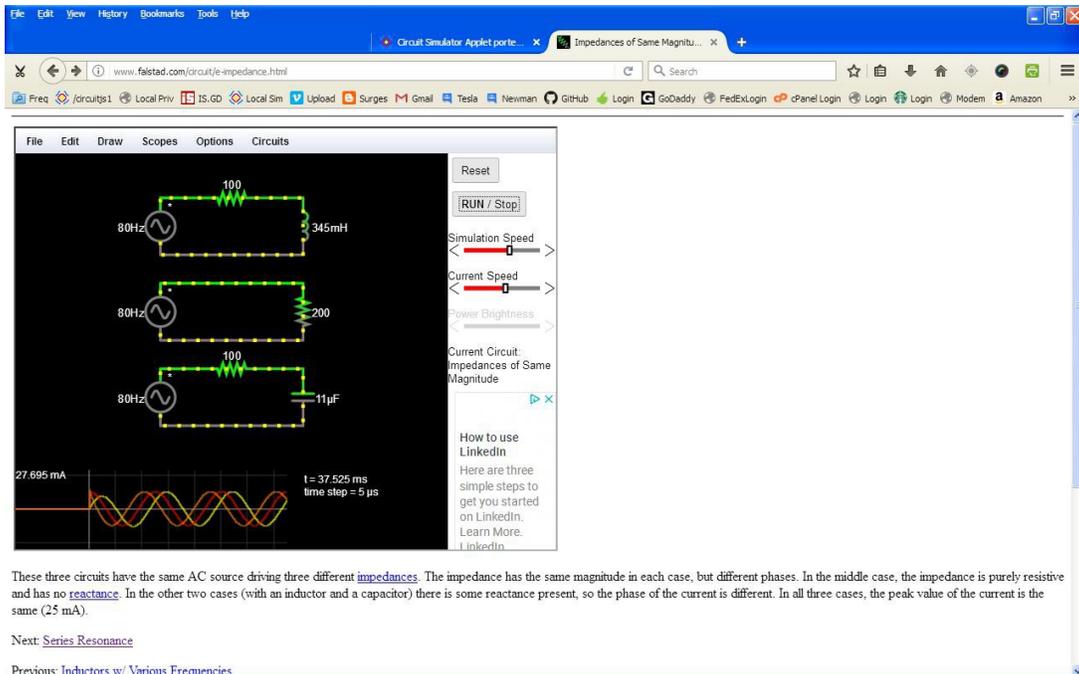
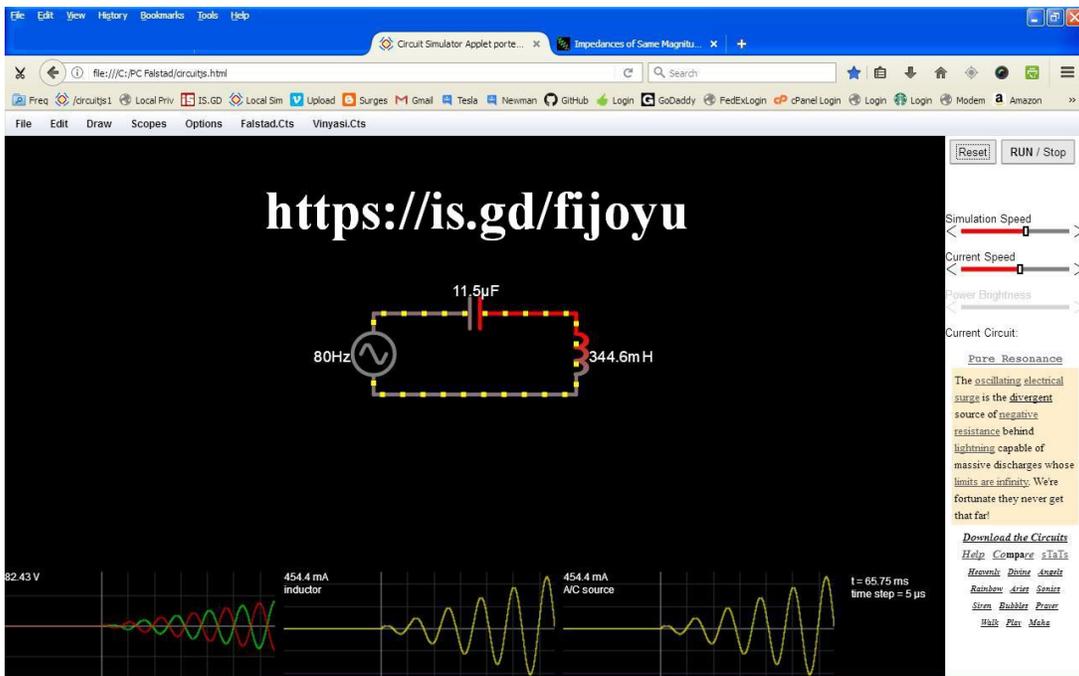


# Impedance of Same Magnitude

In the following screenshot, [Paul Falstad demonstrates](#) matching impedance magnitudes in all three circuits resulting in all three currents also matching...



