



POWER SUPPLY | GENERATION | FINANCIAL | MEMBER SERVICES | RISK MANAGEMENT | IT | SUSTAINABILITY

Painesville, OH Advanced Metering Infrastructure (AMI) Radio Frequency (RF) & Cyber Security

Jared Price | August 19, 2019



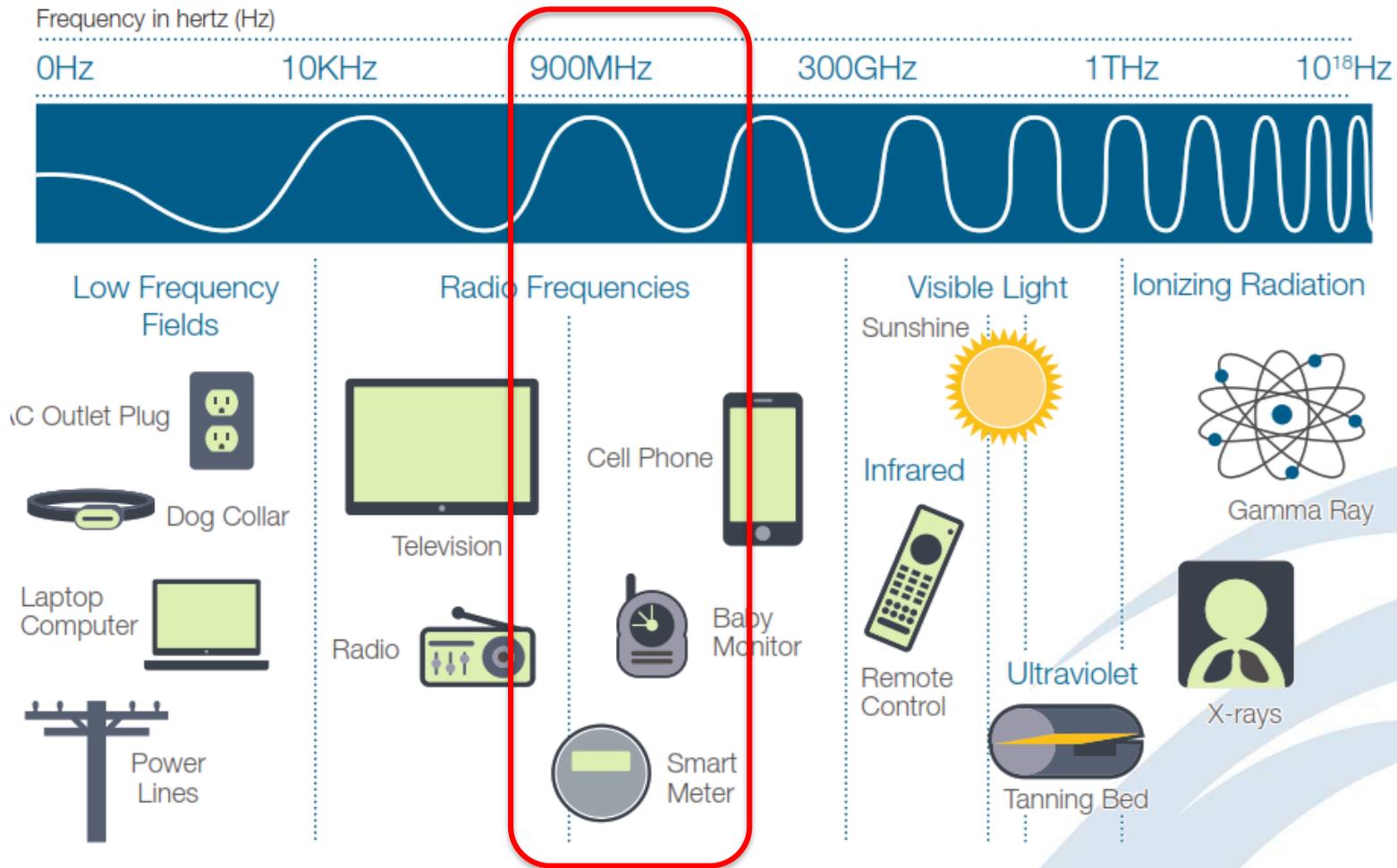
AMI is a mature technology

- **In 2017, U.S. electric utilities had about 78.9 million advanced (smart) metering infrastructure (AMI) installations.**
 - **This is now over half of the 152.1 million total electric meter installations.**
 - **About 88% of AMI installations are residential customer installations.**

