Oakley Greenwood

Positioning Effective Price Signals to the End User Customer

Jim Snow

Energy Pricing Summit
9 December 2011
Melbourne

Key issues

- The importance of price and price structure
- What SMI (AMI) will enable in terms of pricing
- Cost reflective tariffs – be they time differentiated and/or capacity based
- Choices for retailers
- Choices for distributors
- Choices for customers
- Implications for vulnerable customers
- Implications for demand management

The importance of price and price structure

- Prices remained relatively low in real terms until 2008
  - Total energy consumption grew steadily, though peak demand grew faster largely due to strong economy and rapid increase in penetration of air-conditioning
  - Load factors decline, which drives up average unit price
- Significant prices increase begin, particularly in NSW and QLD
  - Some DBs (Ausgrid, Energex) start to notice a decline in weather normalised consumption in the residential sector, though peak demand continues to grow (though slower than previously)
  - But the combination is likely to be even worse for load factor: Ausgrid forecast to 2019 (total system load):
    - Peak demand: +1.6% pa
    - Energy consumption: - 1.4% pa

This is a rational response to price by consumers to largely flat energy pricing.
Consumers respond to price and price structure.
Current pricing exacerbates the 'top end' problem.

What SMI (AMI) will enable in terms of pricing

- The profile available from an interval meter will allow accurate assessment of the customer's use of wholesale energy and network assets, and therefore the real cost of being served
- This can be time differentiated in terms of their usage and/or reflect the capacity used
- In-Home-Displays, web portals, and other applications will be able to provide customers with very granular information on their energy use in a timely way so they can react to signals
- In most cases, though, price (rather than information alone) will drive behaviour
  - Coupled with good information and load control services responses are greatly enhanced
  - Interestingly where there is a combination of more dynamic generation and network pricing Retailers have voluntarily installed SMI/AMI for their customers
- But all will be affected - customers, retailers and distributors will face new choices for price arrangements and service offerings to assist customers and themselves – it will also promote innovative competition which is really sadly lacking

Choices for retailers

- The serving retailer will know
  - Which customers they are serving at a loss
  - Which customers are producing above average profit
- The first thing to note is that this unwinds hidden cross subsidies between individual customers – the Net System Load Curve starts to unravel
- Secondly large volume users may not always be the largest margin customers
  - When all customers have the same profile, the largest provide the largest retail margin
- Cross subsidising customer groups starts to have greater risks as do flat tariff arrangements
  - The price offer to the “loss” group will go up over the long run, as retailers will not want to knowingly serve customers at a loss
  - Similarly they will also need to be prepared to offer a more competitive price to the more profitable group as they will be vulnerable to other retailers willing to serve them at an average profit and who can determine how to do so by assessing the load profile
  - Margins will normalise over time – but not prices
  - Flat tariffs will be provided and taken up - but they will have higher inbuilt margins for the risks

Choices for distributors

- AMI (and the now virtually complete separation of distribution and retail businesses) opens a number of questions that have always been there:
  - *What commodity should we price* – kWh, kW, kVa?
  - *On what basis should we differentiate our pricing* – end-use customer class or use of system assets?
  - *Who are our customers* – end users or retailers?
- Our *strawman* for best outcomes:
  - Price cost-reflectively (price based on cost-drivers such as capacity; price for indifference)
  - Price based on use of system assets – voltage level differentiation
  - Price to retailers – in bulk at bulk supply points if needed (effectively how it is done anyway in the end)
  - Provide a range of services that reduce retailer/customer costs based on the pricing e.g. load control, embedded generation control?
- Benefits
  - Reduces revenue risk and become indifferent to consumer/retailer behaviour
  - Provides correct signals to the parties that can best manage the risks associated with those signals
  - Provides a rational basis for further involvement of distributor in demand management
  - Makes network indifferent to (or at least provide insulation against) policy decision regarding carbon outcomes

