The reason for higher electric bills

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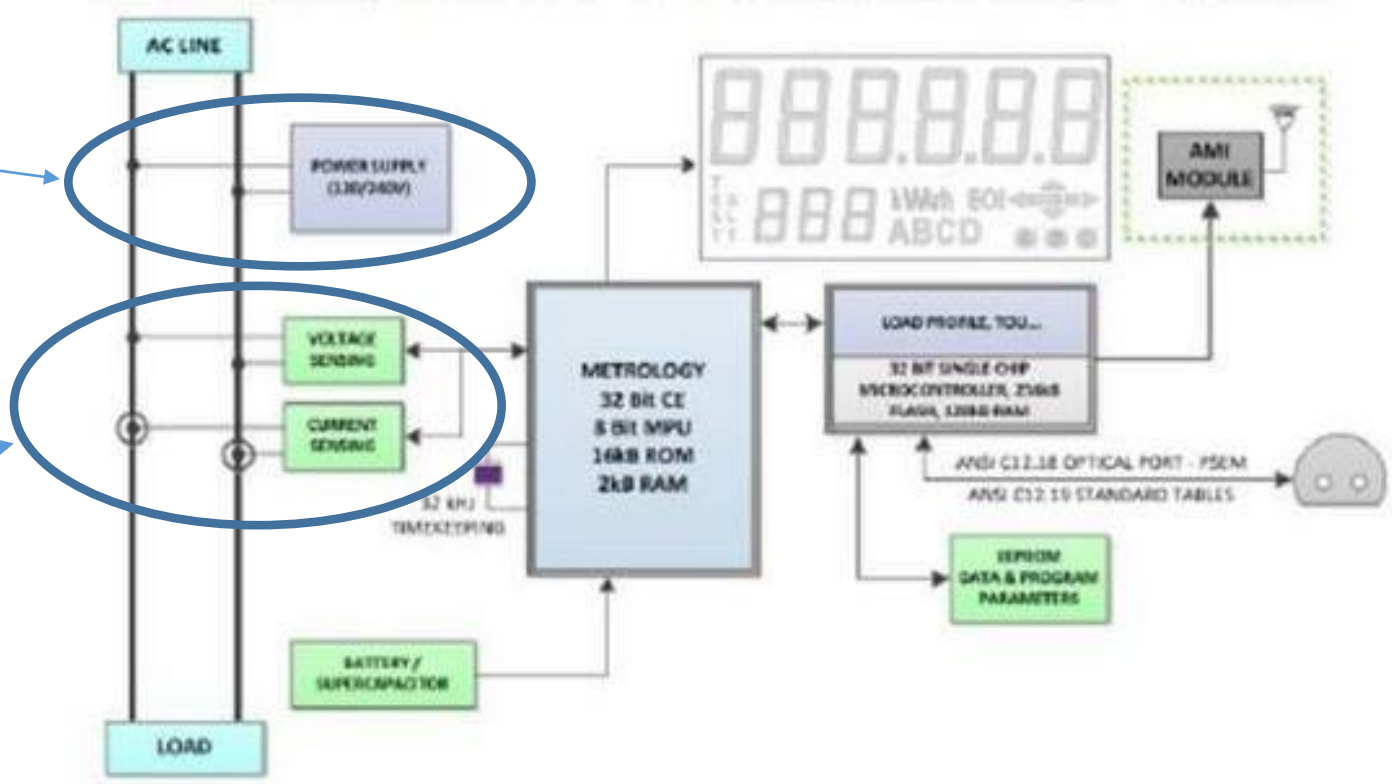
The new AMI electric meter block diagram

The Switched Mode Power Supply, (SMPS) which injects high frequency Oscillations/Harmonics and High Voltage transients, the old type analog meter did not create these effects

