**Making the right choices today for tomorrow's consumers**

As we approach the second decade of the century, we face the need to make major investments in our energy infrastructure on a scale not seen in 40 years.

One thing we have learned in those 40 years is that it is possible to get those investments wrong – wrong from an engineering point of view, wrong from an economic point of view, and wrong from the point of view of consumers.

Thankfully, New Zealand has made many sound decisions about its energy infrastructure, and only a few bad ones. I think we score a B or perhaps a B+. And that's with the benefit of hindsight.

Looking to the future, I believe that the investment environment we face today is fundamentally different from what it was 40 years ago. However, I would argue that the major driver of that fundamental shift in the environment is not about engineering, or economics or even demographics.

Instead the major driver of the shift is the fact that the New Zealand energy consumer is about to make the kind of sophisticated claims on energy services that they make of the other technologies that contribute to the lifestyle they want. While we may be well geared up to meet challenges in engineering and finance, the question is: how well do we understand what consumers want and what investments are needed to respond to them?

So it is my task today to look into the crystal ball and ask how we can get the next round of major investment right, and specifically how can we get it right for tomorrow's consumers.

That's a major challenge, for reasons I will explore in more depth later on. At the outset, though, it's helpful to reflect on the fact that we in the energy industry have somehow managed to escape the consumer revolution that has swept through almost every industry in the last couple of decades.

Any middle-aged New Zealander can tell the story of how we used to be happy with 1kg blocks of cheese, how we marvelled that we could get three different varieties of wine in those convenient cardboard casks with the little taps on the side, and how impressed we were when the lads from the Post Office telecommunications division managed to install a new landline in our house in only six weeks!

Times have changed, but curiously they have not changed that much for energy consumers. We still provide energy to households in something equivalent to the 1kg block of cheese.

Households have not, by and large, asked for more than that. Somehow, like Rip Van Winkle, energy consumers went down for a nap forty years ago, and never quite woke up.

In the meantime, energy infrastructure investment forged ahead in what I would call 'single objective mode'. With enormous goodwill and dedication we brought together the best minds of our generation and went full out to give our sleeping consumers what we thought they needed.

We can look at that 40 year investment cycle as a kind of tag-wrestling match, as one discipline struggled with the challenge for a while and then another took over.

First up, in the 60s and 70s, were the engineers and central planners who oversaw massive investment in harnessing our natural resources – hydro, thermal, gas – to create generating capacity, and in building the transmission network to deliver power to growing urban populations.

The focus was on effective resource utilisation and robust systems planning, and the solution set was ‘path-dependent’ in that, once the engineers and planners had decided to go down a particular path, and convinced their political masters and purse-holders, no further thought was given to the alternatives.

Meanwhile, Rip Van Winkle slept on.

Then in the 80s the accountants and managers got the nod, and we moved into the corporatisation space. We started to think of energy as a business, rather than a public service like water and sewerage, and the focus shifted to questions of how to incorporate commercial objectives into every part of that business, that is, how to get efficiency, how to undertake resource allocation, and how to improve return on investment.

Meanwhile Rip Van Winkle half woke up, and starting asking questions about rising power bills.

So in response we sent in the economists with the task of giving the consumer assurances that they were paying a competitive price for power. They shifted the focus onto market structures and how to maximise competitive pressures and transparency at the retail level while creating consistent market signals for long-term investment, and – not unexpectedly, whenever economists start talking theory – the consumer went back to sleep.

Then, at the risk of over-simplifying things, in 1998 the lights went out, and energy consumers started to wake up and smell the coffee.

They woke up first to the fact that some of our legacy infrastructure was starting to creak under the pressure of growing demand from a growing population, especially in Auckland and the top half of the North Island, where we had very few generation assets. And they woke up to the unpleasant reality that fixing it – at least, fixing it through an exercise in civil engineering and construction – would have major cost implications, as well as impacts on the visual environment and on current land use.

Suddenly, they realised that there were difficult trade-offs to be made, and they began to ask: Do we have any alternatives?

Consumers also woke up to the fact that energy generation, transmission and usage has an impact on the environment and in some of its forms can actually contribute to global warming and climate change. Suddenly, the act of flicking a switch got connected to our concerns about the kind of planet we want to leave to our children and grandchildren.