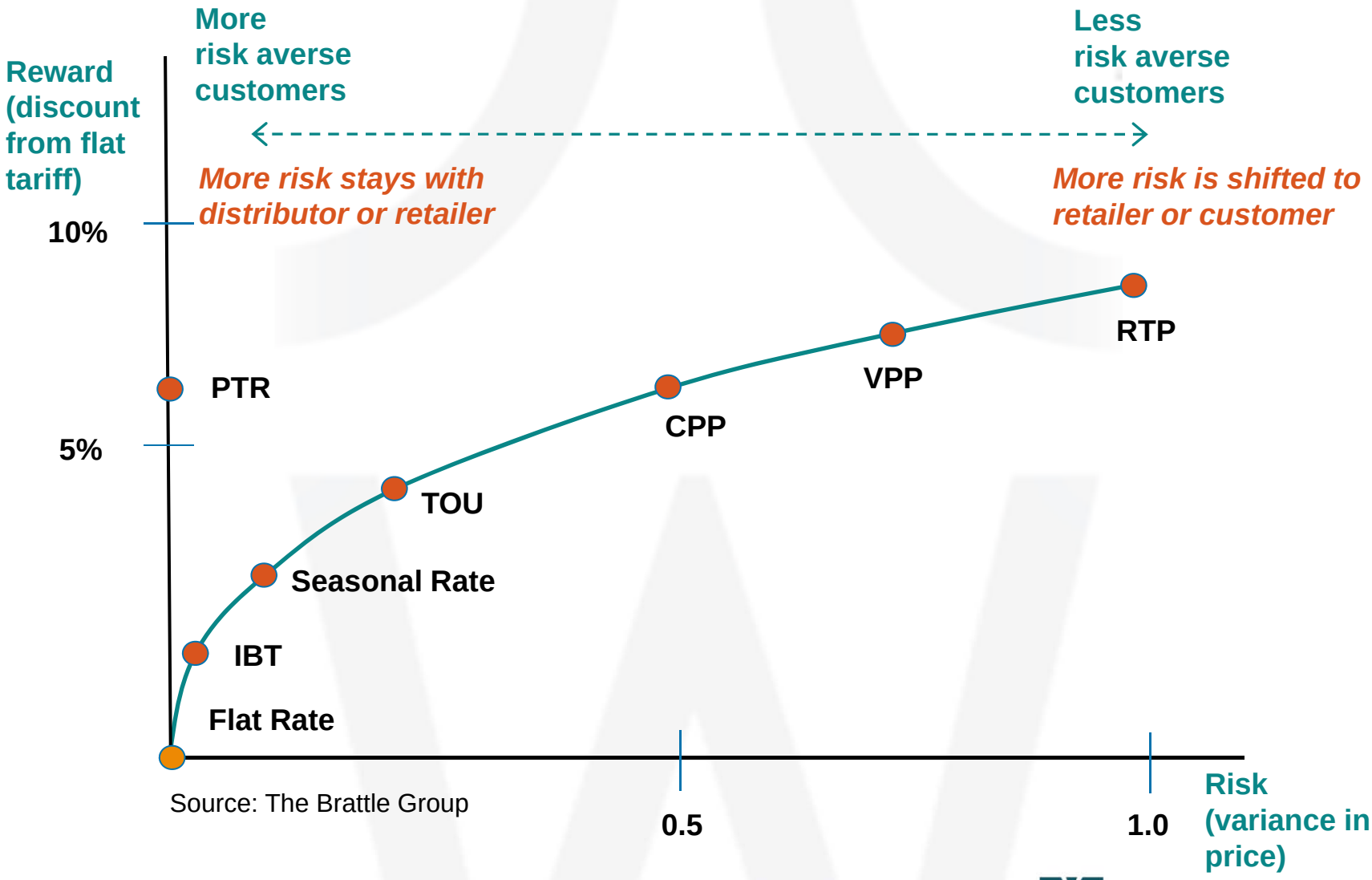
A wide range of new pricing structures is available