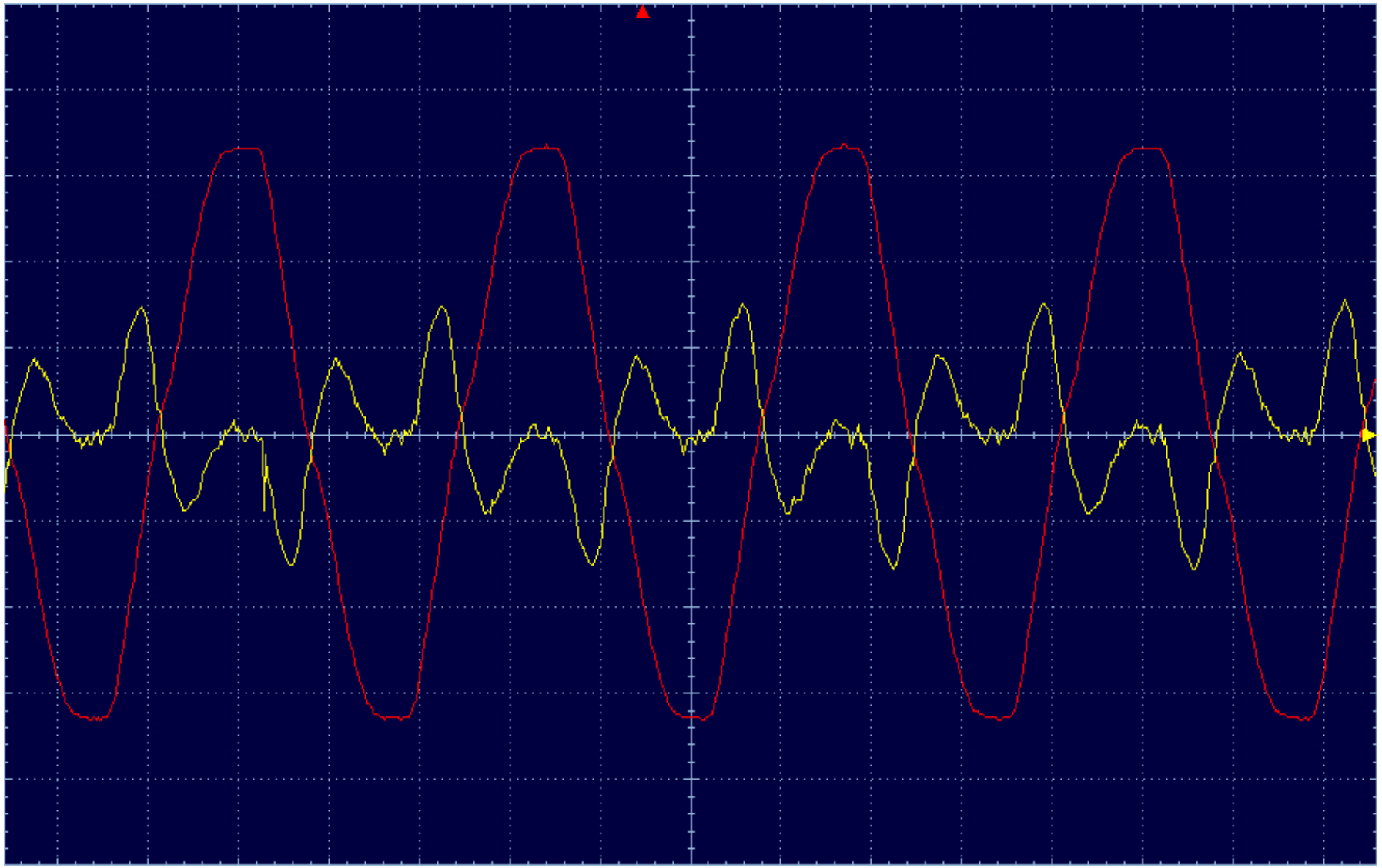
The ITRON “Hall” effect sensors, that Measure volts and Amps, these sensors send distorted measurements to the Metrology Computer as the result of added Oscillations/Harmonics and voltage Transients from the SMPS



What do these transients look like? (at my home)

The RED lines are your normal 60 cycle (Hz) 120 volt power wires. (actual peak is 167 volts)

The YELLOW lines are Transient volts (16 Volts)that are injected on to the power wires from the SMPS – These are not normal and should not be there. So these volts are being added to the measured value of the meter, in this case We see about a 10% error that will be calculated. This was done with few appliances running except a refrigerator and a few lights on. The Heat was off. This transient increases as additional load is demanded



