prevents meter reading errors, personnel liabilities, and corrupt practices.

The Energy Guard™ System can support a Pre-Pay Program with no additional hardware.

When remote disconnection is required, any conflict between utility personnel and the local population is completely avoided. Customer loads on a distribution branch can be sequentially connected when power is restored after a re-closer interrupts power, rather than all at once. Each EG™ also includes a meter that monitors the total transformer load. Thus, phase balance is available for transformer preventive maintenance, and comparison between the total of the energized loads and the total transformer load provides yet another method of theft-of-service detection.

The EG™ unit includes an optical tamper detection system that detects and logs enclosure opening and closing.

Data and control communication between the EG™ and the substation is by QLC PLC, sometimes with the addition of Feeder Concentrator Units (FCU) depending on the grid topology. The last leg of EG™ System communication and control between sub-stations and the district or central office is carried by the utility network or GMRS radio link.

Utilities that have implemented EG™ Systems report greatly reduced non-technical and Theft-of-Service losses, and have quickly amortized their investments in Energy Guard™ Systems, in some cases in less than one year.

Link to WSJ article

http://online.wsj.com/article/SB10001424052970203716204577013501641346794.html#articleTabs%3Darticle.

Doron Shafrir

Mr. Shafrir was born in Palestine in 1946 and, after serving in the IDF, emigrated to the US. Shafrir earned BS and MS E.E. degrees, and invented microprocessor-controlled, programmable toys (a programmable Corvette automobile model is now a collectible item) and other digital devices prior to founding QLC.