Energy Myths: Challenging Paradigms

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Summary: Depleting fossil fuels, Peak oil and other social and market forces pose a serious threat to energy security. This energy crisis would be felt by all the sectors of an economy as well as the society. Intellectually, we may be aware of issues like 'peak oil' or the energy crises, but our world view is often distorted by the myths in which we live, be it cultural, economic or personal. This article throws light some of these 'Energy Myths' that act as a step back to approach a sustainable energy future.

Keywords: Hydrocarbons, Energy Balance, Carbon Neutral, Peak Oil, Alternate Energy, Sustainability

Introduction:

We live in a world where cause and effect are separated over time and space. It is not easy to comprehend the nature of felt effects against its causes. Continuous exposure to series of effects, with its causes hidden behind deep structures, get construed as beliefs and then transformed into myths. This paper is an effort to demystify some of the energy myths which have a similar line of history and ignorance to which could be detrimental towards world energy future.

Main Body:

1. Energy is always Free

1.1. Money and Environment

The sunlight that falls on our earth creates a free flow of energy which if captured, is capable of sustaining our civilizations for centuries. But can all of it be 'captured', and is it 'free'?

We can no longer think of energy as 'free', not even sunlight! Money is not the only yardstick here. Trees store sunlight and convert this into carbon; a process that takes many years. Humankind utilises this effort in the form of biomass and hydrocarbons. So what price do we put on these energy products? Rs.10 per Kg of fuel wood or Rs.75 for a litre of petrol. The question is what is the true cost? Perhaps it would help us to think in terms of 'Time Durations'.

Imagine you have created a personal 'Time Bank' that is the approximate duration of a lifetime, say, 75 years. Now, consider the length of time trees take to grow so that they can deliver you wood to use for infrastructure or burning energy needed to cook food. Each time you cut a branch from that tree you are consuming decades of time and sunlight. Just because you are getting this wood for free does not mean no costs are attached. Now, subtract the time equivalent to the amount of wood you see around in your home, office and the shopping malls. Pretty soon your 'Time Bank Account' will be overdrawn!

If this made you broke, then think about the amount of Hydrocarbons consumed globally. If we convert this into time equivalents, we can see that we have consumed millions of years of photosynthetic energy in few years. So next time you celebrate your Birthday, put on some extra candles in appreciation for earth's bountiful heritage. After all, we are all derivatives of ancient sunlight.

1.2. Energy for Energy

No matter what technologies we employ, it takes energy to extract energy. The magic of 'Energy Balance' can be seen through the prey/predator relationship. Which do you think would have more energy; the tiger or the deer? Well, if you thought it was the tiger, then all deer would very soon disappear from our forests. You see, the relationship is neither that simple nor unilateral. If tigers were always successful when they hunted, they would always have sufficient energy store to successfully hunt every time. Now, imagine that the only prey available to the tiger were mice. This tiger would invest so much energy in the hunt in return for so less that he would never achieve an energy store surplus. Soon his energy deficit would leave him too weak to catch anything. Nor would he have enough energy to procreate.

This process is called Energy Return on Energy Invested, i.e. energy utilized must be less than energy gained. A basic premise of life is that we have at all times a surplus of energy.

This energy ratio dictates that we must eat sufficient food to sustain the amount of work we do. Now try expanding this to cover other forms of energy such as oil, gas, coal, wind, solar and bio mass etc. If the amount of energy it takes for extraction, refinement and transportation consumes more energy than it delivers, then we are heading towards Energy Starvation. Energy is not FREE. What we need are profitable energy options that deliver enough surpluses to keep our societies and civilizations running.

2. Renewable Energy is Completely Renewable

'Renewable' is a term subject to temporal boundaries (time frames). The sunlight falling on earth renews every day, so these temporal boundaries can be as short as 24hrs. Hydrocarbons undergo millions of years of chemical reactions to be formed. The temporal scale here is way beyond human existence on Earth. Hence, what is renewable may not be perceivable through an anthropogenic or anthropocentric lens.

Perhaps one of humanity's greatest errors is the belief that we can create renewable technologies that can address all our energy needs. These errors are riddled with false assumptions and untested beliefs. Today we have models that, in controlled conditions, are giving promising results, Micro energy generators, solar photovoltaic etc. that can supply electricity to your homes, power your vehicles and recycle waste water. But how practically scalable an idea is that? The debate over renewable energy as the ultimate game changer has its own limitations.

We do have alternative sources of energy, but do we have enough? Rare earth minerals hold the key to many new energy technologies. The problem is many of those minerals are rapidly being depleted especially those which are central for technology development. China holds supply control on majority of rare earth metals and minerals which are central for this technology and alternative energy infrastructures. This has potential geopolitical implications and may shift the focus from the Middle East as oil becomes prohibitively expensive.

3. The 100 year time frame

Human beings often take comfort from thinking in round figures. Whether this is money, distance or time. And they always want to think big! So we will avoid thinking about pessimistic consequences unless they are at least 100 years away. This always happens when we are engaged in conversations about the future. It is so much more reassuring to discuss issues that may affect all of us in a time frame that goes beyond our lifetime. But have we got 100 years to go?