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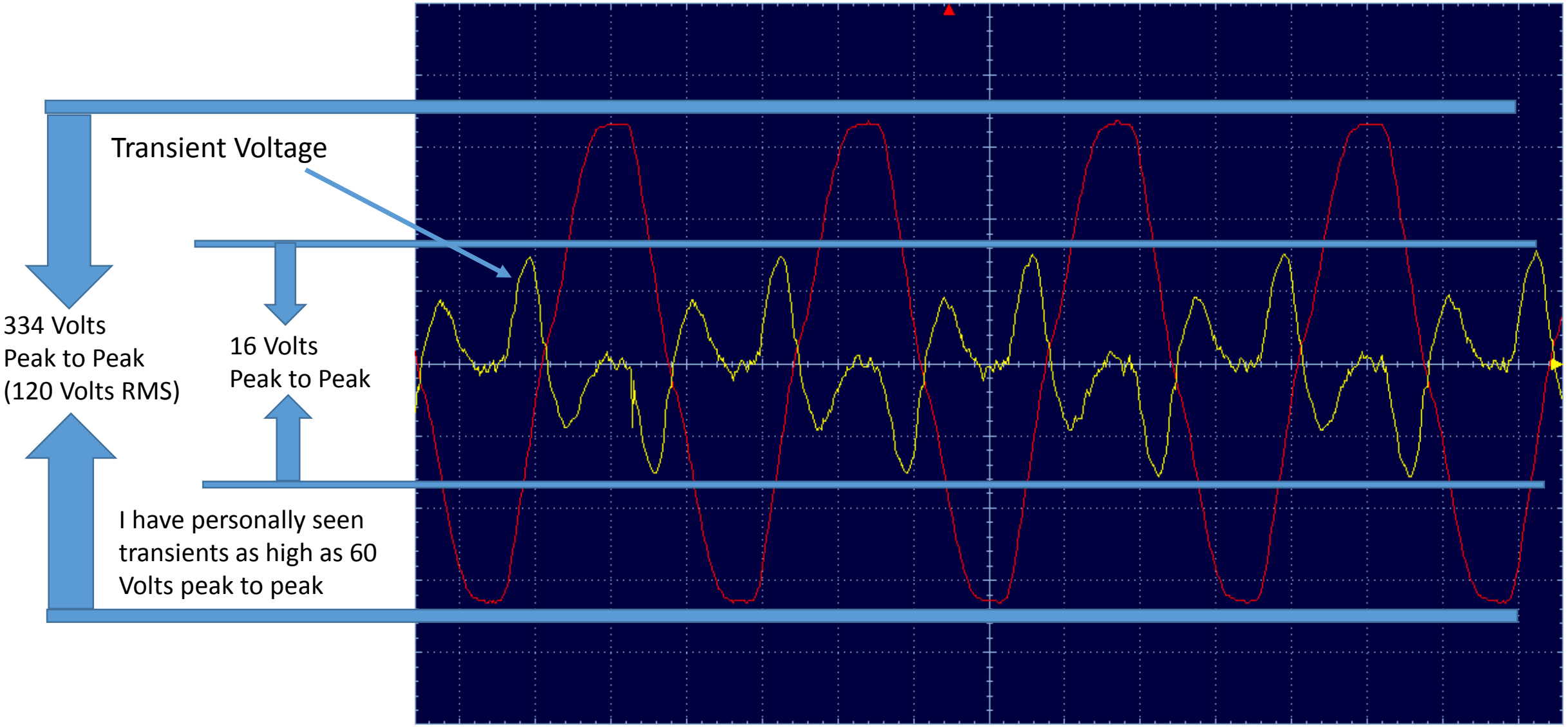
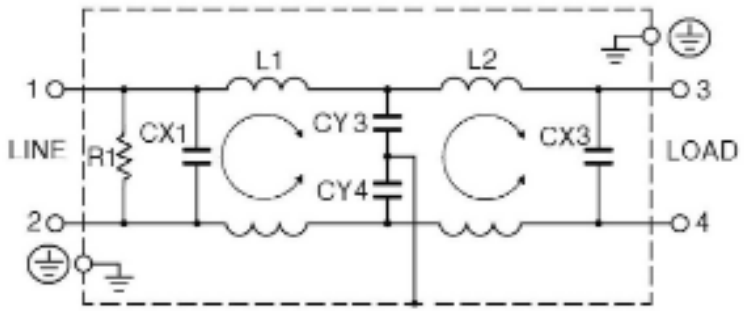


