



# Florida Public Service Commission Staff Workshop on Smart Meters

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# Discussion Points

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- **Sensus Corporate Overview**
- **Sensus iCon A Meter**
- **FlexNet Communications**
- **RF Exposure**
- **HAN Communications**
- **Security**

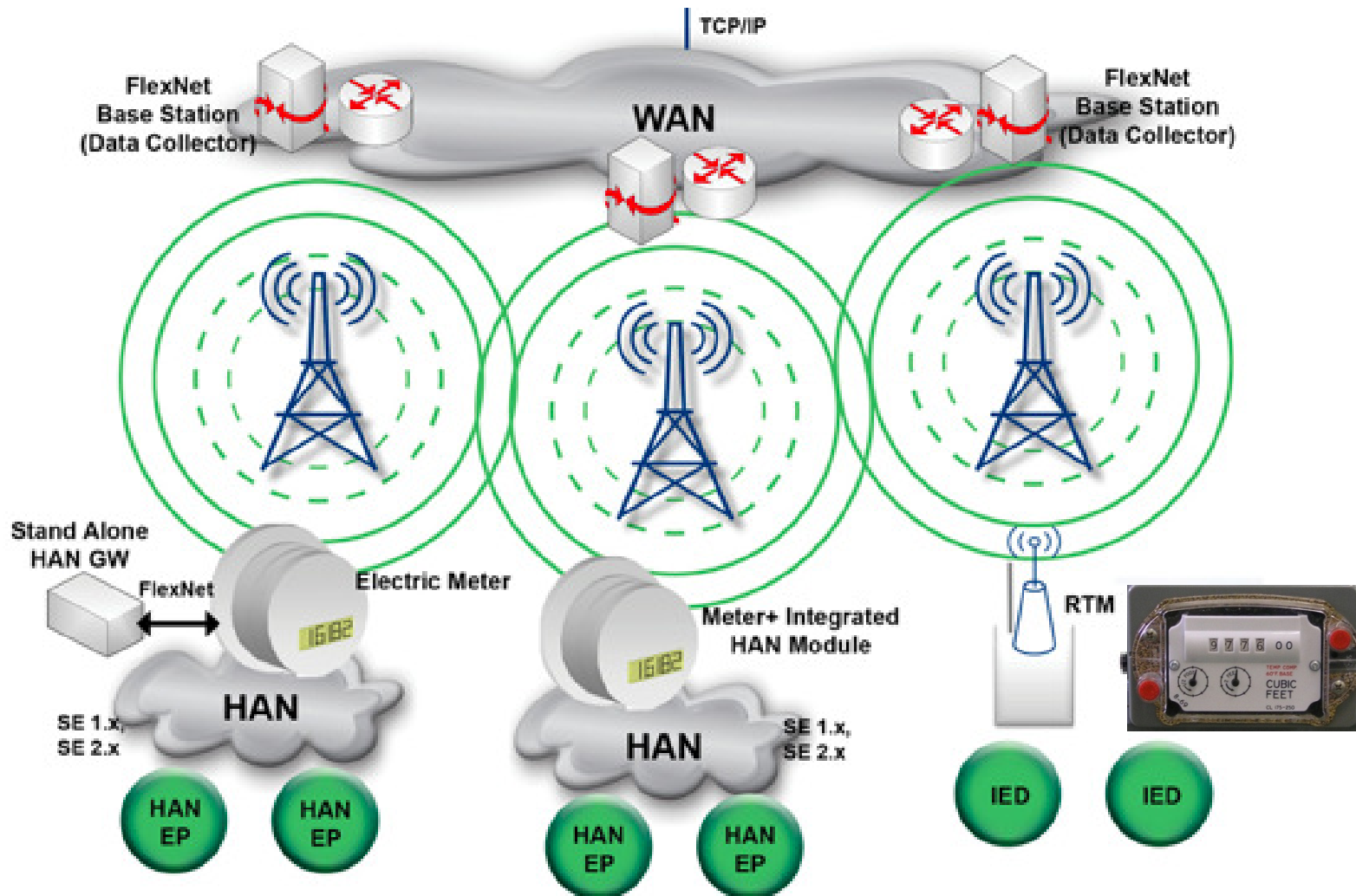
# Sensus



**We've served utilities for more than a century**

- **Global Presence**
- **An Industry Leader**
- **Gas, Water and Electric Verticals**
- **A Broad Range of Energy and Water Solutions**

