

ENERGY SUSTAINABILITY AND THE IMPENDING COMMUNICATIONS POWER CONSUMPTION TIDAL WAVE: WHAT TO KNOW AND HOW TO IMPROVE ENERGY EFFICIENCY FOR THE ITC INDUSTRY



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Today, the Information and Communications Technology (ICT) industry consumes about 5% of the world's energy resources. Yet, with the explosion in channel bandwidths, network densification/buildout, and power-hungry Artificial Intelligence (AI) and Machine Learning (ML) applications for 5G and tomorrow's 6G wireless networks, our industry will soon consume about 1/5 of the planet's energy resources. This keynote demonstrates the evolution of energy consumption across the globe, and illustrates how the industrial and information revolutions have caused different parts of the globe to manage their energy production and resources in highly localized, disparate manners. Remarkably, however, all wireless deployments tend to follow similar energy demand patterns, and our industry has created standards for energy efficiency (EE) to allow operators and manufacturers to deploy and provision networks for sustainability. This talk illustrates the difficulty and complexity of trying to quantify the energy consumption of a mobile radio network, and reveals how all of the existing energy efficiency (EE) standards have significant flaws in capturing true energy efficiency. These flaws have likely slowed the adoption and utilization of 5G while clouding the understanding of power consumption in networks today. Fortunately, a new theory, called the Waste Factor theory, lays bare all of the energy consumption aspects of any communication or computer network, and offers the ability for the ICT industry to accurately design, compare, and optimize energy efficiency in any multi-user network that has a source and a sink (or sinks) of information. This talk demonstrates how Waste Factor was inspired by the popular Noise Factor theory developed at Bell Labs 80 years ago, and shows how to use the Waste Factor theory for determining energy consumption in a real world radio access network (RAN) or even a data center. The talk concludes by comparing Waste Factor with the global standards being used today in the ICT industry, highlighting the generality and utility of the Waste Factor to quantify and expose energy consumption sources that are currently being missed in today's standards, allowing better network provisioning, optimization and substantially more energy efficient designs which are vital for our industry and planet.