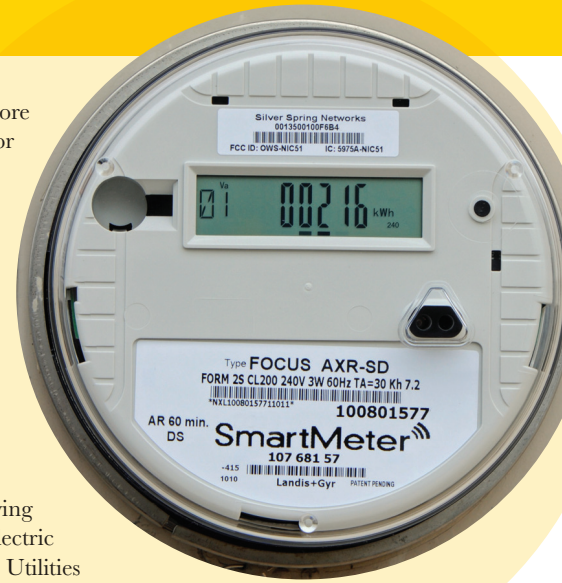




Radio Frequencies and Smart Meters



Utility infrastructure in the United States averages more than 50 years old in most places and will need major upgrades soon in order to keep up with the demand for electricity. The installation of smart meters is an important step electric utilities will take to upgrade their distribution systems. These devices make it easier for utilities and consumers to obtain accurate electricity readings at their homes and businesses. In the future, smart meters will provide consumers with additional data allowing them to make informed decisions about how and when they use electricity for electronics, lights and other electricity-consuming devices.

Smart meters operate by transmitting and receiving information wirelessly and are just one of the ways electric utilities will bring their systems into the 21st century. Utilities also will look to a series of upgrades to create a smart grid that improves reliability and efficiency, enables the increased integration of renewable energy resources and electric vehicles, and gives consumers more control over their energy use.

Even though smart meters are a much needed upgrade to the electric grid, some people have voiced concerns about possible negative health effects associated with the radio frequency waves that smart meters produce.

What are radio frequency waves?

Radio frequency waves are a form of electromagnetic energy. They move through space at the speed of light and can be man-made or occur naturally.¹

Radio waves are used for a variety of purposes but, most importantly, they are used in telecommunications services that make Americans' lives more convenient. Smart meters use low-energy radio frequency waves to transmit information over distances. In addition to smart meters, there are several devices many people commonly use every day that utilize radio frequency waves. These include microwave ovens, cellular telephones, and many other wireless electronics.