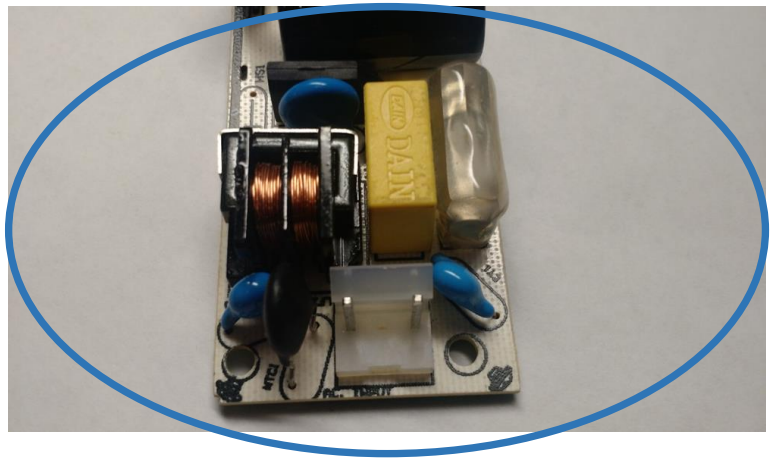
But wait, what about my cell charger, or other electronic devices, don't they do the same thing?

The simple answer is NO

The meter manufactures left out a very simple thing that is in all your other household devices, it is called an EMC filter.

AN EMC filter looks like this diagram and picture:





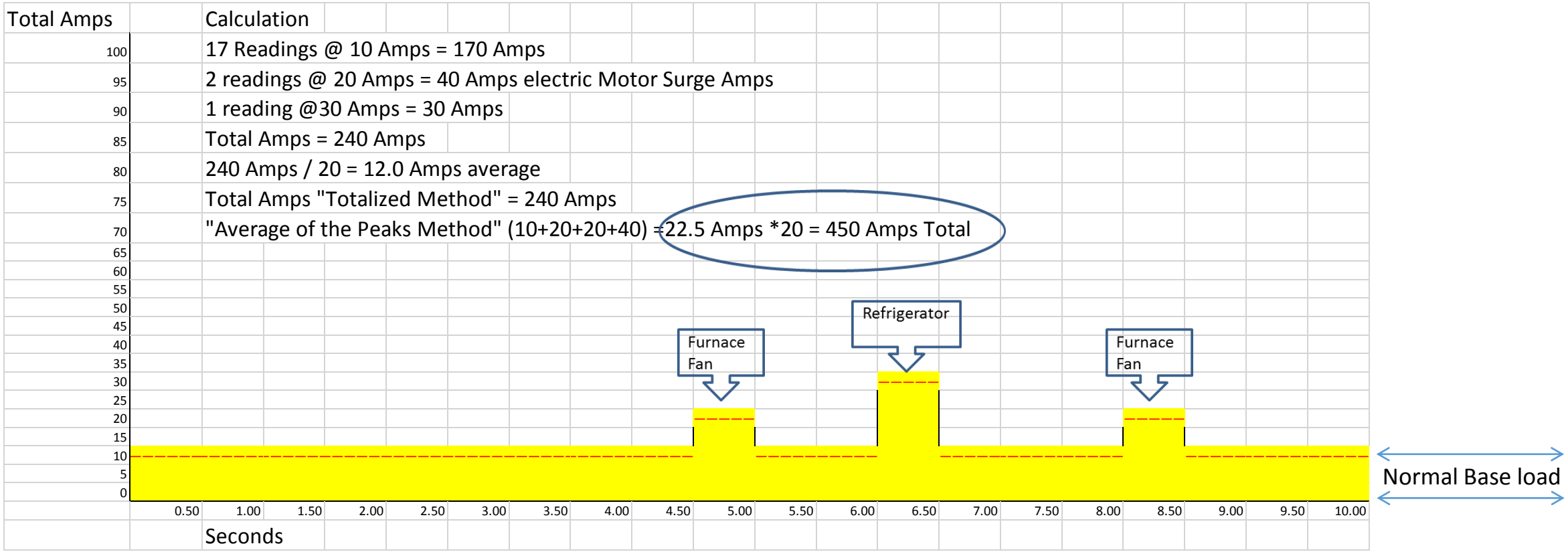
If the meter manufactures had added this type of filter it would have cost the meter manufacturers about $2.00 to add this to every meter power supply and all these voltage transients would have been prevented. So, all these people complaining about sudden higher than ever bills can be in part be attributed to the design of the SMPS and the overall meter architecture.

