



Memo

To: Mr. David Price - SCDHEC
From: Scotty Beasley
CC: DCWSA Board of Directors, Julie Fowler, Jerry Stutts
Date: June 23, 2010
Re: Business Case – FlexNet Project

Darlington County Water & Sewer Authority is respectfully submitting information in support of a green infrastructure project. The Board believes this project clearly meets the goals of the ARRA Green Infrastructure, Energy and Water Efficiency Guidelines.

Completion of the AMR (Automatic Meter Reading) installation effort meets projects outlined to address green infrastructure, water and energy efficiency, innovative water quality improvements, and water conservation. The installation will allow improved billing accuracy relative to water usage and help DCWSA keep water rates the lowest in the region. Subsequent implementation will reduce water loss from the distribution system, increase efficiency of the water production versus the billing capture process and generally improve overall water operations.

With approval of this project, the majority of these efforts will be completed with in-house personnel. The reduction in water loss would yield electric and chemical savings. Commensurate reductions in carbon emissions from power generation, chemical production, and chemical deliver are also expected. This savings would be a direct result of reducing the volume of water treated at the water treatment plants to the distribution system. 16% of water meters in service can be retrofitted/adding the AMR capabilities to include leak detection. The remain number of meters will be replaced to due damage, broken, malfunctioning, out-of-accuracy specifications, and not having leak detection capability. The total average meters in service is 17,000.

Standard procedure for reading meters will be twice a day. First read will be conducted at 8:30am, and the second read will be conducted at 3:00pm. If leaks are detected, customers will be notified at that time.

Included in this business case is the projected savings associated with the installation of the FlexNet system.

Additional benefits of FlexNet, but not limited to:

- Reduce our carbon footprint
 1. Reduction in miles driven
 2. Reduction in gallons of gasoline consumed
 3. Reduction in oil changes
 4. Reduction in number of company trucks needed
 5. CO₂ conserved
- Worker's compensation insurance will be reduced. Currently, DCWSA field personnel are at the highest indexed because of their exposure to accidents, injuries, and animal attacks.
- Leak detection; we will be able to monitor the usage and inform customers of potential leaks. We will see usage during periods when there shouldn't be. We can call the customer, who is able to take corrective steps to not only conserve water, but to save themselves money.
- Unaccounted for water will be virtually eliminated. DCWSA draws the water supply from Middendorf aquifer; leaks leave DCWSA holding the bill for lost water. With the new technology leaks will generally be detected within hours – and addressed.
- Unauthorized use of water will also be detected within hours, allowing DCWSA to collect from customers who may have previously slid by without being detected.
- The reliability of FlexNet will also give us a solid 30-day billing cycle. When we read meters manually, holidays and weather sometime prevented us from doing so, and the billing period could have a 27-35 day billing swing. For our customers on a fixed income, this presents a problem. Those days will be over. Customer service reps will also reap the human benefits of FlexNet. We will be able to alert our customers in timely notification of leaks. Our office personnel currently just collect their money – now we'll be in a position to help them.
- We will be able to join three other entities in the name of conservation; Chesterfield Rural Water, City of Chesterfield, and City of Cheraw. We will be able to leverage the sharing of antennas and TGBs. This project will become regional as other local entities, such as, City of Hartsville and the City of Darlington are looking to use this same leverage if we are able to complete this project.
- The ability to integrate and import data in a way that will allow us to monitor and manage water resources that elevates the latest automatic metering platforms. We have a lot of old infrastructure in the system. With this new technology we will be able to pinpoint where a leak is and fix it prior to the street caving in. That's good not only for traffic, but for their overall cost, because we can repair it before it gets too bad.

June 2010

FlexNet System

Capital Project - Price Quotation

	Quantity	Net Price	UM	Total
5/8" x 3/4" SRII SLP MTR TRPL	17000	\$97.37	EA	\$1,655,290.00
520 x 1 Port Touch Coup Leak Det	17000	\$154.89	EA	\$2,633,130.00
FlexNet Tower Gateway Base Station	9	\$84,000.00	EA	\$756,000.00
FlexNet Regional Network Interface	1	\$33,512.06	EA	\$33,512.06
Meter Installation & TGB Preparation	1	\$450,000.00	EA	\$450,000.00
	Net Total:	\$5,527,932.06		
	Tax:	\$442,234.56		
	Total:	\$5,970,166.62		

Annual Savings Summary:

	Annual	Monthly	
Tru-Check:	\$208,000.00	\$17,333.33	
Unaccounted Water Loss + Leak Adjustments	\$96,143.72	\$8,011.98	
Administrative:	\$15,000.00	\$1,250.00	
Repairs & Maintenance:	\$74,113.50	\$6,176.13	
Service Technicians:	\$32,800.95	\$2,733.41	
Vehicle Cost:	\$16,679.00	\$1,389.92	
Reading Reductions:	\$10,640.00	\$886.67	
Total Savings:	\$453,377.17	\$37,781.43	

18% to 6%

12% Reduction in Water Loss	
Water Loss (gallons):	202,000,000
Well Energy (1000g):	\$35,508.77
WTP Energy (1000g):	\$22,759.95
Chemical (1000g):	\$10,100.00
WTP Labor (1000g):	\$27,775.00
Total Annual Savings:	\$96,143.72

202,000 x 0.175786
 202,000 x 0.0112673
 202,000 x 0.05
 202,000 x 0.1375

FlexNet

System Specifications

SYSTEM OVERVIEW

The Sensus FlexNet System is a wide area Advanced Metering Infrastructure (AMI) system that provides the ability to read water, gas and electric meters with a common AMI platform. The FlexNet system is designed around the central concepts of Simplicity, Flexibility, and Reliability. The system supports one-way radio frequency (RF) transmission for water and gas meters, and offers two-way RF functionality for electric meters, including on-demand readings, remote disconnects/reconnects, and load shedding.

The system transmits using a patented (7-level FSK) RF modulation developed specifically for AMR/AMI applications. The system transmits on a primary use (unshared) licensed band in the 890-960 MHz spectrum. Due to licensed band operation, the FlexNet system can transmit at the highest power levels available with any AMR/AMI system (up to 2 Watts) and with a variety of transmission modes ("normal" mode, "buddy" mode, and "boost" mode). Use of licensed band also ensures that performance will not degrade over time due to interference from other systems and devices. The low noise floor of the licensed band and higher transmission power of the endpoints combine to provide the Flexnet system the highest range of any system on the market. The high power, various transmission modes, primary-use licensed band operation, and long range allow for the smallest infrastructure footprint in the industry. In addition, the water and gas meter endpoints provide four (4) transmissions per day with a twenty (20) year battery warranty. Hourly readings can be included in the four (4) daily transmissions. The SmartPoint transmitter can store hourly readings, and each transmission contains between 8-168 prior readings. This allows the system database to backfill any readings from transmissions that may be missed.

The Sensus FlexNet system is a "single-tier" system, meaning that readings are transmitted directly from the meter endpoint to one or more Tower Gateway Base Stations (TGBs) which are usually miles apart from each other. No complex series of collectors are required to "store and forward" reading data due to the excellent network performance capabilities. Upon reaching the TGBs, the readings are sent immediately to the back-end software (RNI and MDM) via any available Ethernet connection (wired, wireless, Wi-Fi, fiber, frame relay, analog modem). Typical range from the endpoints to the TGB varies due to many factors (building density, topography and foliage), but reliable communications can be established between SmartPoint via one of the variety of transmit modes (established at installation time). The FlexNet system supports long range reliable transmission which can be achieved with minimal infrastructure. This in turn results in low overall maintenance costs. The utilization of primary-use licensed spectrum ensures that the system performance (value) will be protected for the long term from interference, which can severely degrade performance in license free ISM band or secondary use spectrum fixed base systems.

The back-end FlexNet software allows very easy interface to most Customer Information and Billing software packages. The Meter Data Manager (MDM) is accessed via an internet browser, which means that the FlexNet system does not

require any special client software to be installed on user PCs. The Meter Data Manager (MDM) software can easily be configured to work with various billing system file formats without any reprogramming, offering compatibility with virtually every utility billing software package on the market. The web architecture allows multiple users to access the system locally or remotely, and provides the ability for Sensus to provide remote support if desired by the utility.

AMI SMARTPOINT™

The water and gas SmartPoint transmitters are capable of collecting readings from the meter on an hourly basis. The SmartPoint transmits the reading data to the Tower Gateway Base Station (TGB) four (4) times per day. Each transmission shall contain the past 8-168 readings in order to provide redundancy. If a transmission is missed, the system is capable of recovering the missed reading information from the SmartPoint on the next transmission. After being transmitted from the meter endpoint, transmissions immediately received at the back-end software for review. No "storing and forwarding" of readings on collectors shall be acceptable. Low power endpoints originally designed for walk-by/driveby applications shall not be acceptable due to low power and range capabilities, and undesirable quantity of required "collectors".

Electric SmartPoint transmitter operation shall allow true two-way RF operation, providing "on demand" reading and remote connect and disconnect capability.