- Capacity based pricing (CBP) – this is the norm with large users for example – but could be applied to residential users
  - Customers pay a capacity charge that is based on actual maximum demand for the year – can be actual or averaged over several years so customer benefits by reducing demand,
  - May have fixed charges as well to signal real costs once capacity is paid for,
  - And an energy charge where costs vary in that way
- Critical peak price (CPP)
  - A higher price is set for a predetermined number of hours or days on which demand and/or energy price is likely to be at its very highest levels
  - The price is fixed, but the duration of the event may be fixed and non-varying from event to event (CPP-F) or it can vary (CPP-V)
  - Consumers are notified in advance of each critical peak event; generally the day before the event, but can be less depending on the particular pricing arrangement
  - In CPP-V consumers are notified about the duration of the upcoming event at the same time
  - Is often superimposed over a ToU structure, but can also be combined with a flat tariff
- Variable peak price (VPP)
  - Essentially a CPP in which the price can also vary and is notified to consumers prior to the event

A wide range of new pricing structures is available

- CPP tariffs are essentially a means for pricing demand in energy terms
  - AMI will allow distributors to price based on demand (CBP), including combinations of peak demand, anytime maximum demand and average demand
  - Many historical reasons why this hasn't been done and will require a significant transition but has been successful in NZ for some 18 years
- Peak time rebate (PTR)
  - Set up like CPP in that a set price is established that will pertain during specific hours on a maximum number of days upon notification by the utility
  - However, rather than this price being a price the customer pays during those periods it is a rebate that is paid by the utility for each kWh that the customer reduces consumption on event days below his/her baseline consumption on similar days
  - One issue is where this money comes from – and has major gaming risks as with any rebate scheme
- RTP
  - Consumer is charged a price that reflects actual movements in wholesale electricity price
- These types can be used in combination, for example:
  - CPP or PTR can be superimposed over a flat tariff or a time of use tariff or seasonal option
  - RTP can be used for the variable part of a load, with the baseload on a static ToU or flat tariff

Dynamic pricing arrangements shift risk



Source: The Brattle Group

Oakley Greenwood

Changes in network price structure

- The major reform in pricing that is emerging is **network pricing to the low voltage system users**
  - This was the genesis of the Time of Use and AMI developments for example
- Evidence suggests that while customers may find they can cope with time-varying prices, and many even benefit from them, a large segment do not accept them voluntarily, and
- Unless the development is well implemented many customers can become downright suspicious and hostile to them
  - Not everyone wins when you unwind a cross subsidy as we have discussed
- As a result, retailers have tended to offer flatter pricing structures – and they will continue to try to respond to what customers want
  - If more dynamic pricing gets traction either across the market or in segments they will naturally respond – in the long run
  - Competition should also start to bring pricing innovations customers may adopt in the long run if the market is allowed to explore these options – less prescription is better than more
  - Flat tariffs with high premiums will also invite competition from demand response enabled offers – again innovation may change the dynamic

Changes in network price structure

- Traditional network pricing has also been relatively easy for retailers to cope with and this has created its own inertia
  - Most network tariffs for smaller volume customers tends to be energy based, and
  - The retailer can simply add the charge to all portions of the NSLP for pricing (no price risk, no incremental volume risk)
  - Energy changes price every 5 minutes within an enormous band but it can be hedged
- However there is no counterparty for a financial hedge on network charges – it has to be managed in different ways but these can be just as effective (as we have seen in energy as well)
  - Where the network tariff introduces either (or both) more volume or price risk based on consumer behaviour, the retailer will be less likely to repackage the network price as say a flat tariff (and this has been well proven for example in NZ)
- The more dynamic the variation the greater the propensity to pass through
  - A three part static TOU network tariff is more likely to be able to be 'absorbed' by the retailer within its price offer as compared to, say, a critical peak day or capacity/demand based network tariff

Result

- The distribution charge is more likely to get through to the end-use customer
- If it doesn't, the retailer has to deal with the risk
- In either case the pricing can make distributor economically indifferent if it is based on some form of the long run average incremental cost for demand (LRAIC) and other drivers of underlying fixed and variable costs:
  - If peak demand is reduced, the reduction in revenue equals the long run average incremental cost of demand that will not be needed
  - If peak demand grows, the long run average incremental cost needed to fund augmentation is collected

LRAIC is the annualised cost of adding coincident peak demand growth onto a system at the time of system peak, developed as the average for the system e.g. say adding 200 MW onto a 5,000 MW system peak – what is the annual cost that needs to be recovered to pay for this at say WACC plus O&M?

