

Do you mean energy or do you mean power?

This is a letter that I wrote to two of our local politicians, here in Geelong, in response to a letter I had received informing me of various energy activities in which they had been involved.

Dear anonymous politicians 1 and 2,

I have just read and enjoyed the thoughts you put in your letter numbered 350-3216-27240.

Could I ask you to reconsider how you use the words, energy and power? Let me explain why I make this request.

In your letter you use the word, energy, twice, and you do so quite correctly according to its scientific definition as, "the ability to do work". However, you also use the word, power, on four occasions and on three of these you actually are actually referring to energy and not to power. On no occasion do you use the word, power, correctly according to its definition as "the rate of using energy". On the fourth occasion you write:

"This project could eventually power 120,000 homes with clean, renewable energy." where I guess you mean to say: *"This project could eventually provide clean, renewable energy to 120 000 homes."*

Do you mean energy or do you mean power?

When politicians and journalists speak about energy or power it invariably becomes clear that they have no idea what these words actually mean, as they use these words interchangeably. And when I hear this I immediately lose confidence in their ability to understand the basic reality that underpins globally important concepts such as **peak oil, the greenhouse effect, global warming, and climate change**. When discussing these issues we are really discussing energy and the rate it flows into and out of our environment; that is we are discussing energy ('the ability to do work') and power ('the rate of using energy').

Many politicians and journalists clearly don't know that energy means being able to do something and power is a measure of how quickly the energy is used. One way of understanding the difference between energy and power is to compare them with distance and speed.

If you travel the 1000 kilometres from Sydney to Melbourne in 10 hours travelling time, you know that your average speed is 100 kilometres per hour (km/h). If you do this in a Ferrari with a top speed of 350 km/h you will still average 100 km/h unless you break some, or all, of the speed limits on the way. The Ferrari marketers routinely publicise the top speed even though they know that no-one can legally travel at anywhere near this speed on public roads.

Now let us suppose that in my business I receive regular deliveries that are charged as so many cents per kilometre. It does not matter to me how fast the driver travels to my address. He could deliver my parcels in a truck at 80 km/h or in a Ferrari at 350 km/h. I am buying distance, not speed. Most of us know that distance and speed are quite different concepts.

Energy and power are also quite different concepts. Energy gives us the ability to do things and power is the rate (speed) we do them. Energy is measured in joules and power is measured in watts where the word, watt, simply means joule per second; the word 'watt' is just a short way of writing 'joule per second'.

Suppose you turn on a 100 watt light bulb for 10 seconds to light your way to the toilet. This means that you have just bought 1000 joules of energy from your electrical energy supplier. The 100 watt light bulb uses energy at a rate of 100 joules per second (J/s).

If you replace the 100 watt light bulb with a 20 watt light bulb (using energy at 20 joules per second), you will now use only 200 joules of energy to light your way to the toilet instead of the 1000 joules of energy you used before. Your cost has gone down by 80 % and your production of greenhouse gases has also dropped dramatically because you are using less energy. You are still buying and using energy but you are now using it more slowly.

When you get your energy bill you are paying for the energy you used, not how fast you used it. You are buying energy, not power. You did not – and you cannot – use power for lighting your way to the toilet. Power is always simply a measure of how fast you use the energy.

As another example, if you boil an electric jug to make four cups of coffee you will need about 350 kilojoules of energy that you buy from your electrical energy provider. If you want to do this quickly you need an electric element in your jug that uses energy faster – with more power. A 1000 watt jug will boil this jug in about 6 minutes and a 2000 watt jug will take about 3 minutes.

Few people are aware that energy and power are quite different physical things. They don't know that energy is the ability to do things and that power is a measure of how fast you use the energy.

When selling electrical energy plans to politicians and the public marketing, electrical engineers actively encourage this ignorance. Like the Ferrari marketers these electrical marketing people choose to sell by referring to the top power rating (equivalent to speed) that will rarely, if ever, be achieved. For example TRUenergy has gained political approval to build a solar energy converter near Mildura by describing it as a '345 gigawatt generator'.