In the next screenshot, I've moved the capacitor and inductor into the same circuit, but kept the same frequency at the voltage source...



Notice how the power level keeps growing. The input voltage is fixed at 5V peak-to-peak whereas the output voltages are steadily growing! Since the current is the same at both the source as well as at the outputs, plus the voltage at the source is less than the voltage at the outputs, then this constitutes overunity!

It's also interesting to note that Paul set it up this way to inherently be possible for infinite overunity had he arranged his components in this manner. It only works if the frequency of the sine wave generator is fixed at 80 Hz and the inductor and capacitor have the parameters as they are.

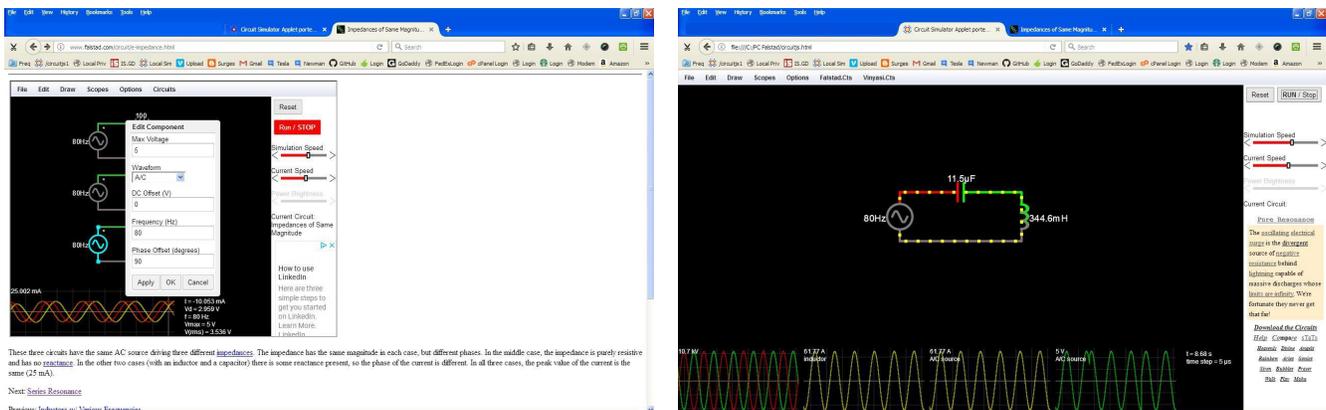
This explains why [Philip Nelson](#) would sometimes experience a potential blowout of his public address system if he wasn't mindful of his display panel in the control booth. If its output began to vary wildly up and down, then he knew from ten years of experience to immediately shut down the entire system rather than wait any longer to see what would happen, because he already knew what would happen: a speaker in the audience would blowup!

It was his job to set up the entire PA system for rock concerts: stake the grounding rod for the gas-fired generator, lay out all of the coaxial cable, etc. There were dials on everything. What particularly irked him was that the readout on the generator was rock steady, yet the readout of the remainder of his system was something else – sometimes higher than the input! This was probably due to magnitude matching occurring among the inductances and capacitances of his various cables snaking throughout the area distributing signals to all of the loud speakers positioned in front of the audience?

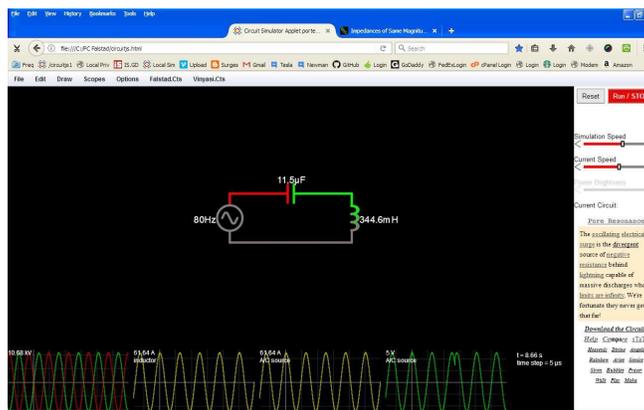
I'll venture a guess that the overunity is also the result of the capacitance and inductance voltages are out-of-phase with each other by one-half alternating cycle making this a negative unity power factor implying that these capacitive and inductive loads have become a generator whenever their pairing is integrated in this fashion?