The water SmartPoint transmitter is enclosed in a two-piece molded plastic housing capable of being installed through the meter or vault lid. The plastic housing incorporates a tamper resistant, waterproof connection technology. The electronics of the transmitter are hermetically sealed in a High Density Polyethylene (HDPE) enclosure that is waterproof and provides an operating temperature range of -30°F to 165° F. (-34°C to 74°C) The pit set SmartPoint transmitter may be completely submerged in water for the life of the product without any internal damage or malfunction. The two-piece enclosure must contain the unit components including, HDPE enclosure, battery, and wire connections. The unit is available with TouchCoupler technology (or equivalent) that eliminates the need for wire connectors.

The water SmartPoint is a one-way device that transmits at a power level of up to two (2) Watts in primary-use licensed band in the 900 MHz spectrum. The transmitter can transmit at least eight (8) reading digits from the encoded register in a resolution of at least 0.1 gallon or 0.01 cubic feet for meters up to 1 inch. Water SmartPoint transmitter also has the ability to provide leak detection capability. The water SmartPoint transmitter also provides the ability for field replaceable batteries.

The meter endpoints are FCC Part 90, 101, and 24 approved for licensed band operation, and communicate with the TGB using an RF modulation designed specifically for AMR/AMI applications. Furthermore, the modulation uses CRC-32 error detection and Viterbi forward error correction scheme capable of recovering up to one bit error out of every three bits. The receiver has a sensitivity of -109 dBm or better for mPass

mode operation in order to provide adequate range for minimal infrastructure.

TOWER GATEWAY BASE STATION (TGB)

The Tower Gateway Base Station (TGB) receives and processes the readings from the meter transmitters, and convey the data immediately to the Regional Network Interface (RNI) for storage in the database where it can be viewed by utility personnel. The TGBs provide for redundant, overlapping coverage of meter endpoints. No "collectors" using "store and forward" technology as the primary method of operation shall be acceptable. Each Tower Gateway Base Station or pole top collection device provides a live, two-way Ethernet connection with the back-end computer system (RNI). The TGB is supplied with an eight (8) hour battery back-up in the event of primary power loss. In the event of a power loss greater than eight (8) hours, the FlexNet system can recover missed readings by backfilling prior readings sent with each transmission from the SmartPoint .

The TGB has the ability to maintain at least one primary and one secondary data link to the back-end system (RNI). Both primary and secondary data links provide for two-way Ethernet (TCP/IP) communications. Both the primary and secondary data links can be any form of Ethernet chosen by the utility (wired, wireless, Wi-Fi, fiber, frame relay, leased line, POTS, etc.). The system is capable of operating at a data rate of 33.6 BAUD or greater between the TGB and RNI. The TGB has the ability to store up to 30 days of meter reading data from all meter endpoints in its service area in the event of extended failure of the data links to the utility office. If communication links cannot be re-established within 30 days, the system allows a laptop computer to be connected to the TGB to recover reading data.

The system is "single-tier", meaning that the SmartPoint endpoint transmits directly to a Tower Gateway Base Station (TGB) with a live, two-way Ethernet link to the back-end system in the utility office. Repeaters or "Buddy Boxes" may be used, and provide for instant forwarding of the reading data to a Tower Gateway Base Station (TGB).

REGIONAL NETWORK INTERFACE (RNI)

The RNI is the network backbone of the system. It receives and stores the reading data from the TGBs, and presents it to the user via the Meter Data Manager (MDM) software. The RNI also monitors system health of the TGB(s). The two servers consist of the Network Controller (NC) and the Utility Information Platform (UIP). The Network Controller (NC) maintains communications with the TGB(s) and routes the data to the Utility Information Platform (UIP). If the Network Controller loses communications with the TGB(s), the TGB(s) will automatically store up to thirty (30) days of metering data. The TGB automatically downloads the stored meter reading data to the Network Controller (NC) once communications are re-established.

The Utility Information Platform (UIP) collects the raw meter data from the Network Controller (NC). The UIP uncompresses the meter data and stores the most current data. The UIP also uses the redundant information contained in each transmission to fill in any missed meter readings from

prior transmissions. The FlexNet system can store up to 13 months of meter reading data in conjunction with the Meter Data Manager (MDM) software.

The operating platform used in the Regional Network Interface (RNI) consists of multiple servers, a Network Controller (NC) and a Utility Information Platform (UIP). The Network Controller (NC) uses the Red Hat (Linux) operating system, and the Utility Information Platform (UIP) uses the Windows 2003 Server operating system. Both servers use a RAID 1 hard drive array for redundancy. The UIP maintains at least sixty (60) days of data on the dual redundant hard drives. The Regional Network interface (RNI) servers, in conjunction with the Meter Data Manager (MDM) software, maintain a 13 month deep history of meter reading data. This data is available for review at any time via the Meter Data Manager (MDM).