And thirdly consumers woke up to the fact that they had remarkably little choice as energy consumers, compared to the choices they had become used to in the huge range of other goods and services that gave them the lifestyle they enjoyed.

It was as if each day they sat down to meal of exotic and delicious foods that their parents would never have dreamed of, but in the middle of the table they still had a cardboard cask with a litre of Muller-Thurgau in a clear-plastic bladder.

So, as we ask ourselves how to make the right investment choices for tomorrow's consumers, the first thing we need to realise is that we now deal with a consumer who has got out of bed, has showered and dressed, drunk one if not two cups of strong espresso, and is ready to engage.

In other words, the consumer is On.

What might this shift mean, then, for how we make investments today in our energy infrastructure?

I want to suggest a number of components to this shift, acknowledging at the start that this cannot be an exhaustive survey, and that, like any developing market, the emerging energy market will almost certainly find a way to surprise us.

The first thing to note is that we will see a proliferation of objectives. All of the legacy objectives will still apply, things like security of supply and price competitiveness. But a new set of objectives will be overlaid on top. And we won't be able to address those sequentially; we will have to make the shift into a multi-objective operating and investment environment.

That will open up the value chain for scrutiny, as we ask: what is it that energy consumers value, and how do they trade-off security of supply, environmental sustainability, choice, price competitiveness, and so on? This will create more uncertainty on the one hand, but on the other hand it will create opportunities for new business models.

What I mean by that should become apparent if we look at some of the fresh mix of objectives that tomorrow's consumers will ask us to address. There are three I want to talk about today:

'Wireless' energy;
Green energy; and
Energy choices.

First, 'wireless energy'. This is a dangerous concept for the CEO of a lines company to be talking about, and you will be happy to know that I don't mean this entirely literally. What I am referring to is a shift analogous to the wireless revolution in telecommunications. Our future consumers, after all, will increasingly be the generation brought up on mobile phones rather than land-lines and wireless internet.

So what I mean by "wireless" energy is the values they will instinctively look for in a technologically-advanced service industry: they will look for services that are personal, flexible, tailored, value-added, and networked. They will look for smart provision that packages services around how they want to live their lives, that predicts what they will need and finds a way to deliver it.

It will be a generation that increasingly loses touch with the on/off switch. Their expectation will be that the technology around them is permanently on, and what's more technology that is permanently interpreting and responding to their needs.

We at Vector are at the sharp end of this, in that power outages bring about the 'end of civilisation as we know it' not only for business customers, whom we expect to rely critically on their technology, but also for households whose daily routine is often now governed by intelligent (but mains-dependent) machinery.

Secondly, green energy. So far as consumer sentiment is concerned, the tipping point happened several years ago. Any player in the energy sector who is not on the path to sustainability and carbon neutrality is not on the path to long-term profitability either.

What's more, that path may not be as long as we had thought. Green energy used to be synonymous with expensive energy and insecure supply. That is changing rapidly, and the tipping point from a return on investment point of view may be upon us soon.

A recent McKinsey analysis shows that the price per watt for photo-voltaic panels over the past 30 years has dropped by about 6% per year, every year. There has been the occasional supply-demand induced plateau, and we have had one of those in recent years. But most analysts are now predicting around a 15% - 20% fall in the next 6-12 months, which means it will return to the long run trend.

Some analysts predict a step-change in the cost arising from current developments around thin film photo voltaics. As you may know these are materials that do not use silicon (which is a major cost component) and which can be printed onto flexible or light materials, thereby creating new applications for solar.

McKinsey notes that if the current thin film developments achieve predicted price levels they could make solar PV as cheap as New Zealand grid electricity within three to five years. That depends upon assumptions about hours of sunlight, the cost of PV and price of grid electricity.

However, even if thin film PV does not accelerate the historic price trend, that underlying trend would bring about price convergence within 10 years.

It should be noted that this analysis pre-dates President Obama's recent announcement of his new administration's energy goals, which aim to free the US energy economy from dependence upon foreign oil. That shift – from a fossil-powered presidency to a solar-powered one – will greatly increase the flow of research and investment capital into renewables and the related technology.

