"Cellnet's communications modules and wireless network represent a technological breakthrough in end-to-end communication services, enabling—for the first time—wireless data communication at a very low cost."

Pain vs. Promise:
AMR's Long Journey to Mainstream Acceptance

By Edmund P. Finamore, P.E., ValuTech Solutions

This bold statement declaring the arrival of commercial acceptance for Cellnet's wireless automated meter reading (AMR) network was made by Cellnet CEO John Seidl in its 1996 annual report. For many, this early claim of AMR's commercial viability still has not been realized—despite the plethora of new technologies and increasingly favorable utility environment that have developed over the years.

The Cellnet solution, first associated with the Kansas City Power and Light (KCPL) installation in 1994, established Cellnet's early network AMR front-runner status with an installed base of around 500,000 endpoints by the end of that year. With the subsequent announcement of additional network installations at Union Electric, Northern States Power and Puget Sound Energy, Cellnet laid early and rightful claim to its position as the leader in fixed network AMR communications. The groundwork for Cellnet's early success actually dated back to 1984, when the company first began to focus its efforts on memory-based electronic meter registers. Some 10 years later with the KCPL signing, AMR's fixed network era had truly begun.

Why AMR?

In hindsight, AMR was inevitable. What began as a voice communications revolution years before had raised awareness of the benefits and capabilities of wireless communications, and eventually led to a new generation of high-volume, data-focused business communications solutions that could interact with, and even control, a multitude of commercial devices. These commercial applications would eventually provide the leveraging characteristics and economies of scale needed to achieve commercial viability. Early business models included parking meters, home security services and vending machines among a growing array of other potential applications. However, developers soon began targeting the utility markets where meter reading automation could generate easy operational savings while other uses for the data were being found.

With the passing of the National Energy Policy Act of 1992, utilities began entering a new era of deregulation that would eventually lead to open access for third-party energy suppliers and further underscore the benefits of emerging new data-centric utility network meter reading applications. Cellnet, with its early work on electric meter registers, was well positioned to capitalize on this potential new market for network metering communications.

Early Development Efforts

Of course AMR's origins had actually occurred much earlier and were not limited to Cellnet's then electric-only fixed network solution. During the early 1980s, other efforts were under way to develop handheld and mobile meter reading solutions for gas and water applications as well as electric. In fact, while Datamatic claims it installed the first electric AMR device at Texas Electric Service (now TXU) in 1980, other competitors would soon enter the scene. Founded in 1977, Itron began shipping its encoder receiver transmitter (ERT) devices to a few utilities as early as 1983. By the end of 1995, Itron had shipped 5 million devices and claimed this volume represented nearly 80 percent of the installed AMR market share. Some observers believe that Atlantic Gas Light (AGL Resources) completed the first significant installation of gas ERTs as early as 1987.

The 1990s produced a host of new competitors for the growing AMR market. In 1994, Kentucky-American Water piloted Schlumberger, Sensus and Badger technologies but discontinued the installations for business reasons. Potomac Electric commenced a rollout of Metricom's Ricochet fixed network technology in an early attempt to leverage a wireless network for both AMR and Internet applications. And power line carrier technology overcame many technical difficulties with new installations at Alberta Power (Distribution Control Systems Inc./ TWACS) and Crow Wing Power (Hunt Technologies' Turtle System).

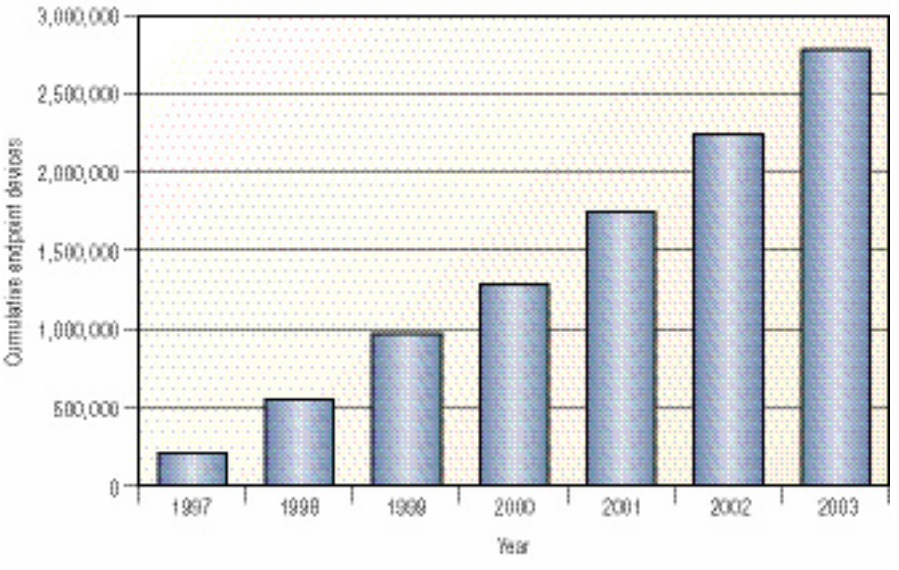
Changing Times Yield New Technologies

AMR's long journey produced some dramatic technology changes over the years. Most early applications involved handheld computer-based systems that were carried by meter readers in place of pencil-based meter books. While these systems significantly improved meter read accuracy and virtually eliminated accounting department keypunch error, few operating efficiencies were achieved since site visits were still required to obtain readings. Later, as more advanced mobile and fixed network solutions became available, the operational benefits of AMR would begin to emerge and the business case for implementing AMR would further strengthen.

