Overview

Electricity Prices have risen 50 %

- Compare to the WA SWIS and also the breakdown of actual costs between generation, distribution and retailing as a proportion of the prices in WA (monopoly) and deregulated states. See appendix 1.

Compare supply charges

- What proportion of supply charges is for infrastructure and for retailing?
- Compare the annual supply charges for natural gas and electricity for a variety of locations which are supplied with electricity and gas. This must occur in all states & territories.

Poor focus on consumers

- Consumers have no immediate feedback on consumption and prices
- No easy means of comparing prices of different fuels
- Attempts to minimise the appearance of high prices by supply charges at a daily rate and the use of tiny units to keep the apparent prices low. It's like pricing milk by the teaspoon instead of by the litre.
- Saving money by switching off standby power is an attempt to deceive the public. The % of the average bill is tiny leaving the power companies to keep making the same profits. Eg a new TV uses 65 c/year using Synergy A1 tariff.

Inadequate demand management.

- Demand should be divided into 3 types
  - Short Term: Time of day, weather controlled
  - Medium Term: Seasonal variation, variations in the economy
  - Long Term: Population changes, technology in both in generation and demand, climate change
- The auctioning of electricity is be based on
  - The demand at the moment
  - The available supply

  The problem with this system is two fold

  - The price of energy is not predictable by the users because of the auction system and the predictions used by the bidders.
  - The ability of the generators to manipulate the price by restricting supply.
  - The current system uses the peak demand in a 1800 second (30 min) block. So if the peak demand is of a small proportion of those 1800 seconds, the rest of the period is overcharged.

- The price during charged for that 30 minutes must be the same for each direction of delivery.
- Some years ago, a California power company paid for more efficient light bulbs instead of installing a new generator. This is an example of demand management.

Reliability

- Reliability needs to be specified with penalty clauses related to the % power delivery averaged over the previous 12 months.

Failure to supply as a parts per thousandth of a year (31,556,926 seconds)

Failure to supply (‰)	days	hours	minutes	seconds
0.000 01				0.3
0.000 1				3.2
0.001				31.6
0.01			5	15.6
0.1			52	36
1		8	45	57
2.5		21	54	52
3	1	2	17	51
5	1	19	49	45
10	3	15	39	29

To type ‰ push and hold the Alt key and type 0137 on the number pad in number mode.

Failure to supply as a parts per thousandth of a quarter (7,889,232 seconds)

Failure to supply (‰)	days	hours	minutes	seconds
0.000 01				0.001
0.000 1				0.79
0.001				7.9
0.01			1	19
0.1			13	9
1		2	11	29
2.5		5	28	43
3		6	34	28
5		10	57	26
10		21	54	52

To type ‰ push and hold the Alt key and type 0137 on the number pad in number mode.

The first quarter starts on the summer solstice which is midnight 23rd December each year, and lasts for 7889232 seconds (91 days). This approximates the seasons.

The failure to supply must have penalty clauses for the quarter (for repairs of damage) and clauses for a year for maintenance. The clauses are per affected customer and charged to the retailer who can then pass the cost up to the appropriate distributor who can if appropriate on to a generator if that was where the fault lay.

There needs to be an additional penalty for single to small numbers of consumers who get unreliable power eg 10 ‰ from poor maintenance.

Distributors and particularly network operators also need to be penalised if poor maintenance causes fires in and under their infrastructure eg line clashing. This could be detected automatically by measuring the frequency the current spikes and comparing the pattern with the local wind and temperature records provided by the Bureau of Meteorology.

The ‰ of failure to supply will determine the amount of money spent on maintenance, provided the penalties are high enough and there is an independent arbiter. The danger with this system is that is very slow to respond. So no maintenance may occur for many years and then the companies cannot afford to get their network up to scratch.

Regulatory ownership.

Competition will not work were there is a single line going down the street. It is not cost effective to have a power line for each company going down the street. This is why the NBN now exists. It also applies to water and sewerage for the same reasons. Since there is no competition it should be a government owned enterprise.

The interconnection infrastructure between states may be viable if there is 4 or more companies involved but this is not necessarily viable either for example SA to Vic.

Retailers. What proportion of the cost of electricity is made by retailers. Their only job is to increase demand and contribute little to the supply of electricity.

Generators. Yes, competition here is viable on a network, however how is the domestic and small scale generators to get a fair price? The current system is to auction the sale of electricity in 30 min blocks. How can thousands of small scale producers engage in these auctions and how does the distributor get paid for sending the electricity in the opposite direction?

- **Australian governments should create an industry-funded representative energy consumer body with the expertise to be an effective participant.**

I agree with this.

- **Some 25 per cent of retail electricity bills are required to meet around 40 hours of critical peak demand each year.**

Considering that the usual cause of these peaks are weather extremes, it is unlikely that a higher price for 40 hours a year will make any real difference in demand. The end result will be black or brown outs.

There are only three things you can do

- Legislate so that all heat pump compressors and any motors over 1 kW must use a variable frequency drive (VFD) to control the motor speed and the instantaneous power used on start up. (Inverter air-conditioners have a VFD)
- Use the NBN to communicate to the smart power meter when the infrastructure peak is approaching and then reduce the compressor speed by half to reduce the load at the time. This will work in heat pumps for both summer and winter.
- Those customers who are exporting power at that time will not have their compressor slowed. This is to encourage enough generation locally to run the customers' own heat pump.

Creating real competition

Pricing all energy including electricity and gas in $/GJ will encourage customers to use gas if available for the winter peak. Now comparison pricing will give real competition.

Social responsibility

Cross subsidisation between those who cannot pay should be reimbursed through the social welfare system that can assess eligibility. Then it can be applied equitably.

For example for a given amount of energy used in winter for example, an all-electric house will cost much more than a gas and electric house. Should the payment be equal?

Cross subsidisation between city and country needs to be maintained as it is done in other public systems such as the NBN, phones, postal…

A greater incentive for local generation of power should be given at the outer edges of the distribution system considering the losses on long power lines. For locations not on the grid and where local generation is provided by the power company the incentives should be much higher. See "Horizon power" as an example.

Itemised costs of running an electricity business by sector

Generators including individual domestic and small business generators

Energy supply, energy conversion efficiency, where it is less than 100 %, taxes, (carbon pricing where applicable), pollution charges for the disposal of waste (eg. Fly ash, infrastructure purchase and maintenance, interest, depreciation, provision for expansion and profit.

In addition damage due to unforeseen circumstances. eg cyclones, droughts in hydro systems.

Distributors

Cost of electricity, the loss of power through the network from the point of sale to the point of delivery, taxes, infrastructure purchase and maintenance, interest, depreciation a provision for expansion and profit. In addition damage due to unforeseen circumstances eg cyclones.

Network operators

Cost of electricity, the loss of power through the network from the point of sale to the point of delivery, taxes, infrastructure purchase and maintenance, interest, depreciation a provision for expansion and profit. In addition damage due to foreseen and unforeseen circumstances eg cyclones. Infrastructure includes power meters for consumers.

Retailers

Labour for sales and administration, infrastructure including meter reading software, website, computers, NBN charges , communications charges, taxes and profit.