Customers are also likely to have more choices

- As in any business, more information about how customers use a product leads to more segmentation of products and offers and major innovation
- Flat price offers will still be available
  - Will be based on the customer's profile (or a time-band simplification of it) with a risk premium
- Sculpted offers will also be available for those customers that want them
  - 'Passive winners' – those with lower cost to serve profiles (i.e., those who have been subsidising others under the NSLP)
  - Those who can change their consumption to produce a lower cost to serve profile
- There will be a need for the retailers to develop tools that can quickly process profile information – or surrogate information – into offers
  - They will also be keen to get load control and other DM services from networks (especially if already part of the rate base case) and/or develop a range of these for themselves
- There is likely to be a continuing role for Government or third parties to provide bill comparison services (though input data will be more complex and costly to process)
- There will be a role for the provision of tailored advice to customers on ways they can change they behaviour or end-use technologies to produce a lower cost to serve profile while maintaining acceptable lifestyle amenity

What about those who say they “can’t change their profile”?

- They will face the actual cost of their electricity service
- There will be a need for social welfare programs for some customers, but presenting the right price is vital to avoid economic and social distortions across the customers and the industry
  - This is a basic tenet the developed world has preached for years to those developing their power systems – make subsidy efficient……IMF, World Bank and ADB mantra?
  - Social welfare should also include technology enablement that AMI (if installed) will allow – without loss of amenity
  - Poor credit history is undoubtedly a major social welfare factor – but it is a factor even for customers with relatively ‘good’ profiles – the quick fix can often be the worst one
  - Really this is basic **policy** stuff – and yet it is often so poorly done?
- Will customers with “poor” load profiles have difficulty getting offers?
  - May be difficult for them to get offers they will *like*, but there is no reason to believe that offers won’t be available
  - Innovation will develop for these groups – lots that can be done to mitigate load profile issues

Next steps for distributors to consider

- Our mantra to the industry

  "If you look like you are broken, someone will come along to fix you"

  - While this is true of the industry as a whole (viz. the number of reviews going on, particularly about why prices have gotten so high), it is arguably most true in relation to the networks
  - The alternative is for the industry to take the lead in identifying what needs to be done

- With regard to DM, it is noteworthy that of the 5 questions raised by the AEMC in its recent *Strategic Priorities for Energy Market Development Discussion Paper*, 4 were directed to networks

  - "Who owns the 'property right' to control loads – is it always the customer, or might it be the retailer or system operator (or the network business) in some circumstances?"
  - "What should regulated networks be obliged to do in respect of investment in, and providing access to, smart grid technology – and how should economic regulation be designed to provide the right incentives?"
  - "What is the boundary between regulated and competitive activities in this space, and how should access and pricing be regulated across this boundary to promote competition and enable innovation and flexibility whilst providing appropriate customer protection?"
  - "Technology could create scope for network businesses (or affiliate businesses) to sell products in the wholesale market, e.g. load reduction sold as a hedge contract in direct competition with generators."

AEMC's strategic focus on DM

- Note that the AEMC is primarily concerned with *demand response* to address low duty-cycle infrastructure
  - *Cost-effective demand-side participation in the electricity market can help reduce the need for more generation and* ***network investment*** *to meet forecast increases in peak demand.* (page 39, emphasis added)
  - *This strategic priority has the potential to mitigate the impact of rising prices, and to increase market resilience, particularly if more demand side participation is available at times of high demand.* (page 39)
  - *The AEMC wants to ensure that there are no unnecessary barriers to cost effective demand side participation and development of energy efficiency measures.* (page 44)
- AEMO (2010-11) estimates that there may be as much as 600 MW of demand response in the NEM (about 3.5% of installed capacity)
  - 177 MW very likely to educe consumption in response to high prices
  - 423 MW with an even chance of doing so
- By contrast, WA has about 475 MW – about 8% of its peak demand (and increasing)
  - This would translate to some 1,400 MW in the NEM under the same market arrangements

But why this interest in networks for demand response?

