

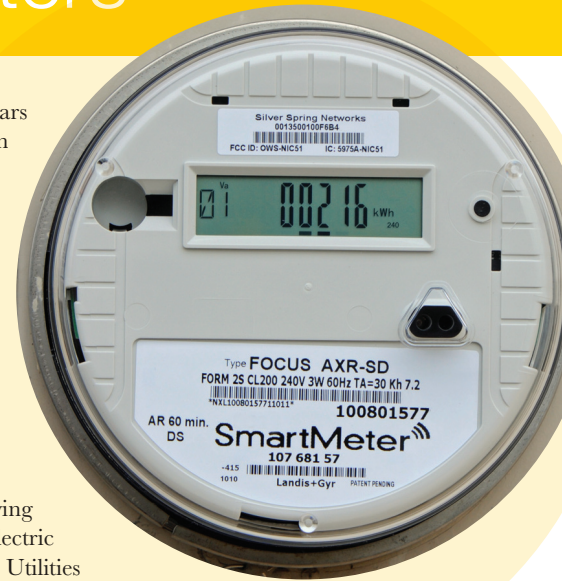
Radio Frequencies and Smart Meters



Utility infrastructure in the U.S. averages over 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 that move through space at the speed of light.¹ They are a low-frequency, low-energy source that are able to transmit information over long distances and can be man-made or occur naturally.

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

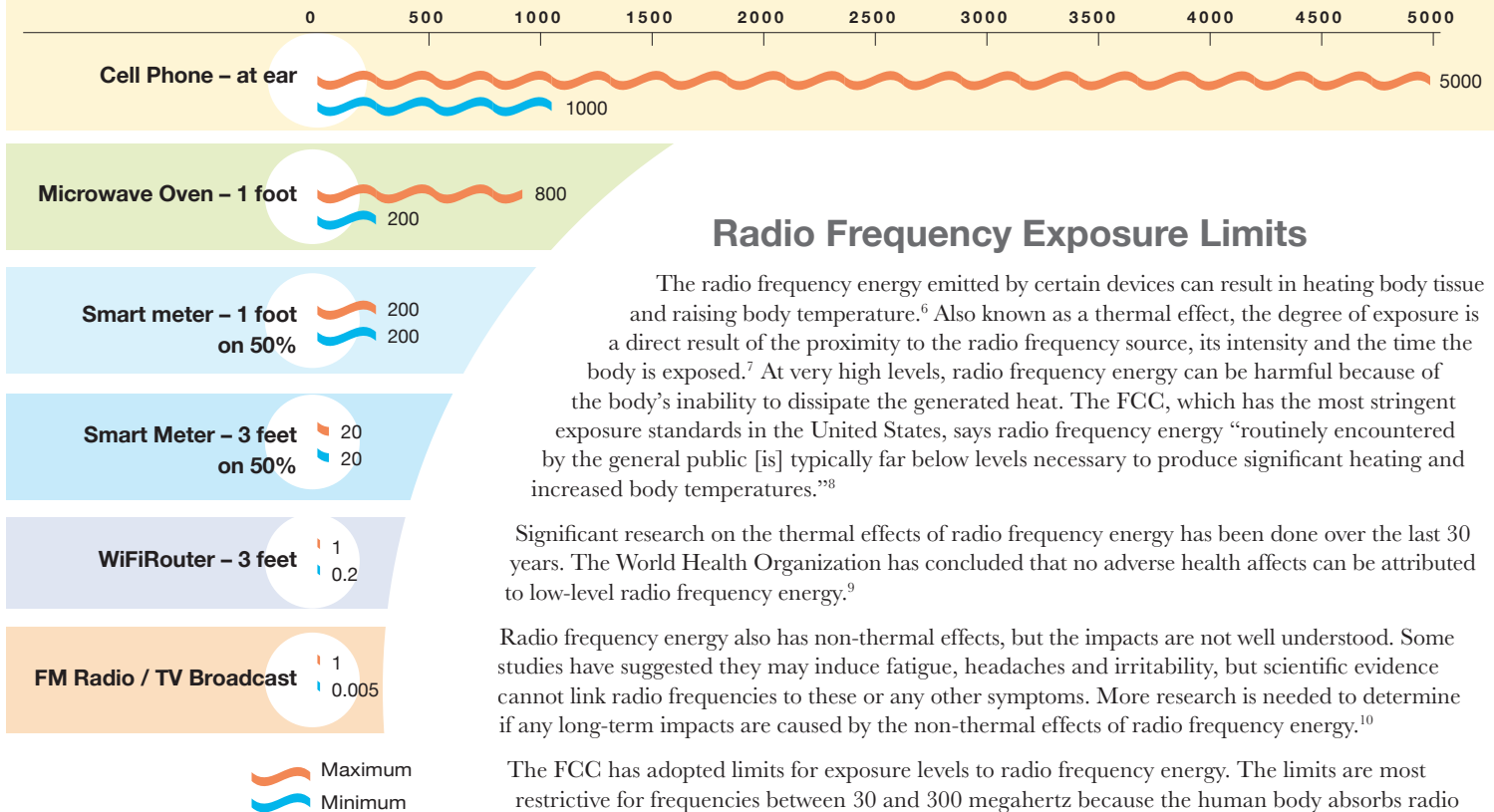
The Federal Communications Commission (FCC) requires that all radio-communicating devices be tested to ensure they meet federal standards before they are allowed to transmit within the radio spectrum. Some require a license or certification before they are allowed to operate. These include smart meters, 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. But **the minimal levels of radio frequencies that periodically emit 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 effect.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

Radio frequency energy also has non-thermal effects, but the impacts are not well understood. Some studies have suggested they may induce fatigue, headaches and irritability, but scientific evidence cannot link radio frequencies to 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.

Smart Grid Benefits

Smart meters are just the beginning of a modernized electric grid. This important first step will lead to more choices and individual control for consumers and a more efficient, more reliable and more sustainable electric 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)



**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.