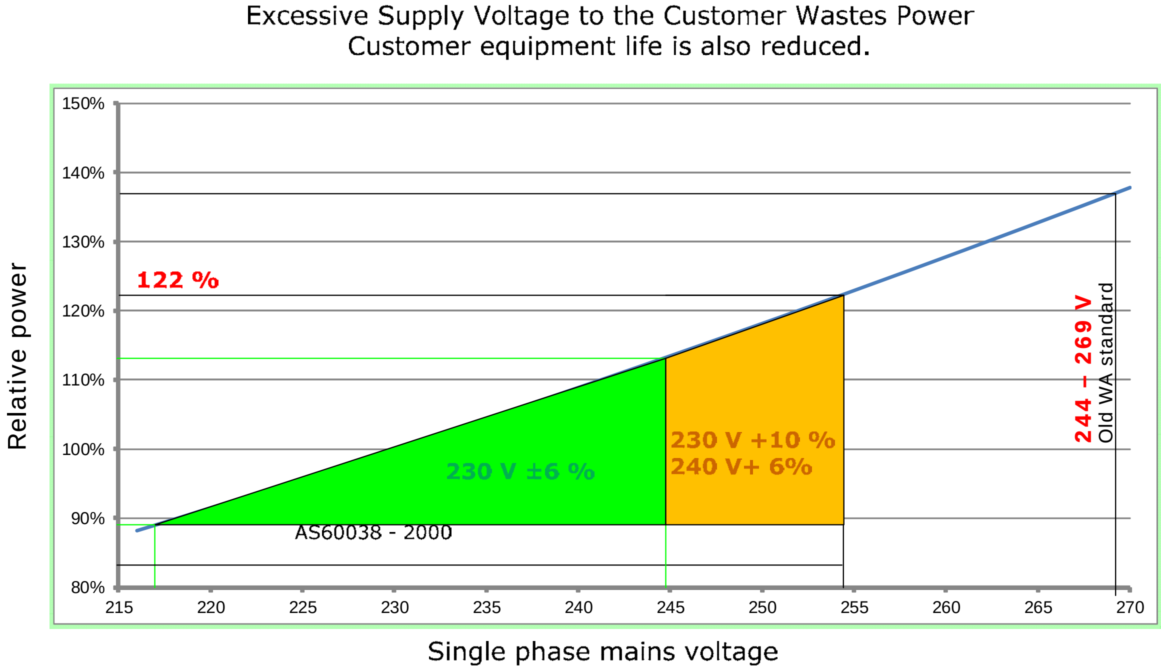
Note: Retailers do not produce electricity or move it to the customer. They just collect the money for the generators, distributors, network operators and the taxes for the governments. Their proportion of the cost should be low. This being the case competition will not reduce the price of electricity by a large amount. So should this area be privatised?

Note: Carbon Trading needs the carbon charges paid by the generators to be distributed amongst the customers in proportion to the energy consumed. The distributors and network operators only need to apportion the carbon trading costs. It should not be included in a composite price otherwise the GST will be applied to the carbon price.

Not included are:

- The voltage supplied to the low voltage consumer.

  The International Electrotechnical Commission of the United Nations standard IEC 60038:2000 and subsequently Australian standard AS60038:2000 is supposed to reduce the power mains voltage to 400 V from 415 V for 3 phase and from 240 Volt to 230 V all ± 6 % although a temporary upper limit of +10 % is allowed during the transition. A number of network operators have no intention of reducing the voltage despite the fact that the standard is 12 years old. Virtually all low voltage equipment designed for a voltage of over 150 Volts is designed for 230 V. The end result is a waste of power, increased infrastructure costs for network operators, interconnection and generators. This ignores the shortened life of equipment including solar inverters and virtually all electronics.



- The Voltage supplied to low voltage customers

  A survey of all network operators and retailers needs to be made and enforcement of the AS60038: 2000 be made, with a completion date to adjust the network to 400/230V ± 6 % specified. Please include WA. & NT.

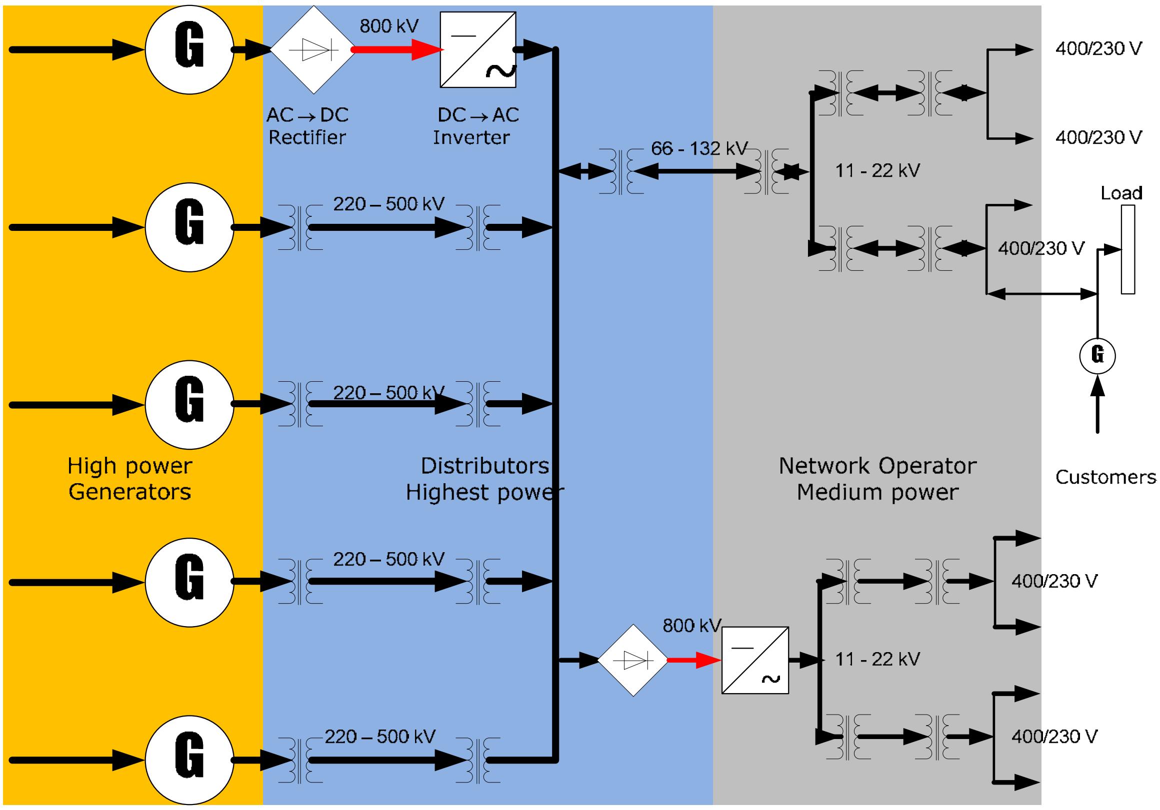
  All electrical/electronic equipment is designed is designed for 400 or 230 V in 50 Hz countries. Using 415/240 V wastes extra power and reduces the life of nearly all mains powered electronic equipment.

- The quality of the power is not mentioned

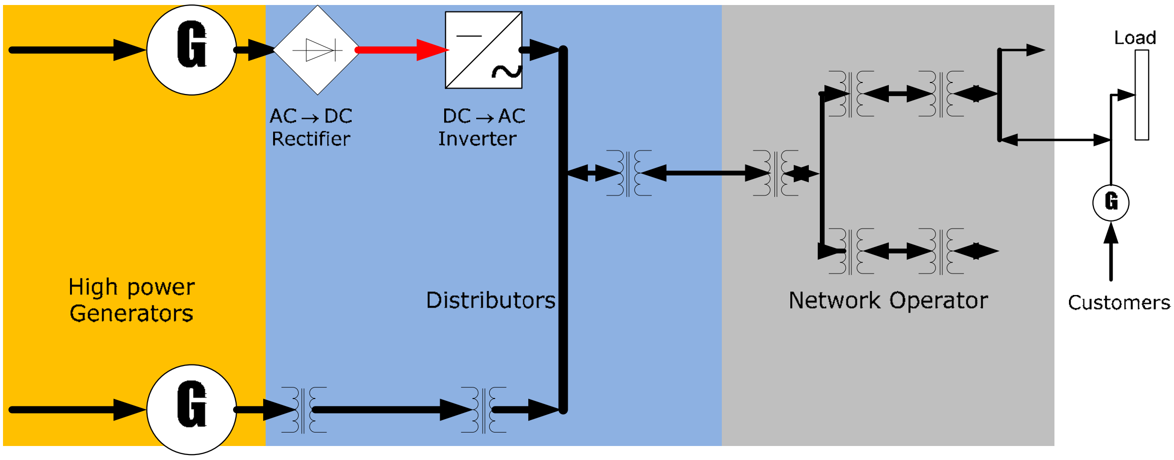
  There should be a maximum spike voltage and minimum voltage dip specified measured at the metering point where there is a fine on the network or the other consumers to keep the power clean.