- Clearly, there isn't much (visible) demand response in the energy market – but has flat prices
  - Vertical integration - gentailers
  - Caps and other financial hedge instruments are generally readily available and relatively inexpensive
  - Demand response, by contrast, has high transaction costs for prospecting, administering and settling
- But Network prices have risen in some jurisdictions very rapidly yielding significant price shocks to customers – it has generally been the part of the supply chain causing this effect
- Where a retailer is exposed to pool price (unhedged volume) and has a fixed price to the end-use customer, it will want to reduce that volume to manage the risks
  - However if the retailer is vertically integrated with generation assets it may not want – even in this situation – to change pool price
  - In all other situations (i.e., when the retailer is hedged) the benefit of DR is essentially an arbitrage of the pool price and the DR strike price – there is no incentive to change pool price as it reduces income to both the retailer and the customer(s) providing demand response
  - This application of DR amounts to a wealth transfer from generators to retailers and DR providers
  - Where the retailer is also a generator the incentive is limited to customer acquisition and retention/satisfaction
- However - it is reasonable to expect that beneficial changes to the network load duration curve will also be beneficial to the wholesale market – from an economic perspective

What stops networks from doing DR?

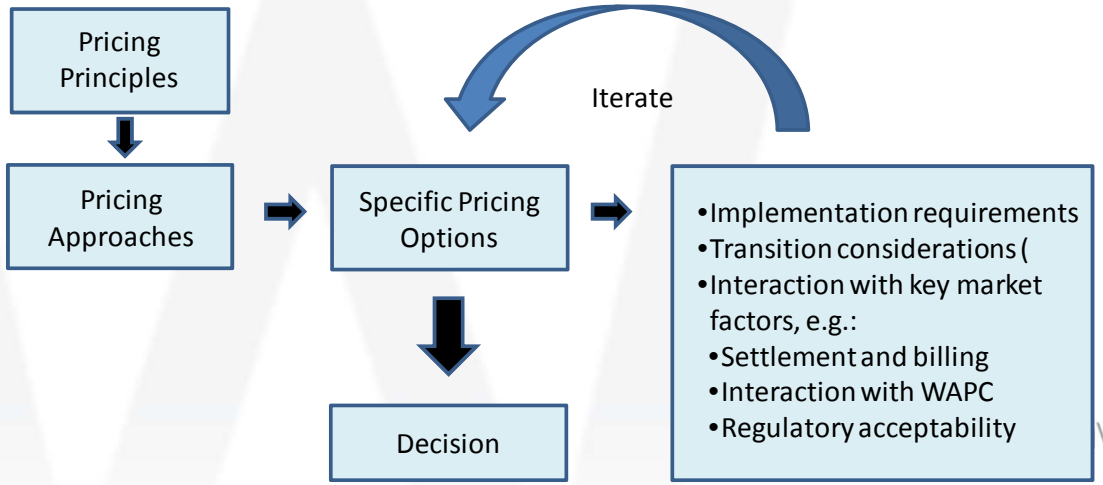
- Current incentives overwhelmingly favour investment in network augmentation
  - Supply side advantages:
    - Culture/practice/track record: networks are expert in and comfortable with supply-side solutions
    - There is a mature market of suppliers, products and constructors of supply-side solutions
    - Established track record of being able to deliver supply-side solutions on time and on budget
    - Very comfortable with the delivered reliability of the technology, which is primarily passive – once installed it provides the rated capacity in the overwhelming majority of cases and situations
    - Other costs also starting to impact networks prices – renewal capital, reliability standards and expectations, energy sales decline limits smearing opportunities (& Ramsey pricing approaches)
    - Critically, it is how networks earn money - perfectly aligned incentives – capital competition ?
  - Corresponding demand-side disadvantages:
    - Generally low capex so earning potential is low (and may be existing prohibitions from network owning assets on customer side of the meter, which further reduces RAB potential)
    - Is not an off-the-shelf purchase as supply-side is – at present DR must be prospected and transacted; networks have little expertise in these areas, and it adds to the time required and the costs
    - No way to trap the full supply chain benefits yet
    - Often technical views that demand-side may not respond when needed so reliability appears less certain than supply-side, or needs more risk mitigation

What can networks do?