# FlexNet Network Architecture



# Smart Electric Metering

- Consumption Measurements
  - Demand
  - TOU
  - Net Metering
  - Load Profile
- PQM
- Alarms (outage / tamper)
- Remote Firmware upgrade
- Service disconnect (optional)
- ZigBee HAN radio (optional)



1S  
2S  
2S-320  
3S  
4S  
12S

*iCon A Single Phase  
Accuracy Class 0.2*

*> 10 Million FlexNet Endpoints Installed*

# Smart Electric Metering

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## What the iCon A meter does not do:

- Track or monitor individual appliance load
- Turn off appliances
- Not a surveillance device
- Store or send personal data



*iCon A Single Phase*

# iCon Meter Standards Compliance

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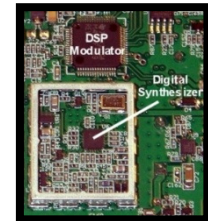
- ANSI C12.1, 12.10, and 12.20 standard for accuracy and performance
- NEMA SG-AMI 1 “Requirements for Smart Meter Upgradeability
- FCC Part 15 electromagnetic interference
- Local technical codes and requirements
- Utility specific and customer beneficial business and technical requirements

# FlexNet Communications Module

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## How does it work:

- Two way communication
- Point to multi-point communication
- Operates on primary use licensed spectrum
- Signal to and from the smart meter: 896–960 MHz
- Transmit power at the antenna: 1.26 watts / 31 dbm
- Transmitter is turned off when not sending messages
  - Does not use pulsed or pulse-modulated RF signals
- Utilizes dithering to avoid on-air RF collisions
- Multi-channel capability
- Last gasp messaging supported with complete power outage





# FlexNet Data Communications

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- All consumption data are stored in meter registers
- Error checking is utilized with each transmitted message to ensure data integrity
- Data privacy
  - No customer information is stored in the meter
  - Transmitted messages include consumption information, alarms & radio device ID
  - No appliance data is measured – meters do not support signature analysis

# Tamper Detection and Reporting

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- Reverse Power Flow
- Tamper and power fail alarm when meter is removed from the meter socket
- Number of demand resets
- Lost meter recovery

# FlexNet Module Certifications

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## Stringent Licensed Band Compliance Requirements

All endpoint designs are tested and verified by an FCC approved 3<sup>rd</sup> party testing facility to meet all spectral masks and power output requirements for FCC Part 24, 90, and 101 rules.

## Long Term Radio Frequency Accuracy

To accommodate for crystal drift due to aging over time, the base station measures frequency error of each received message. The frequency error is then corrected via an on air calibration command from the head end.

# FlexNet FCC Compliance

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- FCC 47CFR1.1310 Emissions
- FCC Part 90.210 Mask J Standard
- FCC Part 90.210 Mask G Standard
- FCC Part 101.111 (5) 12.5 KHz BW
- FCC Part 27.53 Mobile ACPR 12.5K BW
- FCC Part 24.131 Mask 12.5 KHz Channel and 25 KHz Channel (Two aggregated 12.5 KHz Channels)

The Sensus FlexNet is the only radio ever approved by the FCC to operate across FCC Part 24, 90, and 101 rules in a single grant.

