



ADVANCED DETECTION OF UNAUTHORIZED WATER USE THROUGH RADIO FREQUENCY AMR/AMI SYSTEMS

Whether on distribution mains, service lines, or at customer residences, leaks can cost utilities considerable time and money. But at least those leaks occur by happenstance, perhaps due to weather or aging infrastructure. In addition to real losses (i.e., leaks), there's another danger to revenue – apparent losses (i.e., theft or metering inaccuracies).

Less than a decade ago, if a customer was clever enough, it could be difficult for a utility to detect, let alone prove, theft of water services. For example, a homeowner could reverse the meter to have water flow the wrong way – much like trying to roll back a car's odometer by running the car in reverse, only the water theft *works*. If a meter reader had a regular walk-by route, the customer could anticipate read times and make sure to reverse the meter for only a few days or even a couple of weeks between those times when the reader came by. Using this method, the customer could plan days to fill a swimming pool, water the lawn, wash the cars, or other usage-intensive tasks. By the time the utility's reader manually checked the reading, the flow would again be in the right direction, and the consumption might not appear any higher than that of other meters in the neighborhood.

Reversing meter flows, and other forms of unauthorized water usage, are much more difficult to hide these days since the advent of Neptune Technology Group's E-Coder® Solid State Absolute Encoder. This smart encoder with 8-digit resolution registers flow rates down to a tenth of a gallon (as opposed to a standard 6-digit

encoder's 10-gallon resolution), with 15-minute-interval flow monitoring. But more important for theft detection are the flags that are automatically generated by the register to mark alarm conditions.

E-CODER® FLAGS FOR CUT WIRE, REVERSE FLOW, AND ZERO CONSUMPTION

E-Coder functionality is the cornerstone for all Neptune ARB® Utility Management Systems™ – ARB® Mobile™, ARB® FixedBase™ AMR, and ARB® FixedBase™ AMI. The more advanced the System, the more extensive and proactive the theft-and-tamper detection capabilities become.

Beginning with ARB Mobile, utilities have the ability to detect cut-wire situations at the register should a customer try to sever the connection to prevent recording of consumption. Instead of the usual numerical reading, the E-Coder or its sister, the ProRead™, displays a series of colons (: : : : :) when the connection is lost between the register and remote device. Without this diagnostic message, cut-wire conditions could potentially go undetected for extended periods of time.

The example of reverse flow tampering noted earlier would be caught quickly by the E-Coder's reverse flow flag. At this point, the utility could easily decide whether the reverse flow event was purposeful or not. Say that the reverse flow condition was short-lived, as is usually the case; chances are good that the small amount of water flowing in the wrong direction was due to

something like hot water heater expansion. The E-Coder would typically categorize this situation as a minor reverse flow condition if it was less than one (1) gallon of water for a 5/8" T-10 residential meter. On the other hand, if reverse flow is detected and that condition is one that has existed for an extended period of time, such as hours or days, it's much more likely to be intentional. Utility personnel can track every meter in the system showing reverse flow as well as the number of days the condition has been present – and water theft can be caught and stopped more quickly. ARB® N_SIGHT™ AMR software can also show in a graphical format the times and dates the event occurred.

Sometimes a customer attempts to disconnect the meter without cutting the wire, hoping that what the utility doesn't know won't hurt them. A Neptune utility *does* know, however, because when an E-Coder's odometer fails to increment, a flag in the register is recorded and that data is transmitted to a data collector and then to ARB N_SIGHT AMR. The host software can run a report on any customer account in the system showing consecutive days of zero consumption, identifying meters or registers that have been removed from the system.

With ARB Mobile, these conditions are reported every time the route is read. Those utilities that have migrated to ARB FixedBase AMR have an additional tool to fight theft and tampering – that same data can be delivered daily using R900® Gateway fixed network data collectors.

ARB® FIXEDBASE™ AMI PRIORITY ALARMS

Neptune's ARB FixedBase AMI System, which incorporates full two-way, R450™ radio frequency (RF) technology, provides the most advanced level of theft detection from data generated by the E-Coder. When the R450 meter interface unit (MIU) is connected to the E-Coder, the system not only gathers daily flags on cut wire, reverse flow events, and consecutive days of zero consumption, but it can also be configured to send out immediate "priority alarms." When the parameters are met for one of these possible tamper/theft conditions, the system will communicate a priority alarm across the

network, sending an e-mail or text message within minutes of the event to utility personnel who can then take appropriate action.

In addition to alarms for cut wire, reverse flow, and consecutive days of zero consumption, ARB® N_SIGHT™ AMI host software can generate a "soft disconnect" report that identifies all sites within a system that have been marked inactive. Any of the meters on this roster that subsequently register increased consumption generate a flag as well as a "soft disconnect with usage" report. Utility personnel

can address the source of the problem, whether it be a "squatter" living in a residence or a customer trying to disguise water usage.

Regarding tamper events or water theft, utilities today no longer have to wonder where the water – and the revenue – went. Instead, they can take a more proactive approach to addressing these situations. With Neptune's tools from E-Coder flags to priority alarms and detailed reports, it has never been easier for utilities to identify and manage unauthorized water consumption. 