

# FPSC Joint IOU Presentation

Smart Meter Workshop

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Paul Talley, Gulf Power Company



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- The Evolution of Metering
- The Benefits of Smart Meters
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# The Evolution of Metering

The electric meter is the most improved upon device in the utility industry and continues to change as new technologies are discovered

Discovery that two out of phase AC fields can make a solid armature rotate.  
(electro mechanical meter)

Introduction of magnetic levitating bearings

Copper plates were submerged in an electrolytic solution and then weighed

First socket type meters

First electronic registers



Progression of telephone communication over the same time period...

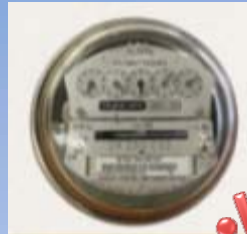


# The Evolution of Metering



•kWh Only

**Traditional  
Electric Meter**



•kWh Only

**Offsite Meter  
Reading (OMR)**



•kWh Only

**Automated Meter  
Reading (AMR)**

## 1970s

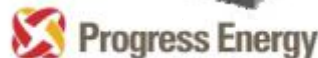
- Electromechanical induction disk
- Manual meter reading recorded on paper or computer cards
- Monthly reading only (kWh)

## 1980s

- Electromechanical induction meter with embedded 1-way 900 MHz radio
- Walk-by meter reading using hand-held device
- Monthly reading only (kWh)

## 1990s

- Electronic digital meter with integrated 1-way 900 MHz radio
- Drive-by meter reading using mobile collector
- Monthly reading only (kWh)



# The Evolution of Metering



2000s

## Advanced Metering Infrastructure (AMI)

kWh Metering Plus Much More

**kWh**    **kW**    **Voltage**  
**KVAR**   **TOU**   **Current**

- Electronic digital meter with integrated 2-way 900 MHz radio
- Meter communication through a fixed communications network
- Daily, time-interval, and on-demand remote meter readings (kWh)

- Outage and restoration notification

*Each day, roughly 500,000 Americans spend at least two hours without electricity in their homes and businesses. Such outages cost our economy at least \$150 billion a year. (via Bob Galvin, galvinpower.org)*

- Monitor power quality
  - Identify bad transformers
  - Customer voltage problems
  - Service phase identification





# The Benefits of Advanced Metering Infrastructure

THE CUSTOMER WILL HAVE:

## CONTROL

- Save Money
- Conserve Energy

### Smart Meters

- Convenience of Remote Meter Reading
- Reduced Electric Theft, (a cost borne by all customers)
- Reduced Estimated Bills
- Distributed Energy Rates
- Potential Rate Offerings
- Etc...

### Our Customers Say:

- Simple Solutions
- More Information (Energy usage and Conservation)
- One size does not fit all
- Expect technology solutions from us

## INSIGHT

- Mobile App
- Web Portal
- Detailed Billing

## CHOICES

- Time-of-Use
- Demand Side Management
- Pre-paid



# The Benefits of Advanced Metering Infrastructure

## AMI meters are essential to improving the long-term reliability and efficiency of the electric grid.

- Faster, more accurate outage identification enables faster restoration
- Improved data for engineering and System Planning
- Improved ability to prevent outages through better detection and more predictive maintenance
- Confirmation of restoration without customer intervention
- Greater operational efficiencies, which help utilities control costs
- Improved delivery of energy, enabling transportation cost savings and reduced environmental footprint



# • SMART GRID

## Advanced Generation



Excess  
Generation  
Storage

Distributed  
Generation



## Distribution Automation



Integration of  
Renewables

Capacitor  
Bank Control



Instantaneous  
Distribution  
Power Flows



Outage  
Detection

## Advanced Metering Infrastructure



Smart Meter

Communication  
Network





# Public Concerns

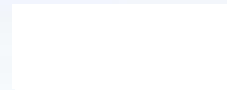
## Privacy

- In the information age, utilities will have an increasing amount of sensitive information that will need protection
- Each utility continues to take responsibility to ensure the protection of its customers' private information just as it has in the past