METER DATA MANAGER (MDM)

The Meter Data Manager (MDM) acts as a middleware between Customer Information Systems (CIS) and the Sensus FlexNet Regional Network Interface (RNI).

The MDM has the ability to accept data from the CIS system and export data back to the CIS system using various outputs in a simple flat text. These formats are user configurable and managed within the MDM software without custom programming in either the MDM or the CIS system.

The MDM provides management reports for the data collected by the FlexNet system. The MDM system and management reports have the ability to identify all of the following (among others): all meters read, all unread meters, High/Low meter usage, possible leak conditions, hourly, weekly, monthly, bi-annual and yearly consumption with selectable date ranges. The MDM provides graphing.

PERFORMANCE WARRANTIES

In evaluating bid proposals, warranty coverage will be considered. The vendor shall be required to state its warranty and/or guarantee policy with respect to each item of proposed equipment. The procedure for submitting warranty claims must also be approved.

As a minimum, the transmitter electronics shall be warranted for twenty (20) years from the date of shipment for defects in materials and workmanship. Battery warranty shall be twenty (20) years from date of factory shipment. For additional information on warranties refer to Sensus publication G-500.

SYSTEM MAINTENANCE AND SUPPORT

In addition to warranty periods, vendors are required to supply information on required or optional maintenance programs beyond the warranty period for both hardware and software. Features of those programs shall also be included with any additional charges such as hourly rate for on-site and/or remote support. The locations of and procedures for obtaining such support shall be stated.



Fixed Network AMI: Water and Gas

What is Sensus FlexNet Fixed Network?

FlexNet Fixed Network is a wide area Advanced Metering Infrastructure (AMI) system that provides the ability to read water, gas, and electric meters with a common AMI platform. The FlexNet system is designed around the central concepts of Simplicity, Flexibility, and Reliability. The Flex-Net Network supports one-way radio frequency (RF) endpoints for water/gas and a two-way RF system for electric.

What type of radio technology is used in the fixedbase network?

FlexNet Endpoints and Tower Gateway Base Stations (TGB) utilize a single, "Primary Use" (unshared) licensed band in 890-960 MHz spectrum.

What is a "Primary Use" or "unshared" liçensed band?

A "Primary Use" license allows Sensus FlexNet to remove potential interferers from Sensus' channels who are not in compliance with FCC regulations.

Will the network be less vulnerable to interference because it operates in a "primary use: licensed band?

Yes. The FlexNet system uses exclusively licensed radio frequencies that are strongly protected by the Federal Communications Commission (FCC). The FCC is bound by law to take action against frequency interferers in the "Primary Licensed" FlexNet spectrum. Sensus stands ready to protect our valuable dedicated spectrum through a variety of legal methods.

Do other fixed base system providers utilize a licensed frequency?

Yes, they do. However, those licensed systems utilize frequencies that are not "Primary Use" frequencies. These systems operate in a licensed voice band but AMR/AMI systems using these frequencies must operate as "secondary users" under the FCC telemetry provisions. These second tier or "secondary users" can be interfered with or slowed down by a voice or "Primary user". If the interference is severe enough to effect the performance of the system a new frequency must be acquired and the endpoints and receivers modified to operate under this new frequency.

What is a propagation study and how does it help in the deployment planning?

Reliable transmission range is crucial to the operation of a properly designed network. Sensus utilizes sophisticated propagation modeling incorporating the specific variables for the utility's coverage area to determine the optimum infrastructure placement.

Propagation modeling incorporates such factors as geographic and topographic parameters of the endpoint locations and proposed sites of TGB's. Once the modeling is complete, a proposal will be discussed with the utility outlining implementation and infrastructure requirements.

What reception range can I expect from an endpoint?

Range is affected by several variables including:

- ù Height of the collecting receiver's antennae –The Sensus FlexNet satisfies the first variable by placing a TGB(s) on utility towers (when available) or on tall, existing radio towers.
- ù Radio spectrum used to broadcast the data transmissions –The "Primary Use" licensed band used by the FlexNet system provides the utility with an interference protected spectrum.
- ù High powered endpoints. – Another advantage of the licensed frequency band is that total RF output power of 2 Watts is higher than that for systems using a license free band, typically between 100 milliwatt and 1 Watt.
- ù Sensitive receivers at the data collection points –The FlexNet system uses the latest in DSP (digital signal processing) technology in the TGB's to make its receiver extremely sensitive; up to -121dBm.

Can the endpoints read any other meter besides Sensus?