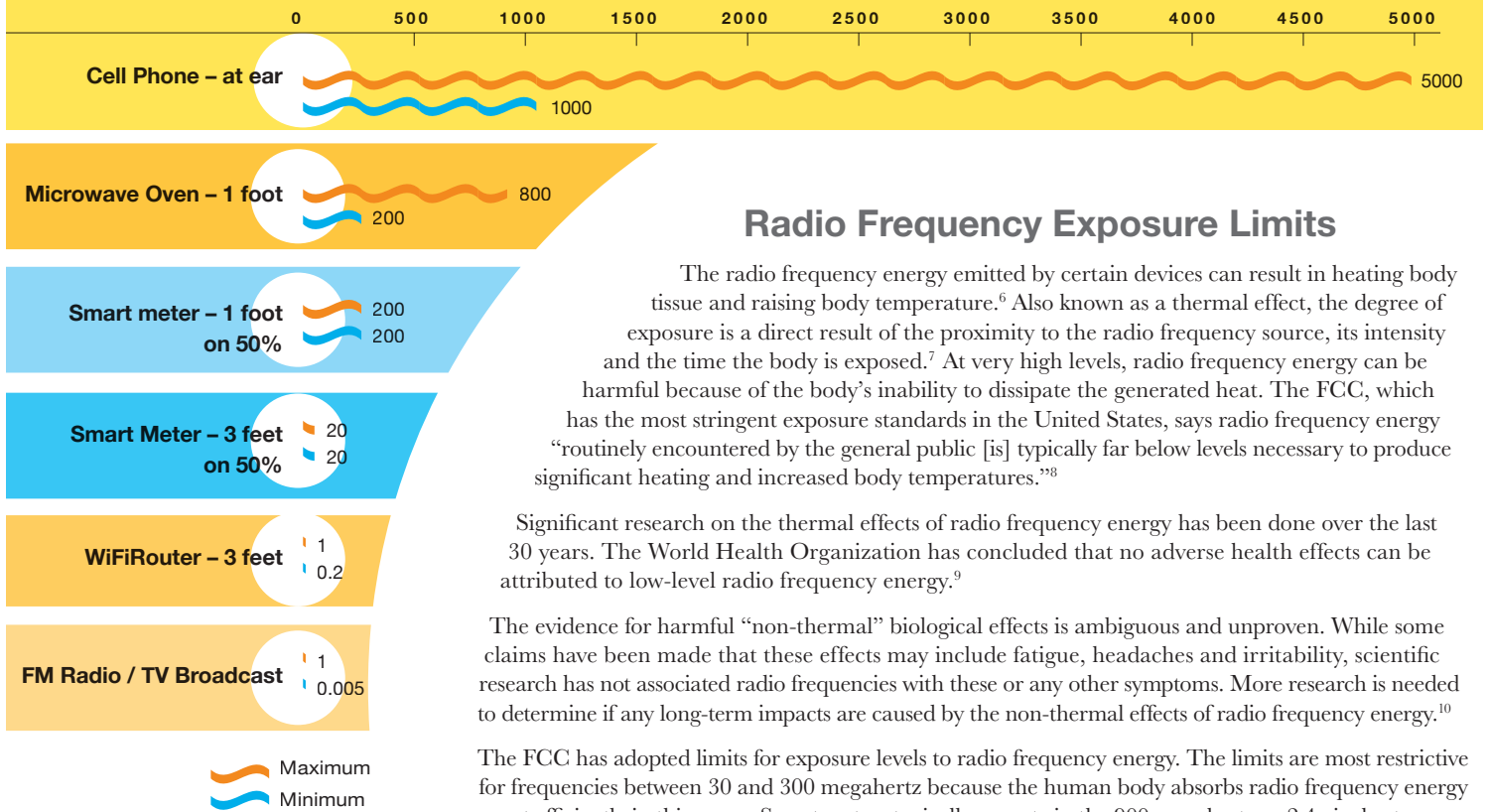
The Federal Communications Commission (FCC) requires that all radio-communicating devices be tested to ensure they meet federal standards before they are allowed to transmit within the radio spectrum. Some require a license or certification before they are allowed to operate. These include smart meters, television and radio broadcasts and cell phones. There also are common electronics that use radio frequencies and do not require licensing, including baby monitors, wireless Internet routers and automatic garage doors (these operate in what is commonly referred to as the unlicensed frequency band).²

Addressing health concerns

As analog electric meters are being replaced with digital smart meters, some consumers have expressed concerns with the potential for adverse health effects because of a smart meter installed at their home. However, **the low levels of radio frequency energy produced during occasional data transmissions from smart meters are significantly less than those of cell phones and microwave ovens and pose no known health threats.**³ Smart meters only transmit information for a fraction of time per day. According to an Electric Power Research Institute analysis of 47,000 smart meters in southern California, 99.5 percent of the meters operated approximately three minutes per day or less.⁴

Additionally, the effects of radio frequency emissions from these meters decline significantly as the distance from them increases. The exposure at 10 feet away from a smart meter approaches zero.⁵ The casing of a meter also acts as a barrier reducing radio frequencies that emit from the rear of the meter.

Instantaneous Radio Frequency Power Density Levels of Common Devices (in microWatts/cm²)



Radio Frequency Exposure Limits

The radio frequency energy emitted by certain devices can result in heating body tissue and raising body temperature.⁶ Also known as a thermal effect, the degree of exposure is a direct result of the proximity to the radio frequency source, its intensity and the time the body is exposed.⁷ At very high levels, radio frequency energy can be harmful because of the body's inability to dissipate the generated heat. The FCC, which has the most stringent exposure standards in the United States, says radio frequency energy "routinely encountered by the general public [is] typically far below levels necessary to produce significant heating and increased body temperatures."⁸