Number of AMI installations by sector, 2017				
Residential	Commercial	Industrial	Transportation	Total
69,474,626	9,060,128	365,447	1,389	78,901,590

Source: U.S. Energy Information Administration (<https://www.eia.gov/tools/faqs/faq.php?id=108&t=3>), Last Updated Oct 26, 2018

Electromagnetic Spectrum



Radio Frequency (RF)

- **Itron-enabled smart grid devices have undergone extensive testing and validation during Federal Communications Commission (FCC) equipment authorization. That filing includes Maximum Permissible Exposure (MPE) testing, which can be found at <http://www.fcc.gov/oet/ea/fccid/>.**
- **The data indicates that all Itron smart meters present an extremely low-level of RF exposure when compared to the regulatory limits established by the Federal Communications Commission (FCC) for safe operations.**
- **Smart meters transmit for only a fraction of the day for short durations. They are often installed in locations that are isolated from residents, which dramatically reduces exposure levels.**
- **In aggregate, actual RF emissions from smart meters are significantly lower than commonly used devices such as cell phones, laptop computers, microwave ovens and baby monitors.**

Source: Health Impacts of Radio Frequency from Smart Meters by California Council on Science and Technology, April 2011

Radio Frequency Comparisons

Examples of RF fields commonly found in the everyday environment in relation to Itron-enabled Smart Grid Devices

Source	RF Output Compared to standing two feet from a Smart Meter
Standing in front of an active microwave oven, two feet from door	550 times more
Holding a walkie-talkie to your head	55 – 4,600 more times
Holding an active cell phone to your head	3.3 – 1,100 times more
Using a laptop computer	1.1 – 2.2 times more
Sitting in a Wi-Fi cyber café	1.1 – 2.2 times more

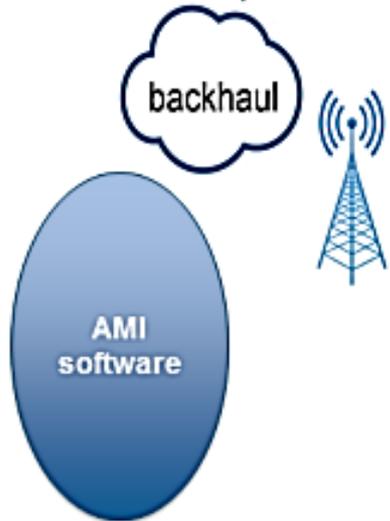
Source: Health Impacts of Radio Frequency from Smart Meters by California Council on Science and Technology, April 2011

Cyber Security & PKI

- **A public key infrastructure (PKI) is a set of roles, policies, hardware, software and procedures needed to create, manage, distribute, use, store and revoke digital certificates and manage public-key encryption.**
- **PKI infrastructures utilize digital certificates for:**
 - **Encryption: Encoding the information so that it can't be read by anyone without the correct key.**
 - **Identity verification: Verifying that the person or thing at the other end of the connection is really who they say they are.**
 - **Said another way... PKI proves data and messages have not been tampered with and also prove the person or device that sent them are who they claim to be.**
- **PKI is used in many technology systems across the world today because it is secure and flexible.**
- **The Itron AMI system utilizes one of the largest PKI infrastructures in the world with over 27 million devices deployed.**

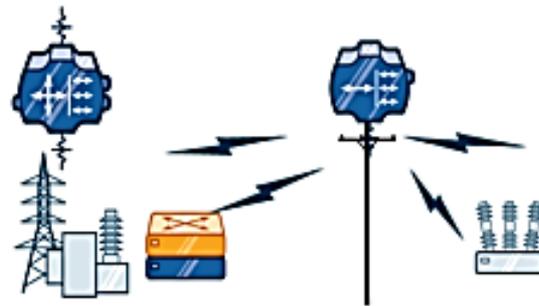
How AMI uses PKI For Security

Certificate exchange to authenticate WAN tunnel endpoints



Application authentication and authorization using certificates

"Drivers License" certificates personalize network devices to utility network



Certificate exchange to negotiate symmetric keys to encrypt and check integrity of command and response traffic

"Birth Certificates" identify all network devices



Certificate-based authentication and authorization for access by field service tools

END