Water transmitters interface to Sensus ICE registers and legacy ECR registers with encoder outputs and Neptune ARB VI registers. Gas residential transmitters are compatible with Sensus, American, and Actaris models. Commercial and Industrial gas meters can install a remote mount transmitter provided an "A" pulse output is available at the meter.

What is the expected battery life for transmitters?

All Sensus water and gas transmitters come with a twenty year nationally published warranty. For terms and conditions refer to Sensus G-500 and FlexNet Gas Transmitter Limited Warranty.

Is the battery pack field replaceable?

Water transmitters have the option of a field replaceable external battery.

How often does the FlexNet endpoint read the meter and send the meter and reading data?

The FlexNet water and gas transmitters have the ability to read each hour and transmit four (4) times per day; or read every six (6) hours and transmits four (4) times per day.

For inside meter sets, is it necessary to have the endpoint installed on the outside of the house?

For optimal system performance Sensus recommends installing the endpoint on the outside of the structure.

What is the Tower Gateway Base Station (TGB)?

The Tower Gateway Base Station (TGB) receives and processes the readings from the meter endpoints in the field and sends the data to the Regional Network Interface (RNI) for database storage where it can be viewed by the utility personnel through the Sensus Meter Data Manager (MDM).

Which locations are suitable for a Tower Gateway Base Station (TGB)?

A high point such as a water tower, communications tower or building rooftop, preferably without any large obstacles (e.g. larger building) adjacent to it. All proposed TGB sites must have access to electrical power and a TCP/IP communication link to send messages to the RNI.

What is the difference between an Indoor TGB and an Outdoor TGB?

The indoor TGB is to be placed in an existing environment that is temperature controlled. In the case where an existing temperature controlled environment is not available, an outdoor enclosure is used to house the TGB. The outdoor TGB is a weather tight, temperature controlled unit. Both TGB's offer the same performance.

What type of power is required at the TGB site?

The Indoor TGB requires 120 VAC. The Outdoor TGB requires 220 VAC.

What types of communication options are available for sending information from the TGB back to the Regional Network Interface (RNI)?

A network connection supporting TCP/IP (internet protocol) packet data communication is required at the site. Examples for suitable communications service types are Frame Relay, cable internet, DSL internet, AFAR Wireless Bridge, or dedicated line (point-to-point).

Once the data leaves the TGB, where is the information sent?

The TGB receives and decodes messages and then immediately transfers each message using a proprietary packet data protocol to the metering database housed in the Regional Network Interface (RNI). Data from the endpoint reaches the RNI immediately without any data processing or reduction in message content along its path. Once at the RNI, the data becomes available for view in Sensus Meter Data Manager (MDM) software.

If I install an antenna at the TGB receiver site, will it interfere with other antennas located at that site? (i.e. cell)

The TGB antenna is unlikely to cause any interference, assuming vertical separation is maintained. Interference caused by other antennas at the site would be evaluated during a pre-installation site survey.

How should the antenna be installed to get the maximum performance?

Generally, maximum performance is achieved by installing the antenna at the highest point available. It is recommended to maintain vertical separation of 10' or more between antennas at the same site.

Since the FlexNet system requires a minimal number of collectors compared to other fixed base AMI systems, what happens to reading data if the TGB becomes inoperable due to some kind of malfunction?

Each TGB is equipped with a battery that provides eight (8) hours of auxiliary power should the site experience loss of power. In addition, should communications be lost between the TGB and the RNI, the TGB has the ability to store up to thirty (30) days worth of data. One of the most beneficial features of the transmitters is its ability to transmit historical data. Should the TGB become completely inoperable, the transmitters have the ability to transmit historical reading data of 8 to 168 readings depending on the amount of consumption on the meter.

What is the Regional Network Interface (RNI)?

The RNI for Water and Gas consists of 2 Dell Servers. The first server is called the Network Controller (NC). The NC server maintains communications with the TGB(s) and routes the data to the Utility Information Platform (UIP). The second server is the UIP. The UIP is a database server that collects the raw meter data from the NC.

What is the Sensus Meter Data Manager (MDM)?

The MDM is a browser-based application that shows meter reading data in a user friendly interface and allows the utility to view the information from any PC connected to the network.

The MDM acts as a middleware between the customers billing system and the Sensus FlexNet RNI. The MDM has the ability to import data from the customer billing system and export meter reading data back to the customer billing system. The import and export formats for MDM are configurable and managed by the user.

The MDM provides reports for management of the meters within the FlexNet system as well as graphical and table views of meter reading information.

How much information will the MDM hold for viewing?

The MDM will maintain a thirteen (13) month history of meter reading data. The history is viewable in MDM at any time.

How does the information get into my billing system?

