



Weird & Wireless: What about wireless power transmission?

Welcome again to the wonderful but sometimes weird world of wireless comms, written by Joel Young, [CTO of Digi International](#).

With everything going wireless, what about wireless power transmission too?

This is probably one of my favourite and most complicated topics to cover. As most of us know, the wireless transmission of electric power using traditional electromagnetic transverse waves is not practical.

Ignoring the effects of absorption and scattering, the power density of electromagnetic waves in free space spread out such that the power density decrease is inversely proportional to the square of the distance... meaning that it reduces very quickly because it spreads out so quickly (see the previous post on free space loss).

It takes a really powerful transmitter to transfer a lot of power. Fortunately, we have one of these extremely powerful wireless transmitters of raw transverse electromagnetic waves. In conventional terms, we earthlings call it the Sun. And our receiver? Well some of the energy is scattered by the atmosphere and some is absorbed - resulting in a warming of the earth and other energy transfer creates organic matter like plants and fossil fuels.

Of course, the best example of a real time "receiver" of this power is a photovoltaic cell or solar panel. Unfortunately, lack of conversion efficiency (see the solar power post), and all of the losses in the system make reproducing a smaller version of this type of system for use here on earth to distribute power from a power plant to our homes not very practical - pretty depressing indeed.

Those pesky laws of physics, refined by the minds of [Maxwell](#) and [Hertz](#) have gotten in the way of wireless power transmission. Fortunately, one of my favourite inventors of the late 19th and early 20th century figured out another way, using those same laws of physics.

Unfortunately, much of his work in the area of wireless power transmission wasn't really appreciated until 50+ years after his death.

I'm talking about the inventor of our alternating current power distribution system - still in use today worldwide and the arch-enemy of [Thomas Edison](#), [Nikola Tesla](#). For those of you that don't remember Tesla, he was born in the Austria-Hungary Empire in 1856 and became a great engineer and inventor.

Some of his inventions of note were the transformer, the AC induction motor, and tuned circuits which are the foundation of radio transmission later perfected by Marconi. Tesla himself had over 700 patents.

He came to the United States to get a job working for Thomas Edison. He and Edison had a falling out because he felt the only efficient way to transmit electricity over power lines was Alternating Current or AC, while Edison was stuck in the world of Direct Current or DC.

As we know, Tesla was right and we are lucky that a wealthy guy named Westinghouse was willing to invest in Tesla's AC system. He was thus responsible for the first hydroelectric generator at Niagara Falls. The rest is of course history.

Well, later in his career, Tesla became obsessed with the notion of wireless power transmission. While his AC transmission system worked very well, he thought there should be even a better way. At one point in 1900, his wireless power transmission system was able to light 200 lamps from a distance of around 25 miles.

Unfortunately, the notion of free wireless power transmission didn't seem to good for business and J. Pierpont Morgan withdrew funding of Tesla's [Wardenclyffe Laboratory](#) because wireless power meant that there would be "no place to put the meter."

Unfortunately for Tesla, because his theories seemed to violate the current interpretation of electromagnetics and a lack of funding to continue his work, many scientists viewed him as an eccentric that had gone beyond his prime.

Of course, I believe that Tesla's work and achievements are well recognized and appreciated today and as you will find, all the modern work on wireless power transmission has its roots in Tesla's work.



Joel Young, VP of Research and Development and CTO at [Digi International](#), has more than 22 years of experience in developing and managing data and voice communications. He joined Digi International in June 2000 and in his current role he is responsible for research and development of all of Digi's core products.

Prior to joining Digi, Joel was VP of Sales & Marketing at Transcript International where he was responsible for sales, marketing, and product development for all information security products. During his tenure at Transcript, he also served as VP of Product Development and VP of Engineering where he was responsible for engineering, research and product development for wireless communications products, cellular telephony, wireline telephony and land mobile radio, data security and specialized digital radio products.

He also served as District Manager for AT&T Business Communications Services where he was responsible for the creation and implementation of voice processing and network database strategies, including deploying new voice processing platforms into the AT&T switched network for private network and other outbound calling services.