Mobile systems and fixed network technology developed by Cellnet, Itron, Metricom, Whisper and others soon produced the more advanced solutions that offered these early benefits plus the potential to offset system installation costs through significant reductions in the large meter reading work forces employed by most major utilities. In August 1994, Cellnet signed its agreement with KCPL to provide network communications services to over 400,000 customers. That same year, Eckstrom Industries introduced a telephone-based dial-inbound system for AMR. A year later, Itron entered the telephone AMR market in a big way with its acquisition of Metscan.

While Cellnet, Itron and others were making their mark with wireless and telephone-based solutions, power line carrier technology began emerging from the shadows to assume a prominent role with the transmission of meter data over utility power lines. Distribution Control Systems Inc. (DCSI) made an early impact with use of its power line carrier technology for demand response purposes, which was marketed to utilities as early as 1983. The DCSI solution was then deployed for AMR to the point where more than 100 utilities have now implemented the TWACS technology. Hunt Technologies, developer of the Turtle AMR system, took a dif-

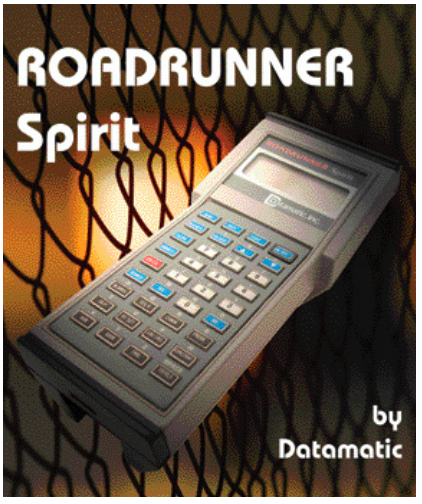
Hunt Technologies Installed AMR Devices



Source: Hunt Technologies

ferent approach that employed a narrow bandwidth technology first developed in the 1980s. Its later affiliation with the National Rural Electric Cooperative Association helped establish Hunt as a prominent provider of AMR networks to the rural electric cooperative industry, with hundreds of systems installed.

In the late 1990s, subtle changes again began taking place as suppliers improved their technologies and continued the search for more reliable yet cost-effective AMR solutions. A growing frustration with the high capital cost of proprietary



Datamatic Handheld Computer, circa 1980.

fixed-network infrastructures had slowed the migration toward advanced AMR installations, and the industry soon began developing new systems built around use of public wireless networks. Networks began utilizing third-party wireless carriers, packet and control channel technologies and paging networks for reliable delivery of utility meter data and alarms. This new emphasis on public carriers further refined utility cost-benefit calculations as pricing strategies began focusing on the tradeoffs and cost of off-peak vs. real-time data. And, communications methods continued to evolve with the use of web-based communications for broader employee access.

The new millennium ushered in an era of increasing industry complexity as utility deregulation expanded, demand response programs regained favor and off-system, third-party energy transactions became commonplace. A new generation of wireless AMR technologies involving licensed spectrum and mesh communications entered the scene to address industry demands for increased volumes of data at lower monthly operating cost. Companies such as Tantalus Systems and Elster Electricity were rewarded in the marketplace for innovative approaches with increased capitalization and acclaimed new sales successes. And, the metering industry responded with development of integrated solid-state metering solutions capable of supporting advanced applications such as time-of-use, remote line voltage monitoring, outage detection and distribution network automation in addition to traditional AMR.

Promising Future for AMR

While the AMR journey has been a bumpy ride for many early developers and adopters, the early pioneers helped shape an industry that now holds exciting new promise for the future. The utility industry's continuing resistance toward spending large sums of money on automated solutions has spawned development of improved AMR technologies designed to minimize capital and operating costs while improving communications reliability and delivering advanced new services. At the same time, a recognition on the part of utilities that traditional meter reading methods cannot support the complicated meter data management requirements of the future has produced a growing acceptance of AMR as the inevitable solution to meet their needs.

Some industry observers feel that AMR's future will ultimately be dictated by the regulatory process currently being played out in California. The classic struggle taking place between utilities and regulators concerning customer choice, cost recovery mechanisms and demand response programs could finally produce some results in 2005, if utilities successfully refine their business cases and the benefits of smart metering finally achieve mainstream regulatory acceptance.

"The current regulatory proceedings in California may have a very significant impact on advanced metering and AMR for years to come. California's well-known energy problems of recent years have focused attention on improving energy consumption patterns by shifting energy consumption away from peak usage periods," observed Ralph Abbott, president of Plexus Research and an authority on AMR technology. "If the California experiment succeeds, it will have profound implications for AMR everywhere. The sheer quantities of equipment would reshape the industry and help drive costs down. Most importantly, if there is a demonstrated and enduring benefit to consumers and the energy industry, it will create a model that could find roots in many other states as well."

Already, an estimated 25 percent of meters in the United States are automated in some manner, and AMR is no longer considered by many to be an emerging technology. As the value of utility data increases and time differentiated rate structures gain increased acceptance, it is likely that an increasing number of utilities will explore the implementation of smart metering solutions. If so, AMR should complete its long and sometimes painful journey to mainstream utility acceptance, and take its rightful place among other traditional utility applications such as SCADA, distribution automation, workforce management and GIS.

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