The RNI creates metering data files on an hourly basis and stores those files on the server. The interface into the hourly files is achieved through the Meter Data Manager (MDM). The MDM extracts the data files from the servers and operates as the interface to the billing system. The MDM communicates to the billing system through a configurable ASCII flat text file.

Are there any outside third parties required to operate the system?

The only dependence on third parties is the data communications service connecting the TGB to the RNI. Once the utility selects the communication mode between the TGB and the RNI, the communications service provider will be responsible for installing the communications link and insuring its operation.

Do I need a special programmer for end points?

Yes. Sensus has programming tools available to program and initiate installations.

Can I verify during installation that data transmission was successful?

Yes. FlexNet Programmers are used to initiate data transmission to the network. Since the messages are immediately sent from the TGB to the RNI, the installer has the ability to confirm data transmission was received through the MDM software.

Who is responsible for installing the FlexNet infrastructure such as the TGB, Antennae, and the RNI?

A third party contractor is hired by Sensus to perform installation of the antenna. Sensus personnel will install and configure the TGB and the RNI.

Sensus FlexNet is described as single-tier. Does this mean I will never need a repeater?

The Sensus FlexNet networks are designed to be single-tier but there are cases where Sensus may need to deploy a FlexNet Network Portal (FNP) to fill in an RF hole or out of reach endpoints.

What is a FlexNet Network Portal (FNP)?

The FNP forwards messages seamlessly to the TGB. The FNP supports mPass(Buddy) messages from the FlexNet endpoints. FNP's can be installed on utility poles or any standing structure with a 120 VAC power source.

What different transmit modes are available for the endpoints?

There are 4 available transmit modes for FlexNet endpoints. Normal, Boost, mPass (Buddy), or Tri-Mode. They are all unique in how the endpoint transmits its message to the tower.

- ù Normal mode: The normal transmit mode sends messages directly to the TGB.
- ù Boost mode: The boost transmit mode slows the baud rate of the message and thus increases the db level of the transmission which increase the chances of the message being received at the TGB. This application is used in situations where endpoints may be on the fringe area of reception. Boost mode transmit directly to the TGB
- ù mPass (Buddy) mode: The mPass mode allows the message to route itself through a near by FNP or a FlexNet equipped electricity meter. mPass mode is used in areas of fringe coverage or locations where the transmissions are out of range of the TGB and work through an FNP or FlexNet equipped electricity meter within range.
- ù Tri-Mode: The Tri-Mode transmit mode transmits using all 3 of the above modes: Normal, Boost, and mPass. This allows the FlexNet endpoint different paths to get the TGB and eliminates the need to reprogram the endpoint in separate modes.

How do I know what mode to program the endpoints?

The endpoint will be programmed into the correct mode during initiation of the transmitter. During the initiation of the transmitter, if the TGB detects a strong Signal to Noise Ratio (SNR) it will place the transmitter into Normal mode. If the TGB detects a weak SNR or doesn't hear the transmitter at all, it will be put into Tri- Mode. This allows the transmitter multiple options for transmitting and thus improving the probability of the message reaching the TGB without additional infrastructure or troubleshooting.



FlexNet™ Technology Overview



FlexNet™ SIMPLICITY... AND THE POWER TO

FlexNet, by Sensus, offers a superior AMI platform solution for all utilities who demand unmatched customer service and intelligent use of their resources.

FlexNet empowers electricity, gas and water utilities with a proven path to increase meter reading efficiency, reduce overhead costs and enhance customer service. FlexNet operates simply, reliably and with unlimited flexibility. Our technology serves as the communications platform for today's Smart Utility, providing superior solutions that meet current needs, without limiting future opportunities.

75 to 300 Sq. Miles
per Tower Range



SmartPoint Meters
(Electricity - Gas - Water)



TGB
Tower
Gateway
Basestation

SIMPLE COMMUNICATIONS

FlexNet's direct meter-to-receiver architecture provides a single tier, flat communication structure. This eliminates store-and-forward schemes complicated by routing databases, hopping algorithms and loss-prone data passing.

FlexNet's tower-based architecture is quickly deployed. This allows a turn-key build-out when used in tandem with Sensus-provided master tower agreements with a nationwide network of existing towers, which eliminates easement and access issues.

RELIABLE DATA DELIVERY

No frequency sharing, no interference, no problems - Period! Operating from a dedicated frequency license awarded by the FCC, FlexNet gives utilities a clear the path for data transmission. This exclusive feature provides clients with the highest RF power in the industry. Two watts of power at your fingertips, increasing range and reliability on endpoint-to-tower communications. While others fight interference in shared bands, our clients transmit with a clarity and security that's protected by Federal law.