  With so many switching power supplies on the power lines there also needs to be a specification the level of interference to power voltage ratio. This is to ensure that consumers to not feed interference up the power line and that the network operator does not add interference to the line. Eg Internet on the power lines.

Network diagrams



Overview of the Electricity Grid



Each component of the system from the generator input to the pillar at the customer must be measured for power flow every second. A component may be a power line.
Each component from the generator input to the pillar at the customer must have a live display and records of efficiency (%) = $\frac{\text{power out} \times 100}{\text{power in}}$

The Reliability in ‰ must also be shown for each component.

Indicates a very high voltage Direct Current line which has extremely low losses for long distances including under water (eg Bass Strait)

Transformer for AC only.

Power flows of the Electricity Grid

Overview

- This shows the components of the system.
  a. The high powered generators

     The convert energy from one form to electricity. Energy sources can be radiated such as solar, chemical such as coal, natural gas, petroleum, canola oil, mechanical power such as wind and wave power and heat such as geothermal.

     A carbon trading cost applies to all chemical sources which contain carbon. No other component in the electricity system produces carbon dioxide.

  b. The Distributors

     They operate long distance high powered power lines. The most efficient is 800 V DC http://www.energy.siemens.com/hq/pool/hq/power-transmission/HVDC/Smart%20and%20Bulk%20Power%20Transmission.pdf

     AC power lines of greater than 200 kV.

     The Distributors connect the high power sources of electricity to the highest demand customers, the Network operators.

Competition will not work here unless each generator and each network operator has 4 power lines from different companies to choose from. With the banks, not even 4 competitors seems to be enough.

c. The network operators

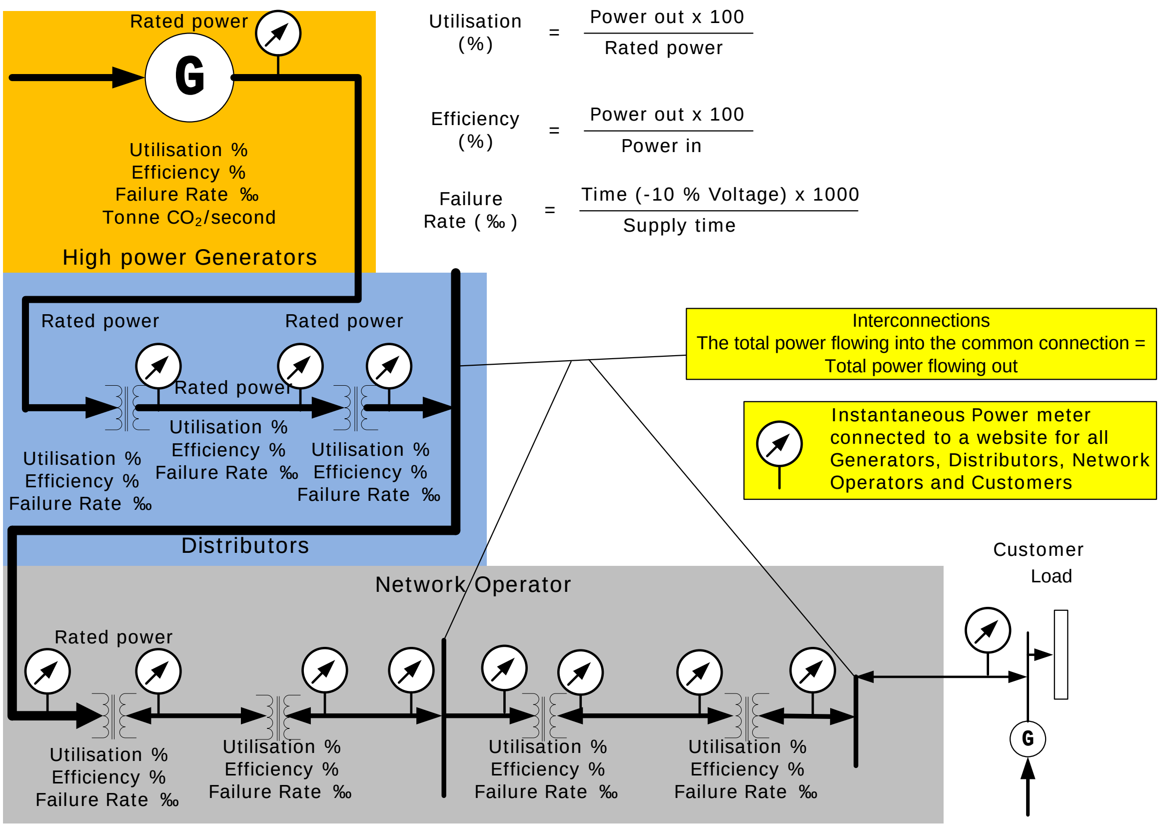
It is uneconomic to put 4 power lines down each street to get real competition, so the network operators should be owned by their respective state governments.

4. Retailers

Perhaps, retailers should sell all types of energy. Such as electricity, natural gas, petroleum, Diesel, ethanol…. This could be used to break up the monopolies in the petroleum retailing business. The retailers must not be corporately connected to the generators, distributors and network operators. They must also not be connected to the major retailers because of their potential to form duopolies over a large number of industries. Retailers must be Australian owned because of the big effect the retailers can have on our economy.

The advantage of the above systems is that the cost of data collection can be minimised. It is also advantages for the retailing of electricity for electric cars.

All energy should be sold in the same realistic unit the GigaJoule and the prices quoted in $/GJ.



Performance monitoring and billing

Data Collection

Currently statistics for the high power sections of the industry are in a variety of energy units or even volumes

Eg. TWh/year, PJ/year, barrels/year, millions of litres/year.

All of the above units can be converted into PetaJoule/year.

$$Power = \frac{Energy}{time}$$

In the above units the time is measured in years where as the standard unit for power is the Watt. The difference is that the time is the second. There is 31,556,926 seconds in a year. The result is the average power for the whole year.

The average and peak power supplied in all energy types should be publically available on a website.

$$Price\ each\ second = \frac{Current\ power\ output\ of\ the\ interconnection}{Average\ Power\ output\ of\ the\ interconnection}\ x\ \$/GJ$$

Average Power leaving the interconnection is averaged over 94670778 seconds (3 years).

The National Broadband Network will allow all metering sites including individual consumers to give real time power consumption, real time billing and real time display of pricing even when the overall demand is varying.