## RF Emissions

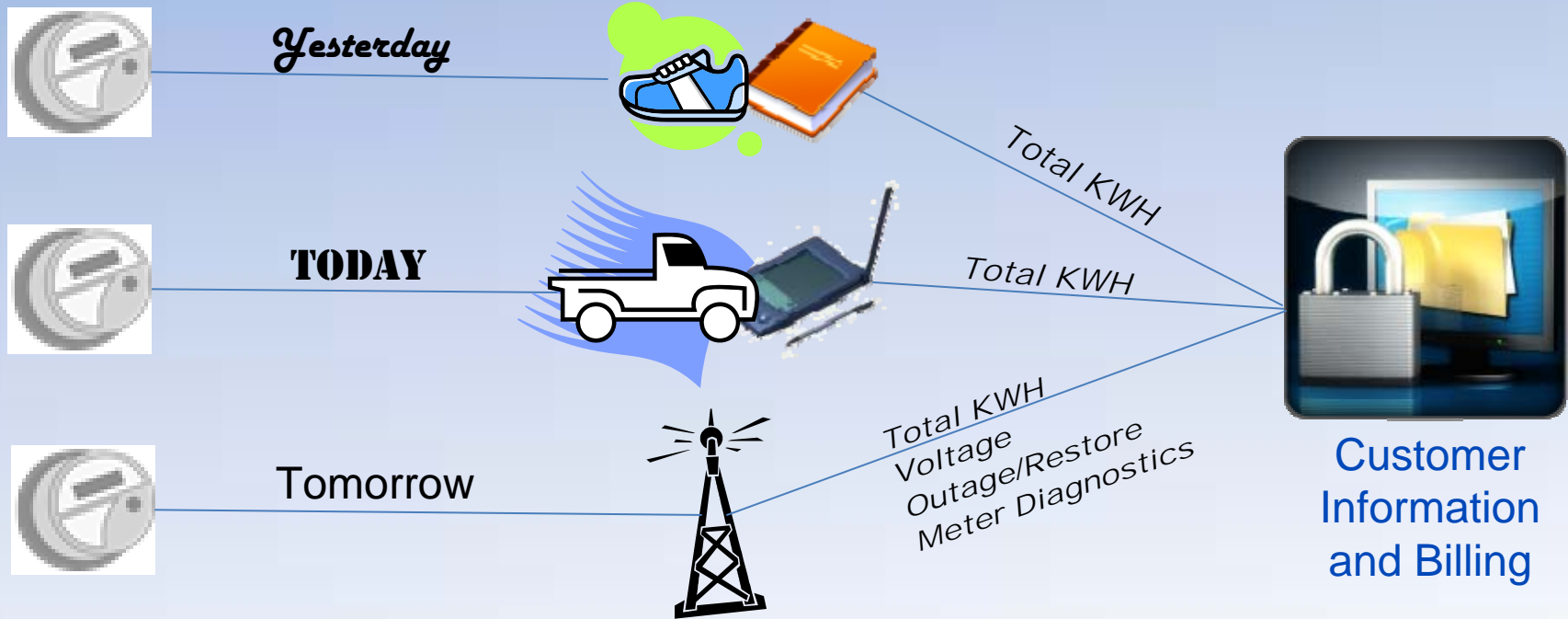
- Radio Frequency (RF) emissions are regulated by the Federal Communications Commission
- Each utility continues to follow the FCC regulations and other industry standards to protect its customers and employees from RF emissions