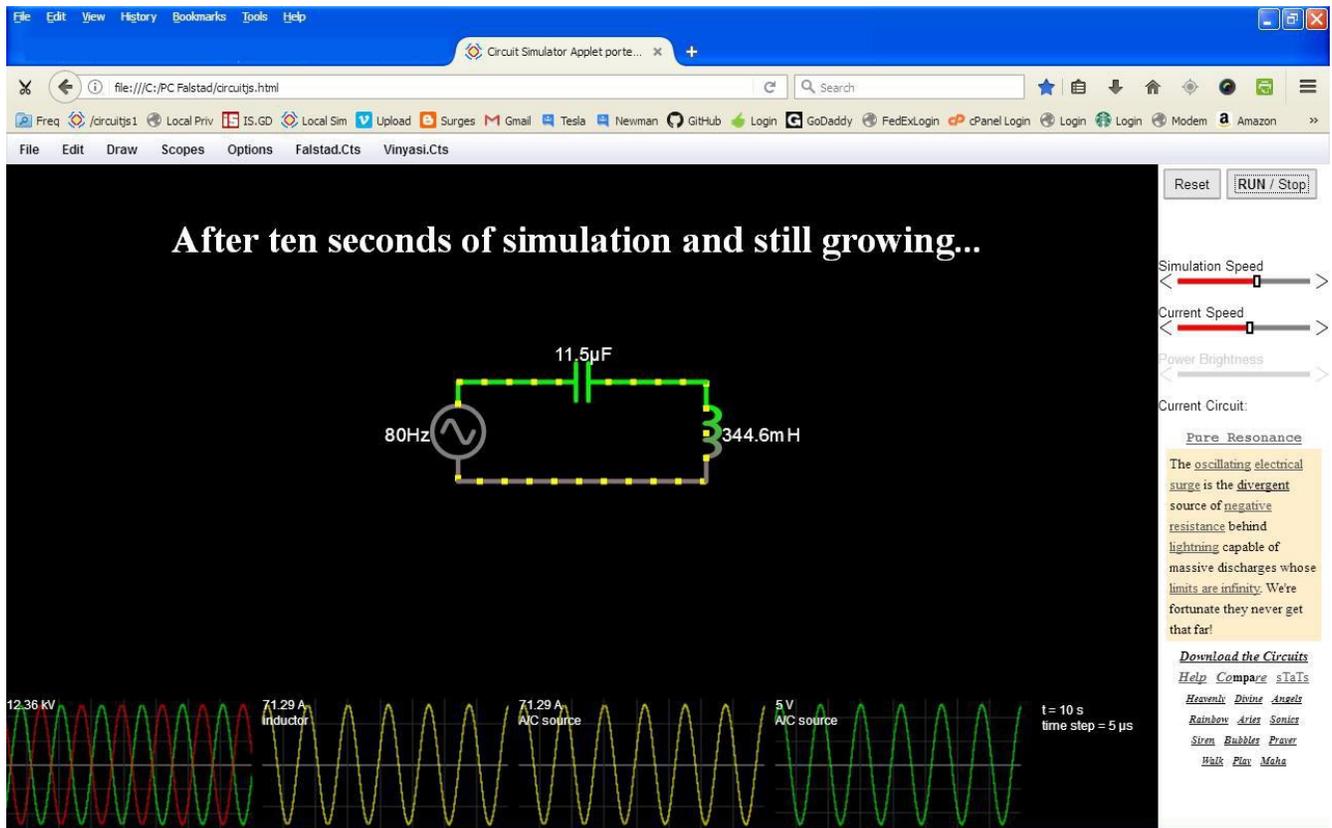
It is also interesting to note that their voltages are in complete conformity with how capacitors and inductors should behave offsetting their voltage phases in the correct directions: capacitive voltage 90° behind current and inductive voltage 90° ahead of current.

The fact that Paul setup his voltage source to be 90° ahead of its current has no impact on its output...



Here is what it looks like when the voltage is reverted back to a zero phase offset...





This condition is called “pure resonance” of an “undamped harmonic oscillator forced at its natural frequency” which responds by “oscillating with an amplitude that grows to infinity over time.”

## Unit II: Second Order Constant Coefficient Linear Equations – Pure Resonance

It is mathematically modeled by this equation if the “B” slider is increased to any amount greater than zero.