Pricing

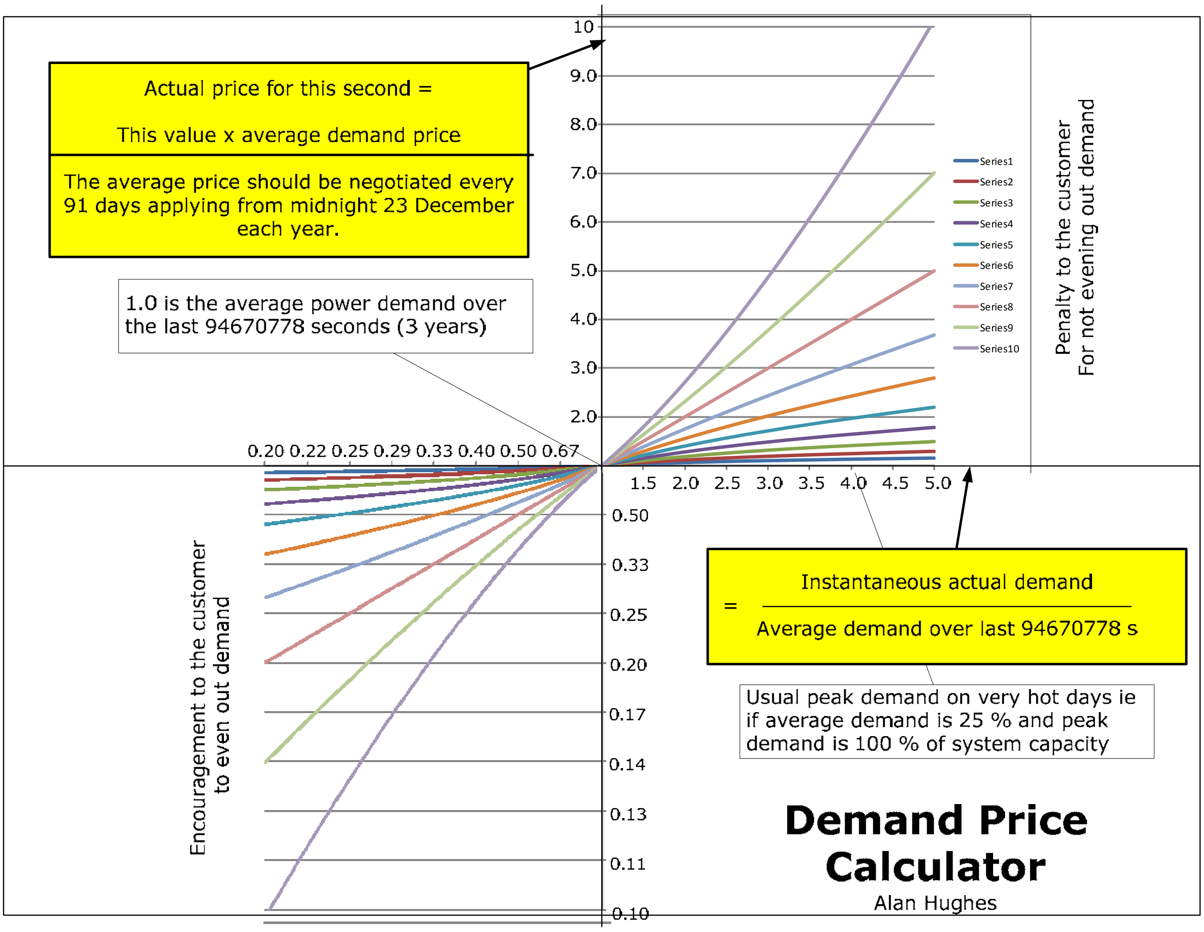
I propose another system for consideration. Demand pricing rather than time of day pricing.

This system uses an Auctioned price for the long term average demand (3 years) in $/GigaJoule. This auction occurs once per season (ie every 91 days) so that seasonal variations can be used in the price. However the price of variations in demand is on a fixed ratio to that price. On the following diagram there is a series of different values of square law to determine the rate of price increase or decrease with consumption. Which one of these graphs could also be selected per season or specified by the AER.

The actual accounting uses the energy generated, moved or consumed for each second. This value is added to the previous second's energy and this continues for the billing period. Remember that a Joule of energy is the power times the time and in this method the time is 1 second, so the value of power for that second is the energy value for example 1 MegaWatt (MW) is on MegaJoule generated, moved or consumed in one second.

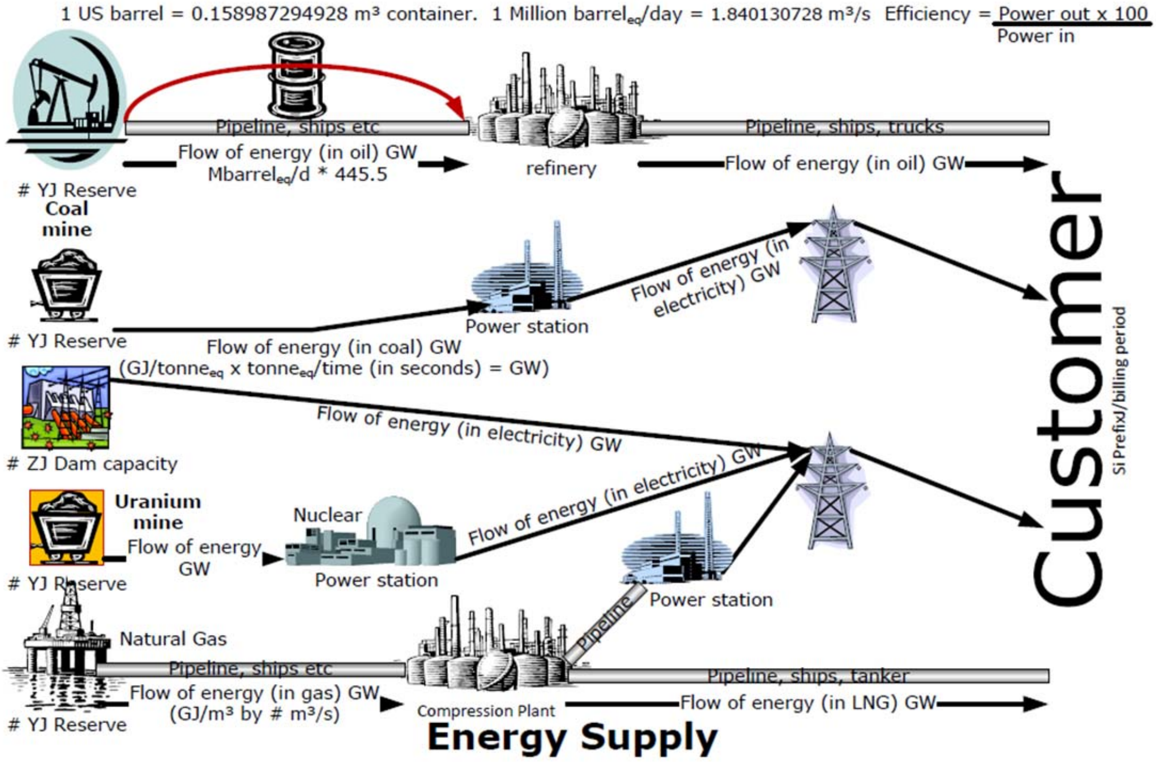
The advantage of the above system is that there is no hedging on the price of peak power electricity only how much will be sold in a season. This reduces the risk allowing lower prices to be charged.

All electricity, and gas should be priced in $/GJ so that there is competition between fuels.



Energy supply

This diagram shows how all forms of energy can be compared in both price and now much power is flowing. Then enables predictions for example the introduction of the electric car etc.