# Privacy

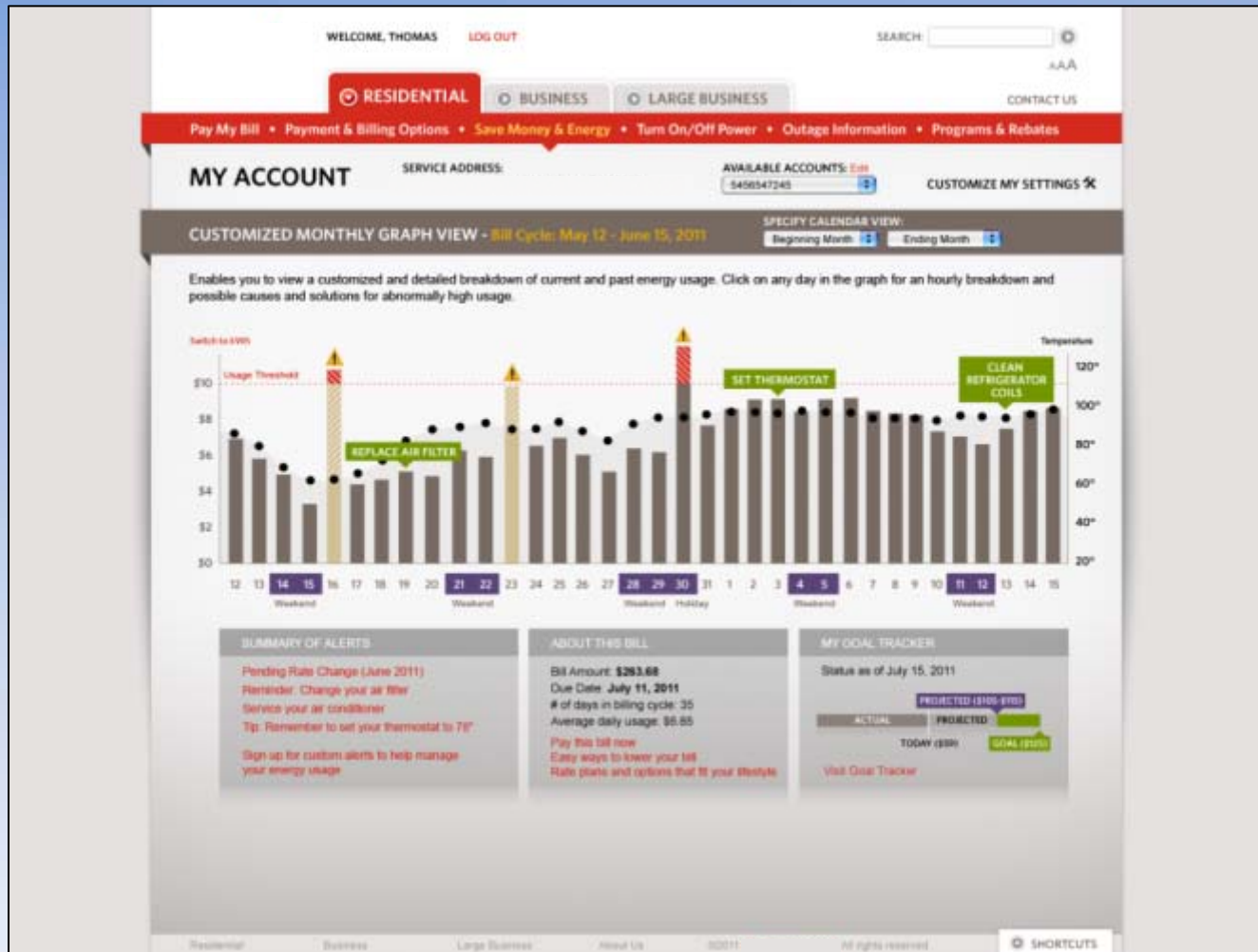
Nothing has changed...except the way the meter is read

- We are still dedicated to protecting customer information
- No customer information is stored at or transmitted from the meter
- Total energy consumption is all that is measured