Maybe some day ("Solar energy will not come in overnight"), when the Sun is shining brightly, when there are no clouds, when there is no dust in the desert air, when all of the solar collectors have just been cleaned, and when the temperature is at an optimum for solar collector operation, this installation might occasionally be able in a single second to convert 345 gigajoules of solar energy into 345 gigajoules of electrical energy that TRUenergy can then sell.

However, two things are clear: TRUenergy will not be generating power as they are an energy converting company and TRUenergy will never sell power because what they do is convert energy from one form to another and then sell that energy to us in the form of electrical energy. We can then use that energy around the house, and we can choose the power to use it quickly or slowly.

Unfortunately, the marketing engineers have had considerable success with their obfuscation. They have been able to convince many, perhaps most, in politics and the media that the two concepts of energy and power are synonymous and therefore these words can be used interchangeably. This leads to some odd constructions that are routinely used by politicians, reporters, and editors.

I have already mentioned '*power generation*', which cannot be done, but which sounds rather godlike; and the idea of selling power, which is equivalent to a car salesman asking, '*How would you like to buy some 80 kilometres per hour – it's on special this week.*'

When you understand that energy and power are different physical realities, you begin to question whether many word constructions actually have any basis in reality. Consider these examples where the word, power, has incorrectly replaced the correct word, energy: electric power, power assets, power bill, power blackouts, power consortiums, power supply, power companies, power stations, reducing power demand, saving power, solar power, steam power, wind power, and so on. (These are correctly written as electric energy, energy assets, energy bill, energy blackouts, energy consortiums, energy supply, energy companies, energy stations, reducing energy demand, saving energy, solar energy, steam energy, wind energy, and so on.)

In all of these the word power is hopelessly confused when writers don't realise that power only refers to the physical reality of how fast energy is used. Specifically, power cannot be generated, it cannot be bought, and it cannot be sold.

However, the word power can be, and often is, used outside this purely physical reality. Let me construct a mythical story using only words and phrases that I have taken directly from politicians and the daily media:

The politician got his big break into a power position when his party came to power at the last election. As the only engineer in the party in power, the powerful leadership team appointed him as Minister for Power. The Minister for Power was a large powerful man who exuded physical power when he was seen doing his power walk in the corridors of power.

As Minister for Power he enjoyed having the power to supply or to deny power to the community. One of the responsibilities was to manage power stations from their initial power up, maintaining power supplies during their lives of power production, and to depower each power station at the end of its power producing life. He felt that among the various administrative power positions in this powerful government, he alone had any power over real power supplies.

As a practical matter I know that I have to pause whenever I read or hear either of the words, energy or power, anywhere in the media. I try to determine whether the journalist or politician

knows that energy and power are different and distinct physical realities, and I try to guess what the writer and the editors might mean by energy or power according to the context. This makes for rather stop-start, and very slow, newspaper reading, so mostly I just stop reading or listening as soon as I determine that the politician or the journalist doesn't know what they are talking about.

Unfortunately, the marketing engineers have had considerable success with their obfuscation over the last 100 years or so by regularly interchanging the words, energy and power, and by pretending to sell energy in the cobbled together words, kilowatt and hour as kilowatt-hour that give the illusion of selling power. The marketing engineers have been able to convince many, perhaps most, in politics and the media that the two concepts of energy and power are synonymous and therefore the two words, energy and power, can be used interchangeably.

In the meantime gas companies, who also sell energy to the public, use the technically accurate and precise measuring units, joules, kilojoules, megajoules, etc.

Finally, I have to say that I doubt that our politicians can begin to fully understand **peak oil, the greenhouse effect, global warming, and climate change** until they are informed by experts who understand the difference between the physical realities of energy and power and not from articles written by journalists who are deluded by spin from companies who hope to gain from misinformation and obfuscation.

Cheers,

Pat Naughtin