Appendices

1. My submission into the ERA WA's Inquiry into the Efficiency Synergy's costs and Electricity Tariffs.
2. My comments on the AER's Statement of approach to the AER price comparator Website

Strategic Energy Initiative Directions Paper Energy 2031 Submission

Critical Planning for West Australia's Energy Future Page 8 - 9

Cross-subsidisation

There is no mention of availability to all West Australians and their businesses and to the degree of cross subsidisation between the locations of high customer density to the isolated customers.

This is currently being seen as a cost rather than a benefit.

Cross subsidisation pays for the interconnected grid which can capitalise on its benefits which are;

- Reducing the need for new infrastructure as demand rises because of decentralised customer generation.
- Improved reliability because of diversity of generation locations and supply routes.
  - Caveat: Domestic grid connected inverters from wind and solar generators, will not operate when there is no voltage incoming from the grid. Supplying of a battery to these systems to allow them to output power to the grid should be investigated to improve network reliability. This would be beneficial in the times of major outages.

Finding the balance

Continuous power to Intermittent Power

One balance is not targeted is the customer's requirements for energy for time of demand and the form of energy.

- What would be the reaction of an industrial customer for example if they could buy large quantities of power only available during daylight at a small percentage of the price of continuously available power?
- The energy system should be promoting the option of the cheapest energy which is only available when that source is available.
- Intermittent energy from solar in arid areas can provide very cheap power but only during the day. An example is Iron Ore converted to steel. Solar furnaces or arc furnaces require not only electricity, but also oxygen which can be produced on site by electrolysis using water. The supply of power is coming from the sun in our areas of lots of sunshine. The Pilbara is an ideal location with lots of sunshine and close proximity to raw materials.

Motivating the Customer to reduce peak power use

- Synergy is promoting SMART power which is designed to reduce peak demand and to get the customers to move as much demand to when total demand is lower. This is done with a monetary incentive. This is very important when coal fired power stations are used because it is not economic to “switch off” a generator in periods of low daily demand. The generation and distribution network has to be able to supply peak demand, however, much of this capacity is rarely used.

  - Each customer needs to know how much they are saving by using SMART Power at periods of low demand.

- **Reliability of supply** is affected by;
  - Underestimation and investment of infrastructure due to growth of demand as well periods of very hot or very cold weather.
  - Insufficient diversity of supply and distribution paths.
  - Inadequate long term maintenance.
  - The stocking of crucial spare parts such as the valve which caused the Varanus Island fire but also things such as 330kV transformers at the ends of high powered transmission lines eg Perth – Collie. Some of these components take months to obtain, because they are manufactured on demand.
  - Insufficient maintenance personnel employed by the energy companies to make outages short.
  - Build-up of conductive materials on high voltage insulators (eg salt, dust, particularly iron ore dust in affected areas).
  - Protection of energy assets from terrorism and war. The energy contained in gas processing plant for example could easily wipe surrounding towns of the face of the earth.

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Community expectations

Whilst I agree that the community expectations about reliability, affordability and sustainability are as stated.

Missing are;

- **Power quality**. This requires an absence of spikes and dips in the supply voltage. These cause computers and many other devices which are microprocessor controlled to stop operating normally. Have you seen the lights dip when the compressor of an air conditioner switches on? (Does not apply to inverter air conditioners)
- High power quality can be achieved by;
  - Use the live SCADA (described later) via the National Broadband Network to monitor individual power quality.

- Mandate the inclusion of variable frequency drives (VFD) for all motors over 1 kW to keep the quality of the power of sufficient quality.
- Adding to the electricity Act that "Broadband over power line" http://www.acma.gov.au/WEB/STANDARD...PC/pc=PC_310024 must be banned from moving over the customer boundary in either direction. (Either conducted on the wires or radiated).
- Mandate the power quality that must be adhered to for customers of the electricity supply companies eg. Horizon and Western Power.
- Most electronic equipment now contain switchmode power supplies. These devices must contain a filter to prevent interference from being sent back up the power mains. As this new type of power supply ages, the filter components can fail sending interference into the electricity supply. The power wiring, which is a good transmitting antenna to radiate the interference. The interference can cause digital TV and radio signals to become unreliable.
- Provide an investigation service much like the ACMA's Interference investigation[1] to determine the source of mains based interference, along with the legislation to compel the source to stop feeding interference into the electricity supply.

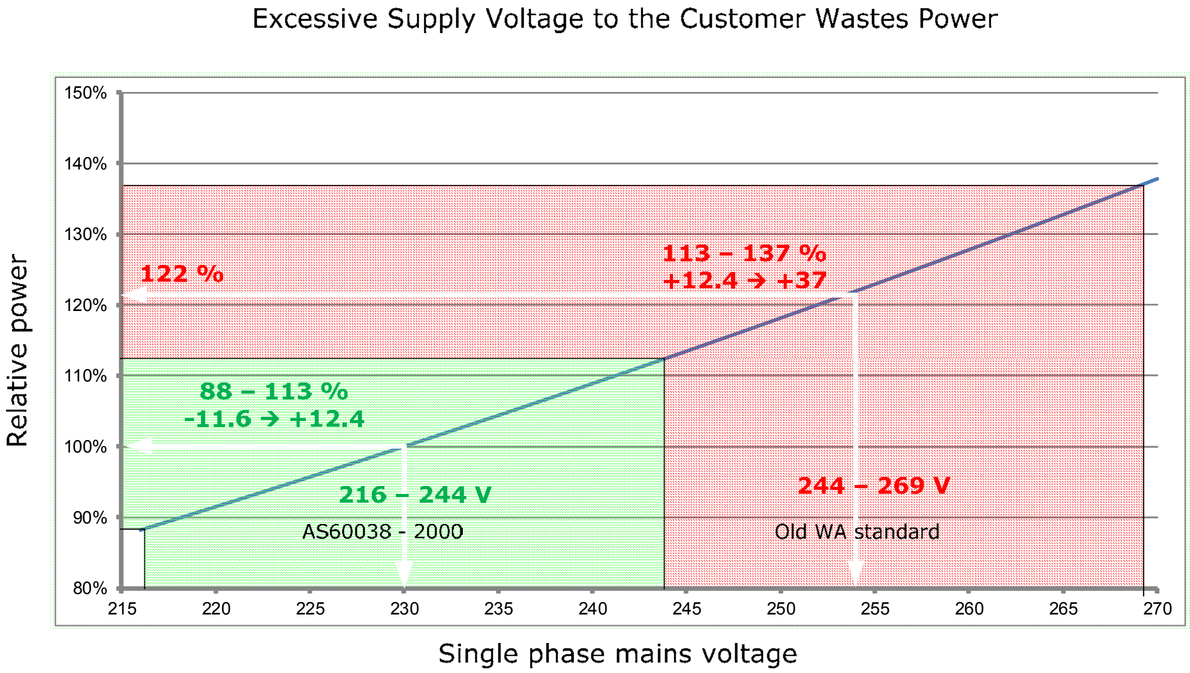
- WA Consumer Affairs should warn shops not to stock surge arrestors if the power quality is sufficient.

  Retailers should not act deceptively to sell a product which is not required to an electrically ignorant public.
    - The public are being offered products like; http://dicksmith.com.au/product/M7812/8-way-network-ready-surge-power-board# by many retailers.
    - http://dicksmith.com.au/product/M7677/powerware-500va-uninterruptible-power-supply Only UPSs will fill in the dips in power voltage.

Ensure that the customers are supplied with either 400 V ± 6 % 3 phase and or 230 V ± 6 % (216 – 245 V) single phase

[1] http://www.acma.gov.au/webwr/_assets/main/lib310172/r004-request_for_domestic_systems_interference_investigation.pdf

The consumer does not want up to an additional 37 % in power bills with shorter equipment life because their supply voltage is excessive. Greenhouse gas generation from coal and gas fired power generators will also be raised by this percentage as well. When carbon trading is introduced costs will rise even more.