FLEXIBLE AND SECURE OPERATIONS

Whether your utility is rural or urban, or electric, gas or water, FlexNet delivers superior communications on a secure network with staged-deployment to the meters you need to read, and much, much more.

FlexNet is flexible to meet your current and changing needs. Distribution Automation, Load Control, Demand Response, Leak Detection and Home Automation Networks are just some of the exciting options available today. Leverage the power of two (2) full watts of transmission power - not milli-watts - on a secure network that reaches more meters with less communication infrastructure.

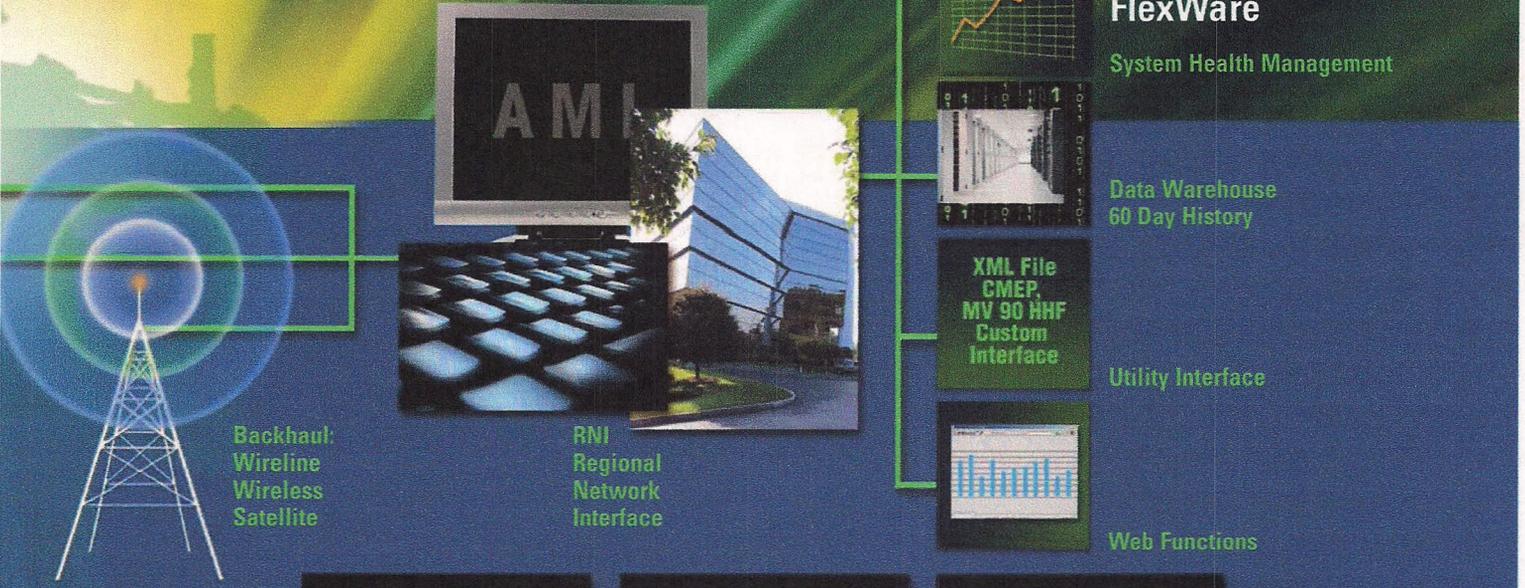
THE SENSUS FLEXNET ADVANTAGE

"Direct and Dependable" - That's what FlexNet customers say about the benefits of using an FCC Licensed and protected frequency in combination with industry open standards and simple, AES-256 encryption, CRC 32 error-checking and redundant messaging:

- 1 FlexNet enables SmartPoints to communicate consumption, monitoring and control data directly to a Tower Gateway Basestation (TGB).
- 2 TGBs installed on existing towers (50-600 feet tall) receive the data and transmit through hardwired network to the Regional Network Interface (RNI).
- 3 Data reaching the RNI has been secured from SmartPoints to head-end. Sensus FlexWare now prepares the data for management information and transfer to the utility's data management systems (MDM, CIS) via hardwired network.

RELIABILITY... FLEXIBILITY...

