Energy storage and loss in a lossy dielectric per cycle

$$\frac{W}{V} = \frac{1}{2}\left(\epsilon' - i\epsilon''_{eff}\right)E^2$$

Energy loss in a lossy dielectric per cycle

$$\frac{W}{V} = \frac{1}{2}\varepsilon''_{eff}E^2$$

Energy loss in a lossy dielectric per second = Energy loss per cycle * cycles per second (NOT radians per second)

$$\frac{W}{V} = \frac{f\varepsilon''_{eff}}{2}E^2$$

Current density in a lossy dielectric

$$J = iw\left(\epsilon' - i\epsilon''_{eff}\right)E + \sigma E$$

$$J = iw\left(\epsilon' - i\epsilon''_{eff}\right)E$$

$$J = w\epsilon''_{eff}E - iw\epsilon' E$$

If all the loss is due to the conduction:

$$\sigma = w\epsilon''_{eff}$$

$$\frac{W}{V} = \frac{f\sigma}{2w}E^2$$

$$\frac{W}{V} = \frac{\sigma}{2\pi}E^2$$

But we know that

$$\frac{W}{V} = \sigma E^2$$

So where is the missing 2 pi?