But Wait, I thought the new meters we more accurate?

	Accuracy	Precision
Definition	The degree of conformity and correctness of something when compared to a true or absolute value.	A state of strict exactness — how often something is strictly exact.
Measurements	Single factor or measurement	Multiple measurements or factors are needed
Relationship	Something can be accurate on occasion as a fluke. For something to be consistently and reliably accurate, it must also be precise.	Results can be precise without being accurate. Alternatively, results can be precise AND accurate.

So to be accurate I must hit the bullseye 1 time, to be precise, I must hit the same target spot repeatedly. The AMI meters meet the ANSI standard for accuracy, but they only have to hit the reference measurement once to be declared accurate according to the ANSI Test. They do not have to be precise and repeat the same measurement, over and over. ANSI is an industry funded standards body, it is not independent government body as the NIST actually is.

Why is the Bill Higher?
It depends on how it is calculated
Totalized versus Average of the Peaks



The utilities will not likely reveal how they are doing this calculation, unless forced under court order, this method can be electronically changed at will by the utility with no transparency to the consumer

The example of a totalizing meter – a gas pump

A gasoline pump is a totalizing type of device, regardless of how fast you press the handle the meter on the pump registers only the amount total fluid dispensed. It is as if you put the gas in a bucket and then poured it in your tank. The meter reads the total volume of gas dispensed, there is no averaging of the rate at which you pumped the gas.

Since I have managed a power measurement product using current sensors and hall effect sensors I can tell you that averaging electronic readings is prone to results that are wrong. In the ANSI testing there is no fluctuating load characteristics. It does vary in load but the load is very stable. The test is similar to using a very, very large Edison Light Bulb with no variation such as a refrigerator motor starting and stopping frequently, and other “reactive” type of loads such as your furnace fan.

Now lets think of calculating the amount of gas dispensed based on how fast the gas is pumped over a window of time, irrespective of the total volume dispensed.

On the next page the math is calculated, it is a very simplified example but illustrates how easy it is to calculate the wrong amount by using averages over time.

The analog meters we had were true totalizing meters, the wheel and dials worked exactly like a gas pump does.

Totalizing versus Average of the Peaks

Run the pump at the slowest setting at 1 Gallon a minute for 1 minute
Stop pumping for 4 minutes
Run the pump at a faster setting at 50 gallons a minutes for 5 minutes
Stop pumping for 4 minutes
Run the pump at the slowest setting at 1 Gallon a minute for 1 minute

Gas Pump Example	
Averaging of the peaks	
1	Rate of flow in Gallons per minute
50	Rate of flow in Gallons per minute
1	Rate of flow in Gallons per minute
17.33333	Average rate in Gallons per minute - 1+50+1 = 53 -- Rate of 53/3 samples = 17.33 Average per minute
15	Sample window for computing the average in minutes
260	Total Amount of gas pumped via averaging the peaks = 17.33 gallons per minute x 15 Minutes = 260 total
Total Volume - Totalizing Technique	
1	Total volume for 1 minute
250	Total volume for 5 minutes
1	Total volume for 1 minute
252	Total Volume in Gallons - there is no sample window, you could pump 252 gallons over a full hour and it would still total the same amount
In this example you paid for an extra 8 gallons of gas based in averaging the peaks versus total amount pumped	

Summary - The consumer is at the mercy of a computer calculation not in their control

- The consumer is at the total mercy of the utilities, the consumer has no tangible means to challenge an inaccurate reading, even the utility cannot confirm whether a meter is accurate, they do not have the equipment or personnel.
- The utilities and meter manufacturers have created and deployed a product that by design creates inaccuracies in measurements from harmonic distortion called voltage transients/harmonics.
- Transients/Harmonic distortions are well documented to create measurement inaccuracies in multiple studies, one of these is Applied Electrometric Technology AEMT conference of April 2014 G201 “Analysis of Harmonic Distortion Effect on Deviation Measurement of Electric Energy in a kWh Meter. I learned this basic concept in my electrical engineering classes over 40 years ago.