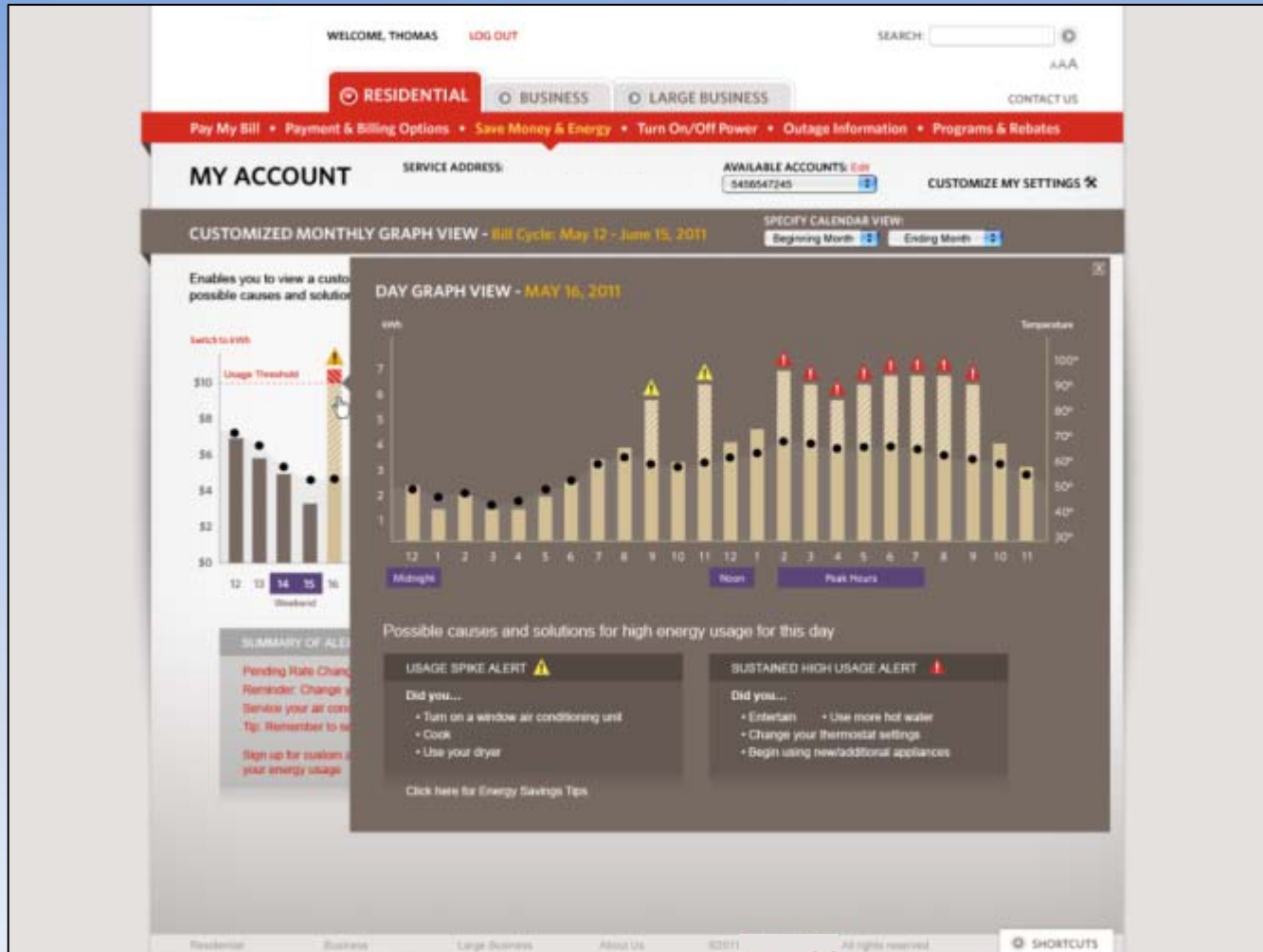
# Customer Web Portal – Daily Use

E  
X  
A  
M  
P  
L  
E



# Customer Web Portal – Hourly Use

E  
X  
A  
M  
P  
L  
E



# RF Exposure

- Smart Meters have been tested & certified to FCC rules
- Smart Meter power is  $\leq 1$  Watt
- Duty Cycle  $< 10\%$  (typically  $< 1\%$ )
- 900MHz Public Exposure Limit is  $610\mu\text{W}/\text{cm}^2$ 
  - 10x safety factor for occupational exposure
  - An additional 5x safety factor for general public exposure
  - So, there is a 50x FCC safety barrier for public exposure
- Peak measured levels at 1 foot are below this limit
- Typical indoor peak exposure  $< 1\mu\text{W}/\text{cm}^2$