Ensure that the supplied voltage is within the correct specification

When electricity was first used in WA it was 240 V @ 40 Hz. The 40 Hz was non-standard and the generators were increased in speed to produce 50 Hz. This increased the voltage to 254 V. Retailers used to sell 250 V incandescent lamps only in WA. In 2000 the Australian Standard 60038 - 2000[2] changed the supply voltage to an internationally unified voltage of 400/230 V. The international standard was ratified in 1983, so this is what all the overseas manufacturers use.

The customer terminal mentioned later, can be used to measure the supplied voltage to find customers who are being supplied voltages outside the 400/230 V ± 6 % range. Not only will the costs for the consumer drop but also the generation of greenhouse gasses at power stations by the same proportions.

Page 39 Very Low Loss High Power long power lines

There is no mention of the use of rectifying AC power to DC for transmission along long power lines at low loss. The DC is then electronically inverted to AC in synchronism with the rest of that network.

[2] http://www.saiglobal.com/PDFTemp/Previews/OSH/as/as60000/60000/60038.pdf

4

This technology should be introduced where applicable. An introduction to the topic is shown in the link below[3]

Page 41 Objective and future planning.

Live Supervision, control and data acquisition (SCADA) of power distribution (Electricity and gas) needs to be rolled out following the rollout of the NBN across WA. The rollout should follow the NBN to all customers' premises. The Water Authority should also partner in this.

The advantage of this is that the customer gets real time feedback on their consumption, power quality, and price, the retailer gets billing information and the power distributor gets accurate real time information of the size of the load and where it is.

Page 44 Short Term

Using only the Watt and Joule measurement systems.

Planning

Change all statistics except billing and contracts to prefix Watt and produce maps of the state showing the efficiency of the infrastructure will highlight the excellent performers and the poor performance where improvements need to be made.

You will see by the report that a variety of units of measurement are used for different energy types and over different periods of measurement. This industry survives because the customers are buying energy for their use. They will demand energy at a particular rate.

If all consumption of energy is within a time period it is power and should therefore be measured in Watts. This will allow a common measure to compare on graphs and statistics.

Efficiency

This will allow for example the % efficiency of each power station, gas plant, pipeline and power line to be easily measured and compared.

$$\%\, efficiency = \frac{power\ out\ x\ 100}{power\ in}$$

If live customer power consumption is available using the NBN the efficiency of individual power lines and pipelines can be measured. It will for example find gas leaks and faulty insulators and joints. A drop in efficiency will show this and a computer system can find the location.

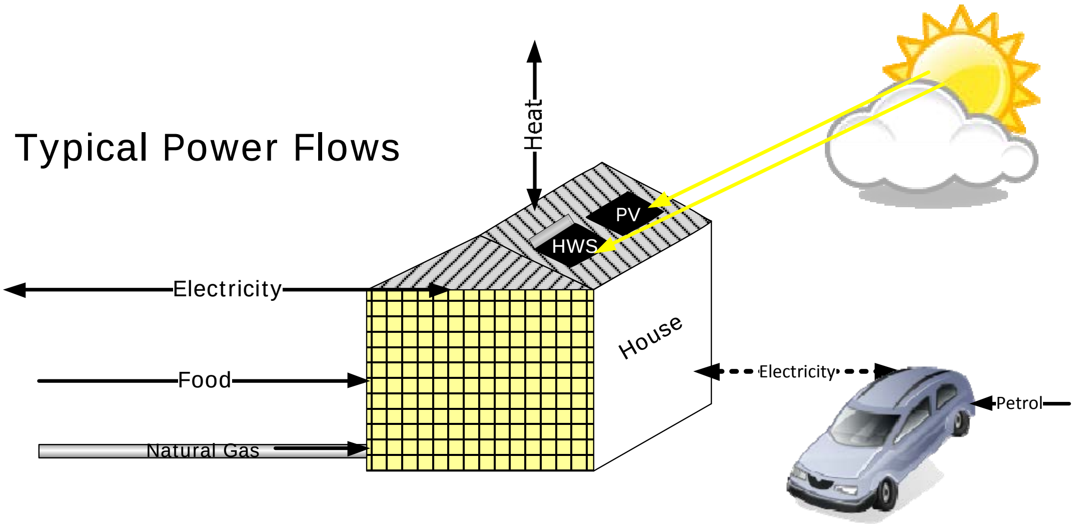
Metering Data Acquisition and Displays

A project to design the customers' data acquisition and the customer display should be commenced as soon as possible, because the NBN is about to be rolled out in Geraldton, Victoria Park and Mandurah.

[3] http://www.scribd.com/doc/7360181/HVDC-Transmission-Lines

SMART metering should include a display in the user area of the customers' premises. It should display all energy sources, the power imported (electricity and gas) as well as that generated and exported. Water consumption should also be included considering the shortage of water and the use of water in evaporative air conditioners. The metering of gas and electricity should measured in GigaJoules (retail) or TeraJoules (bulk customers) and reset at the start of a new billing period. Current tariffs should be displayed along with the cumulative total of the cost in this billing cycle. Power history should also be available along with degree day information.

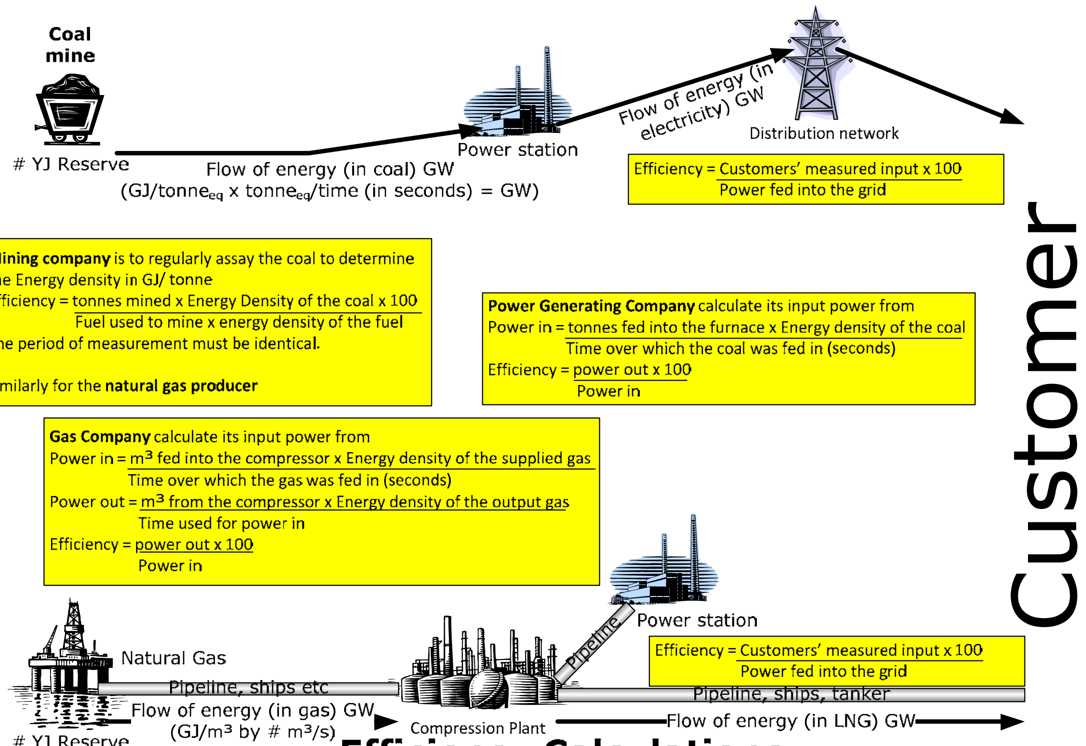
Energy Efficiency.