- As discussed, new approaches to network pricing can:
  - give an explicit price signal regarding low duty-cycle infrastructure, and
  - make networks much less financially dependent on throughput - and solve a potential problem under regulatory regimes such as the Weighted Average Price Cap
- Overcoming these disadvantages will require a transition phase and a permanent change in incentives for networks
  - Incentives will need to reward network for doing a demand-side alternative – they will need to be financially at least as well off as if they did the supply-side option.
    - Performance incentive modelled on the mechanics of the Service Target Performance Incentive Scheme
    - Demand Management Incentive Scheme
  - A transition period will be needed to cover higher transaction costs of demand-side solutions (at least through a significant activation phase) and provide the capability for the network to revert to the supply-side alternative if demand side does not prove up in a particular instance
  - In the longer term, transaction costs should reduce as standardised processes are developed and some level of known (standing) capacity in DR is developed
- Pricing can be done now – but it is a journey – some on the way already

Managing the transition in network pricing

- Stakeholder, shareholder and community concerns will all need to be managed:
  - The magnitude and speed of price increases – and knee jerk reactions/quick fixes
  - The ability for an effective welfare support mechanism to be put in place
  - The need to continue to recover required revenue over the transition period
  - Community expectations regarding network/industry involvement in DM and energy efficiency
  - The historical resistance of customers and reticence of regulators regarding increasing fixed charges or demand based charges with regard to small volume users, and the need to be able to explain the rationale for them, while also providing mitigation strategies
  - The level of cross subsidy that exists in the current tariffs when transposed to a use of system asset framework and what that implies, in light of the other factors above for unwinding them
  - The reactions of retailers to the network prices as they unfold
- An iterative process



