

## 2 Puzzles: Sept 10, 2020

{ Something to think about in 5 minutes }

### Puzzle #1: (fictional)

I built a good sized machine shop with a number of machines and had some good contracts to make it worthwhile. Things were off to a good start until I got my first electric bill. It was for 450KWH's, but I knew we were only using 300KWH's, so I complained to the power company and they emphatically said that they were delivering 450 KWH's to our system.

So, I hired a consultant to come and figure out what was going on. He took a quick look at thje situation and said "*you didn't know about 'ELI the ICE' man*", to which I said "*who's he?*". He snickered and said "you have a lot of motors that introduce inductance into the power system, causing a phase shift, and that changes the '**Power Factor**' because of something called 'Apparent Power' vs 'Real Power'". There needs to be a bank of capacitors outside at the feed point to offset the inductance, and that will correct the Power Factor. I then said "wait a minute, why I am paying for Apparent Power, if it doesn't exist". Is that the missing 150KWH's?, and where did it go? Then he said "it returned back into the delivery system". Whoa, that's cheating. Why are they want to charge me for something they get it back.

*{ show ELI chart }*

### Puzzle #2: (fictional)

Later, as a new HAM, I was putting up a new antenna that unbeknownst to me was a little bit long for the frequency I was going to use. When I put a test signal out on it, my SWR was way too high, so I asked Ray if he could come and tell me what was going on. He took a quick look and said "*you forgot about 'ELI the ICE Man'*". To which I said "*but that was a problem with the Electric System at the machine shop*". Then he said "*that was Power Factor, this is SWR*". Your antenna is a little bit too long, making it inductive instead of resonant, but if you put the right amount of capacitance at the feed point of the antenna (like using a Matchbox) it will make the "**physical length**" of the antenna "**electrically shorter**", and your SWR will drop. You see, you can either add inductance to make it electrically longer, or capacitance to make it electrically shorter. Otherwise, some of your power returns to your Transmitter and can even do some damage.

Then I said "*but I have a Matchbox in the house I can use, and there's even one in my radio*", and he said "that will appear to work for the benefit of the radio, but then the coax will start being part of the antenna because of the ensuing SWR in the coax, instead of being only a feed to the antenna", and because of that, your radiation efficiency of the antenna will be less".

*{ show ELI chart again }*

### The Moral of the story:

*Yes, there is "Real vs Apparent Power" for determining the "Power Factor" in industrial power distribution , and there is "Imaginary Numbers" in electronics and Ham Radio.*

*If you have access to an Antenna Analyzer, besides checking the SWR, be sure to pay special attention to the the independant Reactance and Resistance values. We need to see what frequency that the XL & XC values are at their minimum, which indicates the actual resonance of the antenna, and then take note as to what the Actual Resistance is at that point.*