We all know that the rate of change is accelerating. Be it technological advancement, economic growth, fossil fuel depletion, temperature rise or species extinction. We are seeing changes that outpace our cognitive abilities to respond and adapt to them. At this acceleration rate, we will need to act sooner rather than later.

Previous long range forecasts of melting ice caps, temperature rise, peak oil and extreme weather events are constantly being revised and edging closer. This is what happens when we have exponential growth patterns. Incremental growth leads to more incremental growth. A little like compounding the interest on your savings. Except here we are talking about cheap energy supply and economic growth neither of which can be maintained for the next 100 years.

4. Renewable Energy is Carbon Neutral

Is there such a thing as a carbon neutral system? Well, if you grow a tree and then use it for your fire, you are putting the same amount of carbon back into the atmosphere as was sequestered by that tree in its lifetime. So it is carbon neutral, right? But there is a catch.

If it takes many years for the tree to capture and sequester carbon from the air and we use that wood in a matter of days, what happens to the carbon cycle? It is out of its dynamic equilibrium. The rate of consumption has to be equal or less than the rate of regeneration. If we don't match the rate of carbon emissions with sequestration, then the system ceases to be carbon neutral.

So let us look at alternate energy and imagine it is our tree. We manufacture solar panels which act like tree leaves, batteries which are the fuel wood and LEDs which gives light like wood fire. Its manufacturing, storing and then transport consume energy just like tree. Hence, the alternate energy infrastructure has an embedded or embodied energy and carbon footprint. Now, this footprint may be neutralised if the operational life of the alternative energy system is long lived, generates more energy than it took to produce and has no emissions. The question is does the alternate energy deliver as much or more than it consumes to produce it? How do we know?

It only becomes carbon neutral when the pay-back time is much less than its operational life. We must be ever mindful that practically every man made article will carry a carbon footprint and alternate energy is no exception.

5. Renewable Energy will continue to fuel our infinite growth

The problem with issues like climate change or resource depletion is that people assume that 'scientists' or 'God' will find a solution to the problems. The lens or paradigms we use to view the world can create and shape the problems.

So paradoxes arise when the driving paradigm is 'Growth at any cost' or 'Find solutions to keep growing' and the most paradoxical of all 'Sustainable Growth'.

We need cleaner fuels and we also need to reduce our dependency on fossil fuels. If we expect alternate forms of energy to fuel our 'infinite growth' paradigm, then we are living in a fool's paradise. Growth must always have limits and stabilizers. Take for example your body temperature. You will notice that it goes up and down according to a range of factors such as ambient temperatures, activities etc. Our temperature may spike upwards or drop down, but always within a safe and tolerable margin that is controlled by our body's ability to create 'homeostasis or 'dynamic equilibrium'. This combination of change and response is as important to life as our need to find sustainable means of living and not growing.

6. Energy means electricity and fuel

It is important to understand that electricity and fuel are not the only sources of energy needed for life. When our ancestors lived as gatherers hunters, 500 calories of human effort might have been rewarded with 2000 calories of food if the hunt or the forage was successful. This would result in return of a 400%.

Modern day agriculture delivers energy in the form of food that we eat. But do we know how much energy it takes to produce 1 calorie of food? Thanks to our globalized world and the ancient sunlight that powers the food industry in the form of fossil fuel, the energy footprint of much of our food can

be 5-7 times of what is delivered. Think about the energy costs of manufacturing seeds, fertilizers, pesticides, tractors, farm equipment, cold storage and transportation and the production/consumption equation just does not add up.

Electricity and fuel are the most obvious forms of energy that come to mind when we think about modern day production needs. But many energy requirements are less evident, especially those that underpin the very foundations of our modern built environment. For example, the road infrastructure that makes our transport system work and the house that you live in also have an embedded energy footprint. The clothes you wear, appliances you use, rail, car and flight journeys, not to mention laptops and mobile phones; all are derivatives of fossil energy and human labour. So our energy footprint is now narrowed down to one limited resource – Hydrocarbons are running 95% of the whole show and are non-renewable.

6.1. Using less Energy means driving Less and switching off the lights

When we see live disaster events on television, such as the devastating floods and droughts such as we have witnessed in recent years, do we ever think they might be the result of human activities? Or that mankind is the cause? Of course, many disaster events would have been the result of forces of nature and are not necessarily 'man made'. We know that the world is a system that has patterns and structures. Structures are the cause and effect relationships; they determine the change and response of a system and this results in how a system behaves. The behaviour we see over a period of time is a pattern; a series of events that show us some trend or direction or even a directionless oscillation or flux. Human induced Greenhouse gas emissions and their consequent temperature rises are all affecting the way our climate is changing, with increasing numbers of extreme weather events. So, when we hear about a hurricane, we think of it as a one-off event or a weather accident. People rush forward to fix the results of such disasters, but if we do nothing to resolve the underlying structures and patterns that have led to these destructive weather events then our actions are futile.

When fuel and energy prices spike, we think that we can resolve the problem by simply driving marginally less or remembering to switch of a light not being used. Perhaps we can change our car for something more fuel efficient. But just cutting lights and driving less will not solve the problems that reside in the deeper structures of industrial production processes, so energy prices will continue to rise. The current reality is full of structures and policies that are driving us to the brink of an energy crisis, which is not a myth.

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