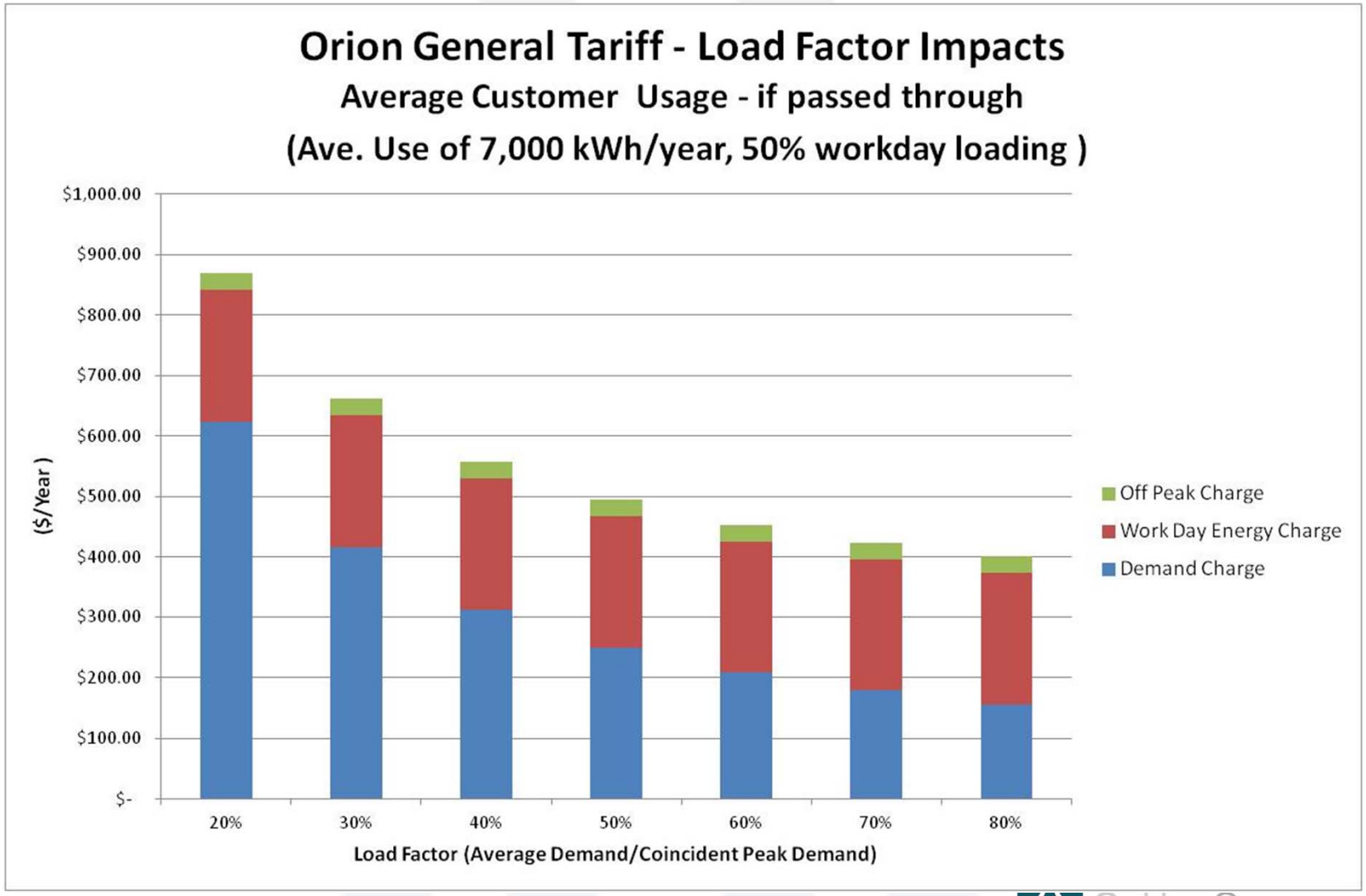
But it can work

- A very similar approach has been used successfully for about 18 years in NZ by Orion Energy – based on Long Run Average Incremental Cost (LRAIC) process (Snow) developed in 1993 – now applies even to low voltage customers

Tariff Component		
Peak Charge	42.80 cents/kW/day	Charged based on usage recorded on dynamic peak days
Energy Charge Working Week Days	6.215 cents/kWh	7 am to 9 pm
Energy Charge - Other	0.785 cents/kWh	Rest is all Off peak