# How is RF Exposure Defined by FCC/CFR

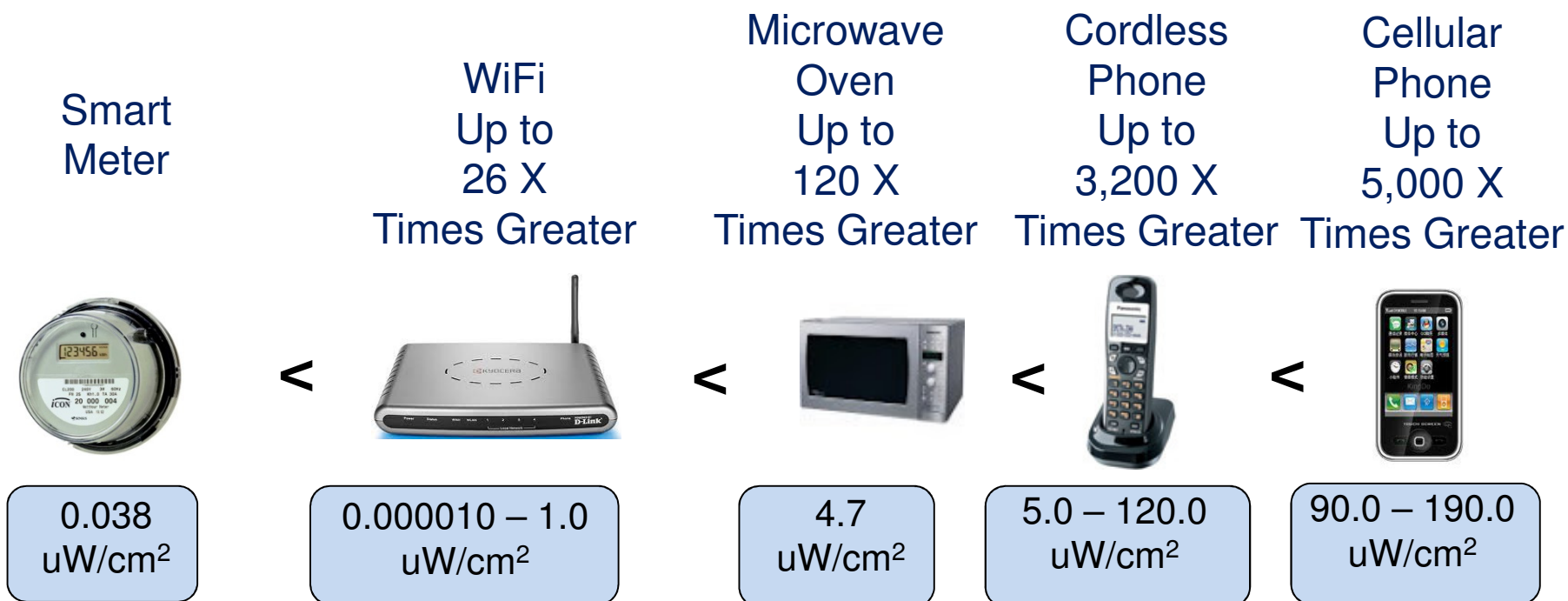
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- Amount of energy per area reaching the human body
    - Measured in units of  $\mu\text{W}/\text{cm}^2$
  - Energy: microwatt (1/1,000,000 watt)
  - Area: 1 cm x 1 cm
  - Average over 30 minutes
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## FCC 47CFR1.1310 Emissions

- FCC limit 610  $\mu\text{W}/\text{cm}^2$  at 900 MHz
- iCon meter 0.038  $\mu\text{W}/\text{cm}^2$

# Comparison of RF Exposure Sources



- 1) Values calculated per 47CFR1.1310 for a typical usage scenario
- 2) Value for the smart meter exposure is for the exterior of the building and is based on the total exposure from an electric smart meter, gas smart meter and ZigBee module (w/o the customer-optional HAN network).
- 3) Microwave (1 minute heating during ½ hour; Cell phone (1.81 minutes during ½ hour); Cordless phone (3 minutes during ½ hour)

# RF Exposure

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## Third Party independent study:

- **Performed by Exponent at the request of NV Energy**
- **Included all components of the FlexNet AMI network**
- **Findings**
  - All components operate below FCC exposure limits
  - 15,000 times lower than FCC exposure limits
  - Up to 5,000 times less than a cellular phone
- **Conclusion – The FlexNet network results in a negligible RF exposure**

# RF Exposure

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- Frequency of transmissions – programmable, typical 6 / day
- Duration of transmissions – 0.1667 sec / transmission
- Compare exposure with cell phone (6 transmissions / day is less than one six minute cell phone call per year)
- Exposure levels decrease significantly as distance from the transmitter increases
- Meters do not operate at close range and transmit significantly less RF than cell phones

**No reasonable expectation of adverse health affects to utility personnel, homeowners or the public**



# Multiple Meter Installation

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- **Exposure increases in presence of bank of meters**
  - Need 23,000 electric smart meters within a 1 foot distance to exceed FCC exposure limits
- **Exposure from nearby houses**
  - RF signal drops very rapidly as a function of distance
  - Addition is negligible

Source: Exponent Report to NV Energy

# HAN Communications

- Enables the iCon meter to communicate with optional in-home devices: 2.4 GHz
- Integrated inside the meter
- ZigBee SEP Certification
- Standard allows interoperability between multi-vendor devices
- Partner with 3<sup>rd</sup> party solutions
- Applications
  - Critical Peak Price messages
  - TOU based prices
  - Price response
  - Demand Side Management



# Security

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- **Cyber security – independent certification by Wurldtech for the iCon A meter**
- **NIST / DOE compliant (SP800-38C)**
- **Encryption enabled**
- **Network monitoring**
- **Alarms alert of malicious behavior**
- **Data privacy - no customer information is stored at the meter or transmitted by the meter**
  - Only information visible from the meter display is transmitted