Whilst there is currently campaigns going on to switch off stand by power the best increase in efficiency that can be gained is around 10 %. Far greater improvements are required. For domestic customers the greatest demand for power comes from heating and cooling of air, water and food.

To reduce these factors it involves town planning making all the blocks' orientation suitable for solar design, maximum collection of energy in winter, the ability to remove heat in summer at night, insulation, etc

Missing is the efficiency of the extraction process for coal and gas, power stations, gas plants and distribution systems. This should be calculated from (power out/power in) x 100. All systems need to be monitored for their efficiency. This can be used for long term planning for infrastructure along with picking up slow reductions in efficiency.

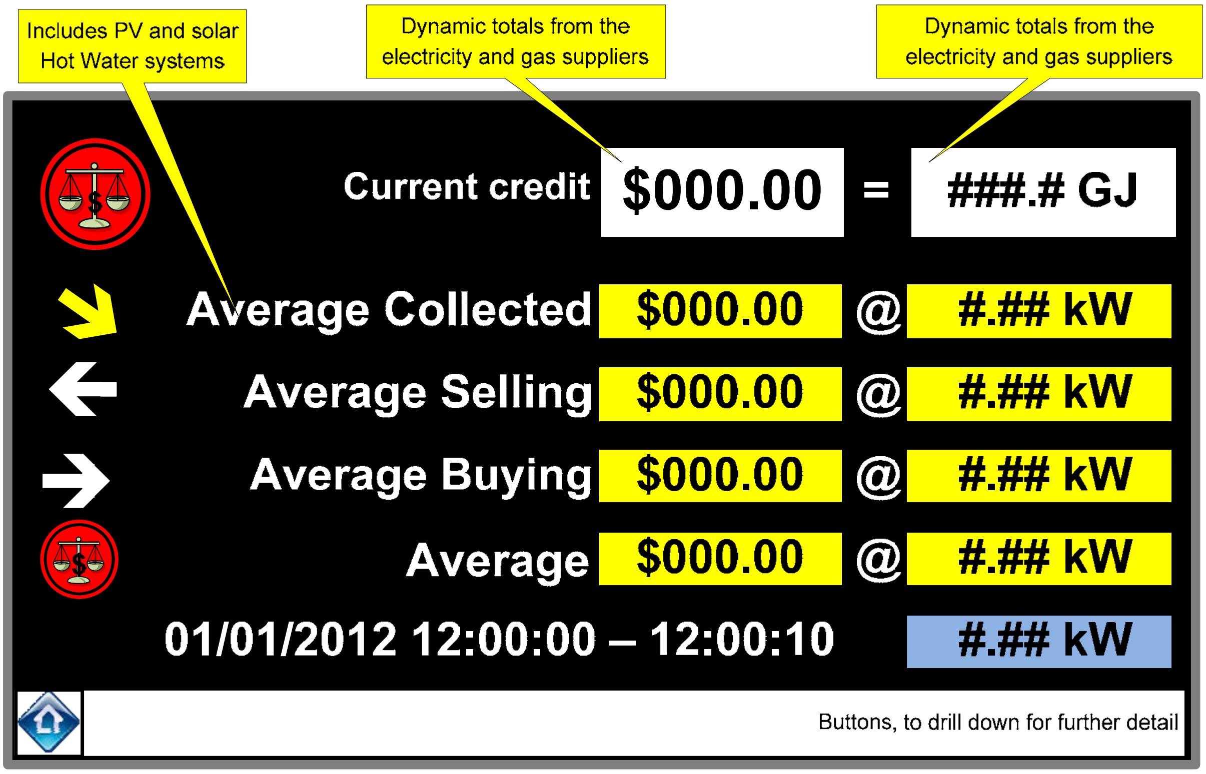


Efficiency Calculations

Motivation

The main motivator for efficiency is cost. This is not only the motivator for the suppliers of energy but also the consumers.

There is insufficient information available for consumers to monitor their energy consumption at account time but particularly live. Instant feedback is more likely to produce an effect than waiting 3 months for a bill.



Power Monitor to replace the consumers' electricity and gas meters and is connected to the suppliers by the National Broadband Network

The averaging in the display (except for "Now") is from the commencement of the account. The power is measured once per second and averaged with the previous average.

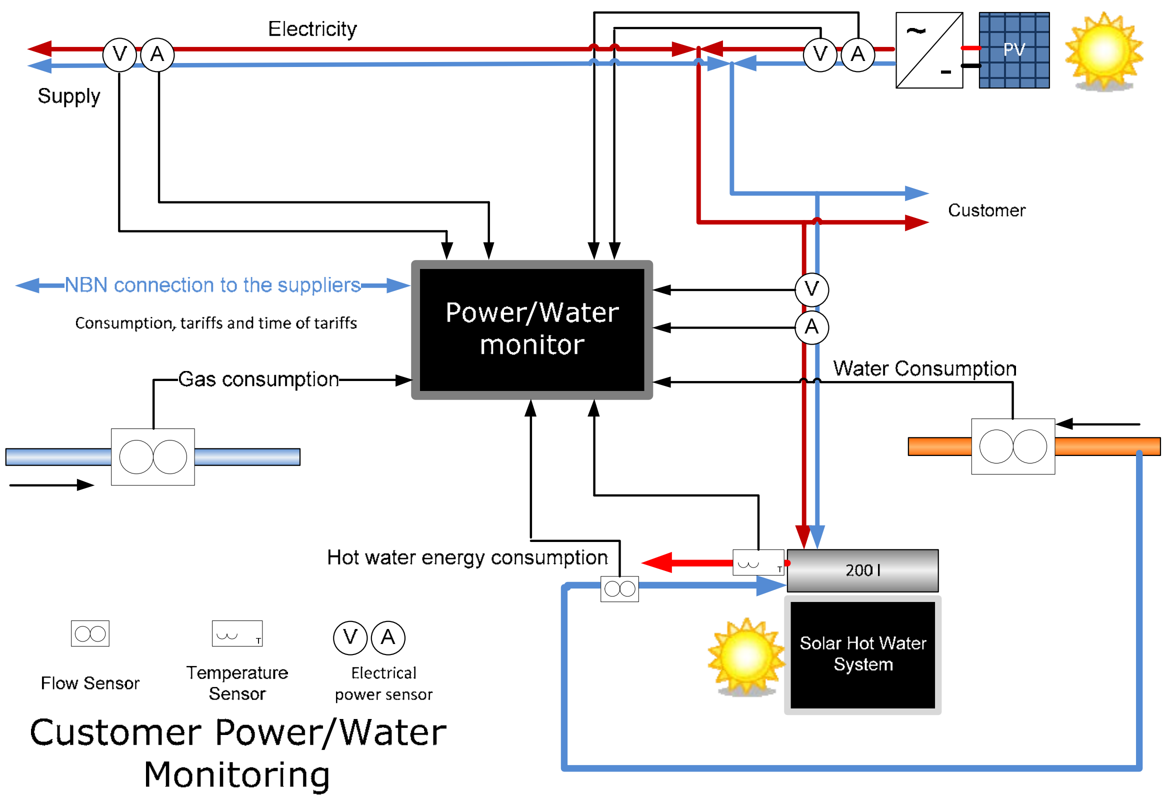
The 10 second time slot is used to calculate the average power over 10 seconds. This is to remove the effects of spikes and dips.

Live billing allows for all energy supplies to be pre-paid therefore eliminating bad debts. Payments can be transfers from banks on line.