\* Matt Butcher





# UNITED STATES FREQUENCY ALLOCATIONS THE RADIO SPECTRUM

## RADIO SERVICES COLOR LEGEND

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## ACTIVITY CODE

- |  |  |
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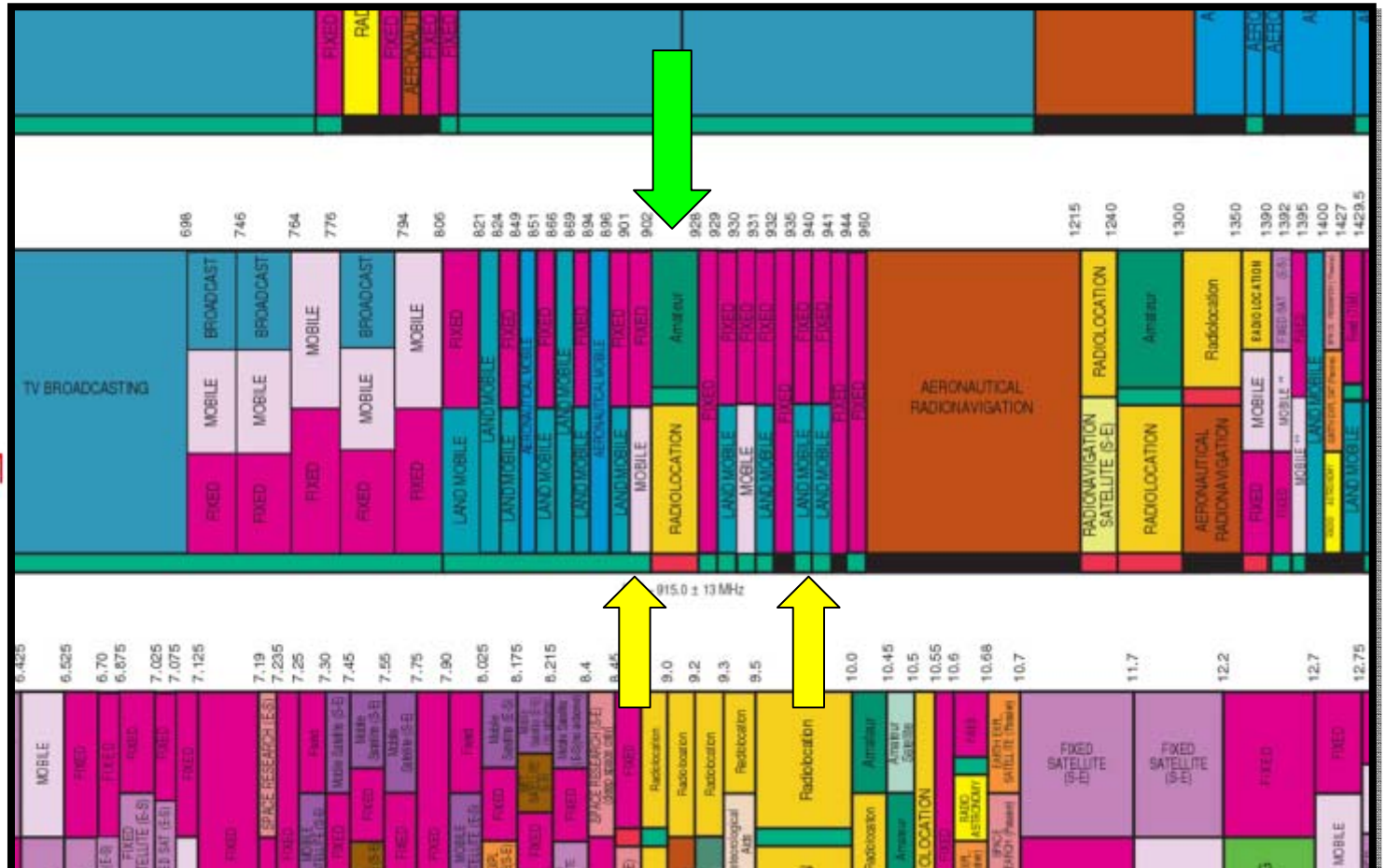
## ALLOCATION USAGE DESIGNATION

SERVICE	EXAMPLE	DESCRIPTION
Primary	FIXED	Capital Letters
Secondary	Mob	1st Capital with lower case letters

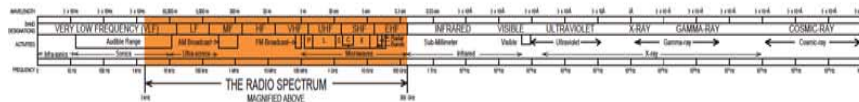
This chart is a graphic representation of the portion of the Table of Frequency Allocations used by the FCC and NTIA. As such, it does not constitute a part of the FCC's or NTIA's rules and regulations. Changes to the Table of Frequency Allocations, however, for complete information, users should consult the Table to determine the current status of U.S. allocations.