In an industry which traditionally invests with a 40-year time horizon, we need to be predicting what that inevitable shift will mean in terms of things like asset values and how price competition works, but more generally what investments we need to make (and who should make them) to create an energy system in which, for argument sake, 60 percent of homes may have photo-voltaics embedded in their roofing.

That brings me neatly to my third new consumer-driven energy objective, and that is the expansion of energy choices.

What I don't want to do now is reel off a list of innovative products and services that are now or could in future be offered to New Zealand consumers. We all have a good idea of where the cutting edge is.

The important shift we have to make is not the shift from the old Henry Ford approach of "you can have any colour you like so long as it's black" to an approach which says "well, you can have green or blue or red". What our customers will increasingly want is control of the paintbrush.

That has been a hard concept to apply to energy supply, since, after all, the product we deal in is in fact an electro-magnetic field that they will never actually see.

What I believe we should be aiming for and investing in is an energy system that shares some of the attributes of the open source model of operation and decision making that has been at the heart of expanding choices and innovation in the world of computer software.

That is, a system that allows concurrent input of different agendas, approaches and priorities, and that harnesses that dynamic to push forward innovation and create the space for new business models to be developed and to attract investment.

From a lines industry perspective, the focus is on facilitating this through creating a smart-grid. World-wide there are very large flows of investment, particularly from private equity, into transforming the legacy electromechanical power grid of the 20th century into a "Smart Grid" for the 21st century, that takes advantage of utility automation and increased use of distributed generation technologies and the capacity to create multi-directional flows of energy to create new uses for stand-by power and peak load shaving.

A smart grid exploits to the full the capacity of a modern network to import, measure, and export energy flows from a large number of sources to meet the varied needs of a large population.

Essentially we are talking about disseminating a major portion of the 'thinking' function of an energy supply system from a few central control rooms to a network of intelligent devices such as advanced meters, sensors, monitors and controls, power electronics systems and networks; and smart equipment and appliances.

What this shift will encourage is a change in what we mean by innovation in the energy sector. Those of us with an engineering background can easily recognise innovation in terms of an improved power pole or switch design. But while this will remain important, there are untapped opportunities for innovation in and around the customer interface by reframing the broader 'contract' with the customer and rethinking the value we add in areas like product design, pricing systems and information systems, and in partnerships with architects, major power users and local authorities.

That is where the new frontier is, and we need to make sure that our large scale infrastructure investments facilitate and do not obstruct those developments.
I want to finish by acknowledging the fact that we are in a global economic downturn, and one that is likely to be with us for long enough that it could recalibrate the world economy in ways that are hard to predict.

Recessions are like meteor showers in that once we emerge from the bunker, we know we will find that the landscape has been significantly altered and we don't need to worry about the dinosaurs any more because they are dead. This makes any major investment programme a fraught exercise, and investment in energy infrastructure is no exception.

I think we are unanimous in our support of the Government's infrastructure investment stimulus package. Maintaining demand in the economy while enhancing the nation's overall productivity is a very sensible objective.

My only concern would be that infrastructure investment needs to be distributed across the value chain. Our transmission system is definitely a major candidate; but we need to be mindful of other projects and make sure that we don’t close out future options and thereby limit consumer choices.

Our policy makers need to take a connected view, and could benefit a great deal from watching overseas developments, in particular the reshaping of the US energy economy, and feeding those insights into our policy frameworks.

We need to avoid the temptation simply to make incremental refinements to our existing legacy, which may do nothing to overcome the problems of fragmentation that have plagued the way we think about policy, regulation and investment.

And we need to keep our regulatory systems under review, to make sure that they get the balance right between promoting the interests of today’s consumers and facilitating investment into the things that will deliver next-generation value to those same consumers.

So, to sum up, investing today for tomorrow’s consumers requires first of all that we as an industry shake off the last vestiges of the benevolent paternalism that shaped energy infrastructure investment in the last century.

Our consumer is awake and highly caffeinated.

Our consumer is green and price sensitive.

Our consumer is living a wireless life and wants a power supply to match.

Our consumer expects choices.

Our job is to make investment choices that deliver all of that.