DELIVER ALL THREE



FlexNet Features for Water Utilities:

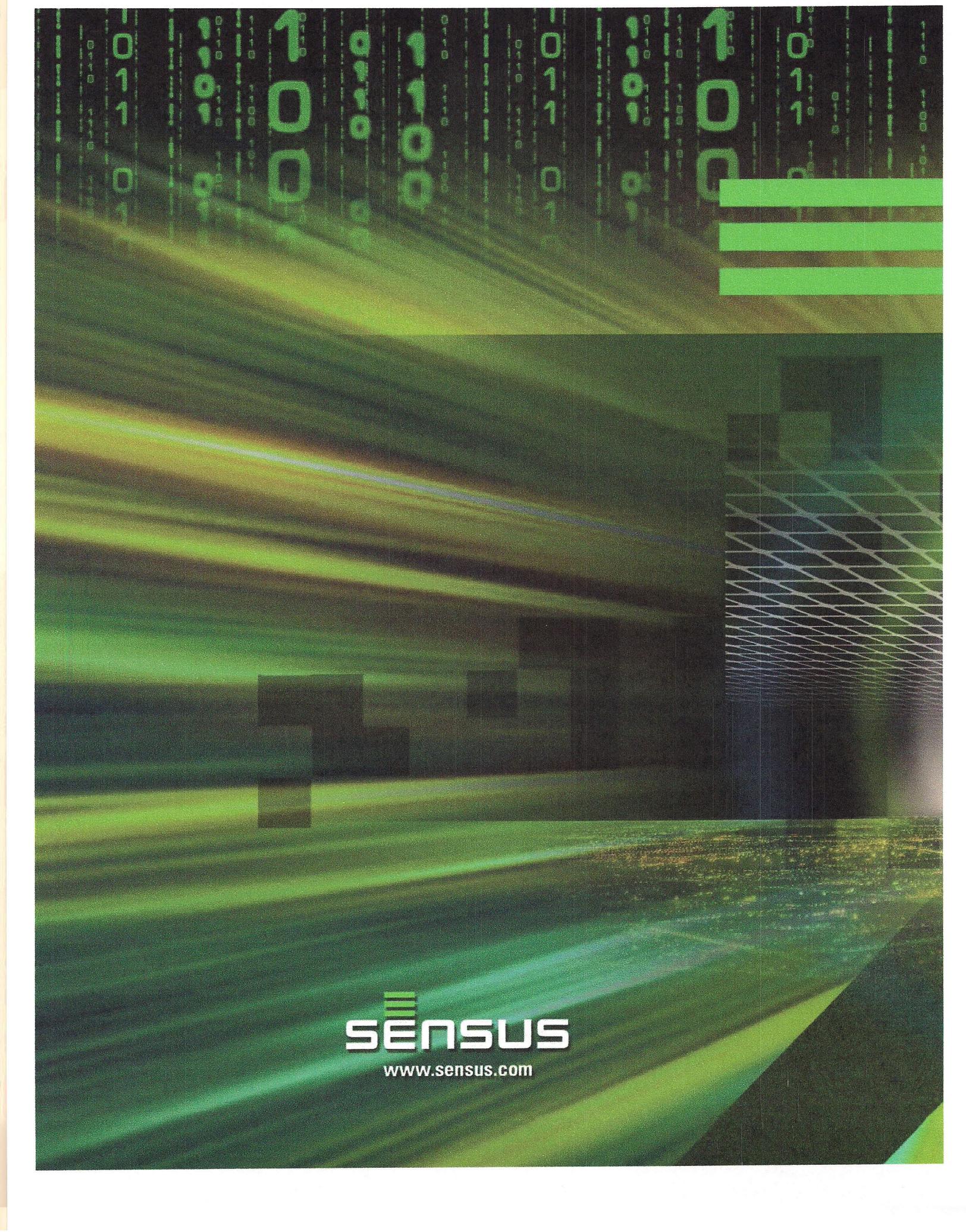
- 2 watts 900 MHz licensed power
- Hourly or daily reporting options
- Flexible programming options
- CRC-32 protected, redundant data messages
- TouchCoupler installation option
- 20 year battery life
- Meter tamper reporting
- Leak detection
- Field replaceable battery
- Low battery warning
- Dual port application

FlexNet Smart Grid Ready Features for Electric Utilities:

- 2 watts 900 MHz licensed power
- Daily, hourly and minute data intervals
- Time-of-use, critical peak billing
- Remote disconnect/reconnect/load limiting
- Demand Response/ Home Automation
- Tamper and energy theft alarms
- Industry standards compliant
- Power fail and restoration notification
- Demand read and reset
- Downloadable metrology and radio firmware upgrades

FlexNet Features for Gas Utilities:

- 2 watts 900 MHz licensed power
- Hourly or daily reporting options
- Flexible programming options
- CRC-32 protected, redundant data messages
- 20 year battery life
- Both residential and C&I Meters
- Provides Move-in Move-out reads
- Low battery warning
- Tamper detection




SENSUS
www.sensus.com