Significant research on the thermal effects of radio frequency energy has been done over the last 30 years. The World Health Organization has concluded that no adverse health effects can be attributed to low-level radio frequency energy.⁹

The evidence for harmful "non-thermal" biological effects is ambiguous and unproven. While some claims have been made that these effects may include fatigue, headaches and irritability, scientific research has not associated radio frequencies with these or any other symptoms. More research is needed to determine if any long-term impacts are caused by the non-thermal effects of radio frequency energy.¹⁰

The FCC has adopted limits for exposure levels to radio frequency energy. The limits are most restrictive for frequencies between 30 and 300 megahertz because the human body absorbs radio frequency energy most efficiently in this range. Smart meters typically operate in the 900 megahertz or 2.4 gigahertz range. Exposure limits are less restrictive for these frequencies because energy at these frequencies is more difficult for the human body to absorb. Standing directly in front of a smart meter transmitting data 2–4 percent of the time, would result in the highest exposure a person would experience and, even in this infrequent circumstance, the exposure would be 70 times less than the FCC limit.¹¹

Compared to other household electronic devices, smart meters use some of the lowest strength radio frequency signals to transmit information. They are lower than cellular phones, microwave ovens, television broadcasts, and many other consumer devices that most people use on a daily basis.

In Conclusion...

Along with stringent FCC standards to protect consumers, current scientific evidence shows there is no known risk associated with radio frequency emissions. There are many everyday items consumers use that emit more radio waves than smart meters.

Smart meters are an important step to improving the delivery of electricity for consumers. Many benefits will result, including allowing consumers more visibility into their energy usage and more control over their energy expenditures. Smart meters will help create a more efficient, more reliable, and more sustainable electricity world for years to come.

About this figure: This figure was developed by SGCC to depict the radio waves from various devices and matches the calculations made by the CCST project team. Quantities for different distances calculated using Inverse Square Law. Assumes distances in far-field, where power density reduces as the square of the distance from the source. Smart meter power scaled to obtain output for 50% duty cycle. The source for the various starting measurements came from Electric Power Research Institute (EPRI), Radio-Frequency Exposure Levels from Smart Meters: A Case Study of One Model (February 2011)

The RF exposure for cellular phones shown in this graph is for comparison purposes only. Cellular phones are evaluated for compliance with FCC exposure rules on the basis of specific absorption rate (SAR) and not power density.



Working for a consumer-friendly, consumer-safe smart grid

The SGCC is a consumer focused non-profit organization aiming to promote the understanding and benefits of modernized electrical systems among all stakeholders in the United States. Membership is open to all consumer and environmental advocates, technology vendors, research scientists, and electric utilities for sharing in research, best practices, and collaborative efforts of the group. Join @ www.smartgridcc.org.

¹ "Radio Frequency Safety, Frequently Asked Questions." Office of Engineering and Technology, Federal Communications Commission, www.fcc.gov/oet/rfsafety. 18 April 2011.

² "No Health Threat from Smart Meters." Utilities Telecom Council, www.utc.org. 19 April 2011.

³ "Radio-Frequency Exposure Levels from Smart Meters: A Case Study of One Model." Electric Power Research Institute, page 9.

⁴ "Radio-Frequency Exposure Levels from Smart Meters: A Case Study of One Model." EPRI, page 9.

⁵ "Health Impacts of Radio Frequency and Smart Meters." California Council on Science and Technology.

⁶ "Radio Frequency Safety, Frequently Asked Questions." FCC OET, www.fcc.gov/oet/rfsafety. 18 April 2011.

⁷ "Radio-Frequency Exposure Levels from Smart Meters: A Case Study of One Model." Electric Power Research Institute, page 8.

⁸ "Radio Frequency Safety, Frequently Asked Questions." FCC OET, www.fcc.gov/oet/rfsafety. 18 April 2011.

⁹ "What are electromagnetic fields?" World Health Organization, <http://www.who.int/peh-emf/about/WhatIsEMF/en/index1.html>. 19 April 2011.

¹⁰ "Health Impacts of Radio Frequency and Smart Meters." California Council on Science and Technology.

¹¹ "Health Impacts of Radio Frequency and Smart Meters." California Council on Science and Technology.