U.S. DEPARTMENT OF COMMERCE  
National Telecommunications and Information Administration  
Office of Spectrum Management  
October 2003

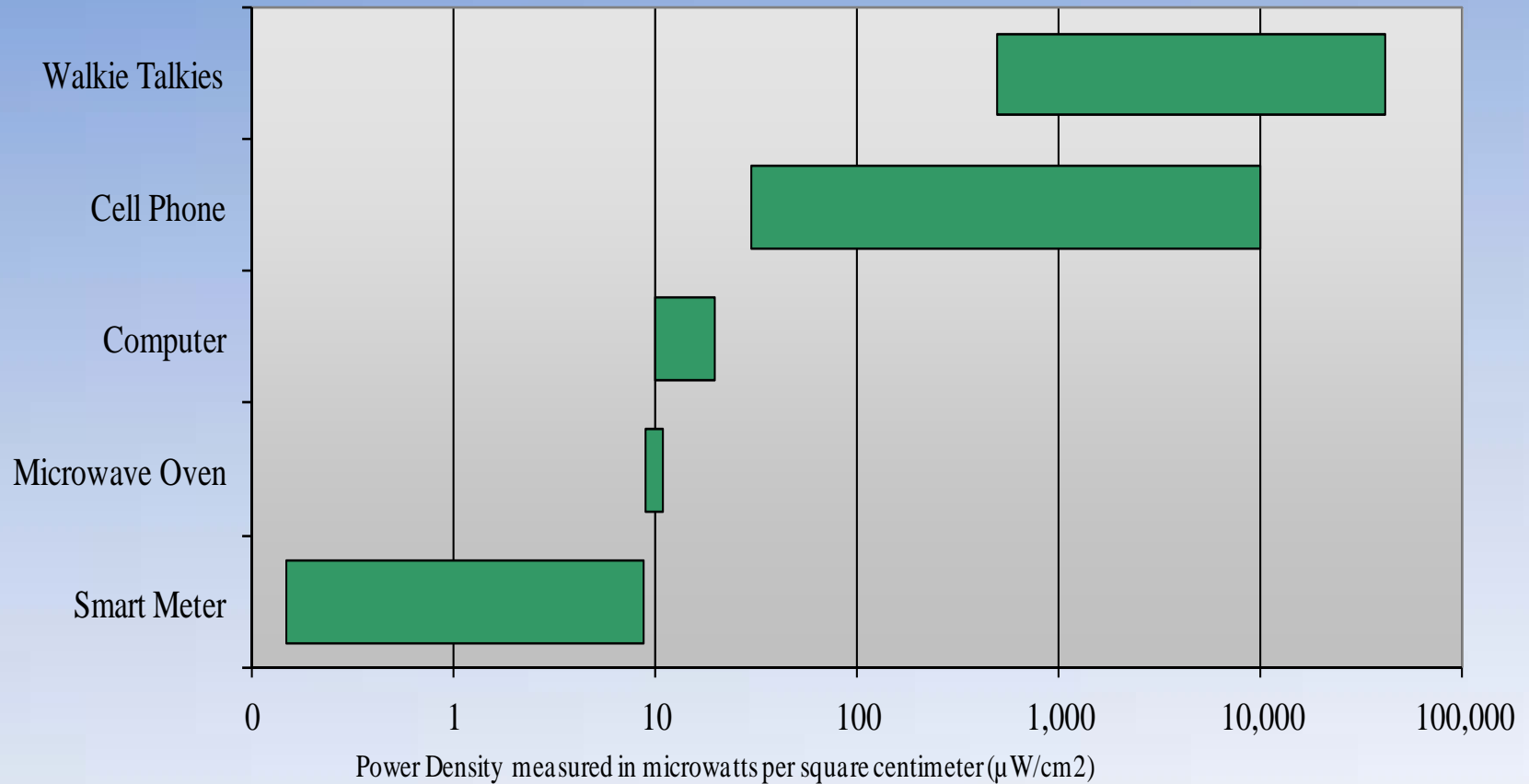


\* EXCEPT WHERE SHOWN OTHERWISE

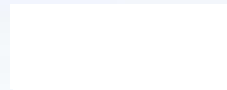


PLEASE NOTE: THE SPACING ALLOCATED THE SERVICES IN THE SPECIFICATIONS IS NOT NECESSARILY PROPORTIONAL TO THE ACTUAL AMOUNT OF SPECTRUM REQUIRED.

# Comparison of RF Density in Everyday Environment



*\* Richard Tell and Associates*



# Progression

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- Advances in technology have influenced electric metering over the last century and Smart meters are the result of that continuing development
- Smart meters allow utilities to provide many benefits to their customers
- Smart meters are fundamental in the foundation for a smart grid
- Utilities recognize the concerns of their customers and are diligent in making sure their grid enhancements comply with all established federal safety regulations and protect customer data