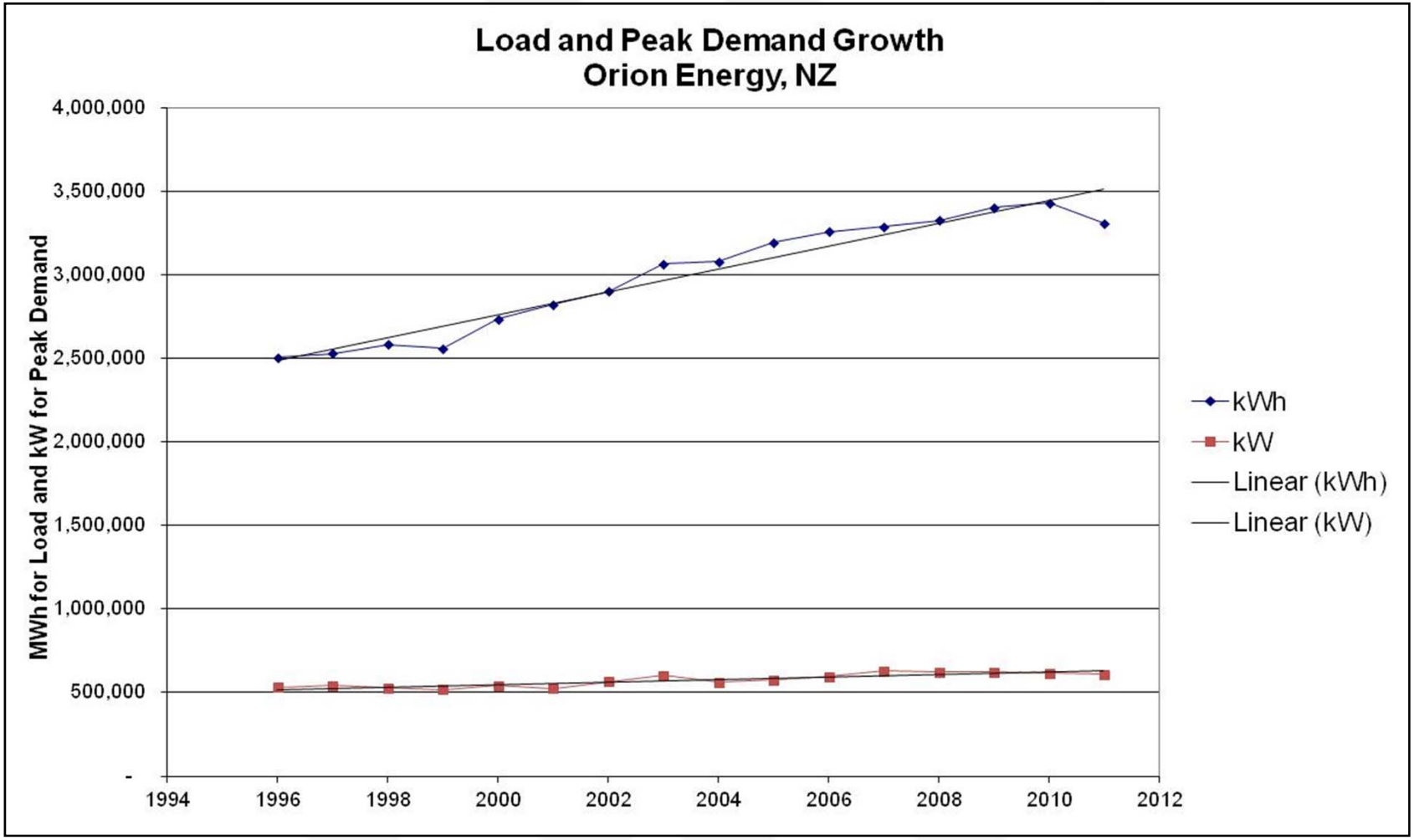
- **Retailers charged in aggregate for their customer load on the Orion Network**
- **They also deploy peak reduction rebates and embedded generation credits using the LRAIC – settled at Grid Exit Points (using NEM type data)**
- **All major Retailers <u>voluntarily</u> installed Interval meters in response**

Impact of load factor on general tariff charged to Retailers



Oakley Greenwood

How has it performed – load factor improved by 20%



Load Factor has gone from 53% to 64%
Peak demand has risen 0.8%/year – energy 2.3% - nearly 3 x faster

Oakley Greenwood

If all economists were laid end to end, they would not reach a conclusion.

George Bernard Shaw

Thank you

Jim Snow, Director
Oakley Greenwood Pty Ltd

+61 4 1777 5893

jsnow@oakleygreenwood.com.au

www.oakleygreenwood.com.au

Oakley Greenwood

Oakley Greenwood – paper on our site now

Melbourne

Alan Rattray

- Energy trading and risk management
- Strategy advice
- Analysis

Lance Hoch

- Gas and electricity network and retail regulation and pricing
- Demand side expertise including energy efficiency
- Climate change impact analysis

Rohan Harris

- Gas and electricity network pricing and regulation
- Water industry regulatory expertise
- Regulator Economic expertise

Brisbane

Jim Snow

- Business Strategy
- Gas industry experience
- Energy project development
- Network regulation
- Energy Marketing
- Demand side
- Industry Restructuring

Jim McDonald

- Gas industry expert

Wellington, NZ

Andrew Shelley

- Regulatory economics
- Model development
- Competition matters

Adelaide

Greg Thorpe

- Market policy, market design and regulation
- Market analysis and market modelling
- Climate change impact analysis
- Transmission / Generation interactions

Sydney

John Wallace

- Network development and operational management expert
- Senior Utility management
- Experience
- Network Regulation
- Network development dispute analysis

Oakley Greenwood

www.oakleygreenwood.com.au