Below is a diagram showing the sensing required for the above display.

A big advantage of this system is that the customer can see the value of purchasing of energy collecting devices and will flatten demand to reduce the variation in power demand.

Other screens show graphs of generation, consumption, hours of sunshine degree days and wind speed, particularly to compare season in one year to the average for that season in previous area.



New factors which should be included

Reduce the confusion over the measurement of energy use.

The main problem is the use of the following units,

- **Watt, kilowatt, Megawatt, Gigawatt**
- MJ/hour, TJ/year,
- barrels/day,
- cubic metre/day.
- Kilowatt-hour

Regardless of the energy source, it is measured for a period of time. The averaged power in Watts allows comparison between different scenarios.

The Unit of Energy[4] eg the Joule and its multiples should only be used for discrete quantities of energy which is not related to the time required to deliver it. Examples are the size of energy deposits of coal, oil or even stored water at a height. It also needs to be used for accounts for buying energy. This then allows comparison of a gas and an electricity bill where one retailer uses a 2 month billing cycle and others use 3 months.

[4] http://infostore.saiglobal.com/store/Details.aspx?ProductID=341659 AS1000 - 1998
http://infostore.saiglobal.com/store/Details.aspx?ProductID=1378939 ISO80000-2009

Appendix

Attached in an appendix are examples of this;

- An energy bill shows a suggested single unit bill, using WA prices but the consumption values are not typical
- All graphs used in the Strategic Energy Initiatives have been recalibrated in Watts. Note that;
    - Figure 8 has the average and peak values in the same units. This makes it easy to see that the peak this year is 25 % greater than the average load in this year.
    - Comparing figure 8 and 9 it is easy to see that the gas energy demand is 5 times that for electricity, the complication is the gas power used to create electrical power is double counted.
- I would appreciate that the new energy scales be used in your final report, so that those not as energy literate can make comparisons.

Conclusion

- I request that you replace the power graphs in your documents so that the non-specialist reader is more likely to understand what is being portrayed. Promote the use of the Watt and Joule in statistics.
- With the aid of the Economic Regulation Authority, Synergy, Horizon power and Alinta price all energy sales in Joules and inform the customers of;
    - Average power in Watts
    - The cost saving generated through the use of SMART Power
    - Pricing of all energy in $/GJ
- Develop an on line billing system with live feedback to the customer to enable them to analyse their consumption of energy. This should be done in consultation with the Water Authority.
- Make the electrical distributors find and fix the customers who are being supplied with electricity which is outside 400/230V ± 6 %.
- Develop an interactive customer terminal.
- Plan for live SCADA rollout to follow the NBN rollout in WA.

Home Screen

Tropical year = 31556926 s
Seasonal (¼ y) = 7889232 s
"2 Month" (year/6) = 5259488 s
Fortnightly = 1209600 s
Weekly = 604800 s
Daily = 86400 s

Australian Standard colour codes AS1345 are used for gas and electrical background boxes

Commercial and industrial customers, tick boxes change to kW and MW

Residential
Business
Commercial
Industrial

Please type in the postcode, power values you wish to price, select the calculation period and the account type.

0000

Tropical year =31556926 s

Residential

Postcode

Calculation period

Ignore leap year

Account Type

Weekday Peak 208 W kW

Weekday Shoulder 208 W kW

Weekend Shoulder 167 W kW

Off Peak 407 W kW

Peak Gas Power 250 W kW

Off-peak Gas Power 750 W kW

Average Electrical Power 1 000 W kW

Average Electrical Power for Sale 500 W kW

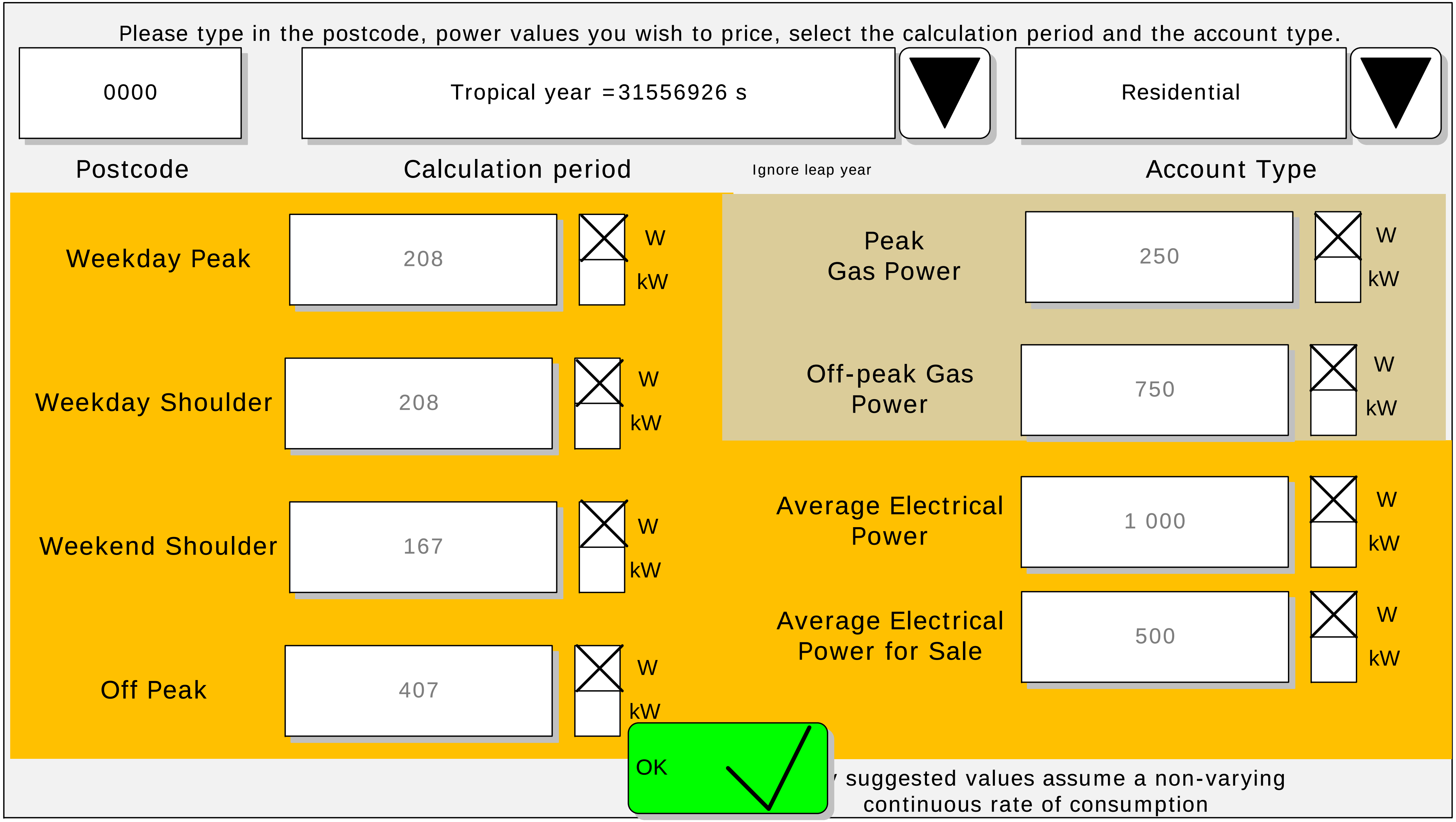
If data is entered into the Average Electrical power the timed use fields go to zero. If values are entered into timed use the Average Electrical power is the total of the timed use fields

OK

All numerical fields except postcode contain a decimal point each

Grey suggested values assume a non-varying continuous rate of consumption

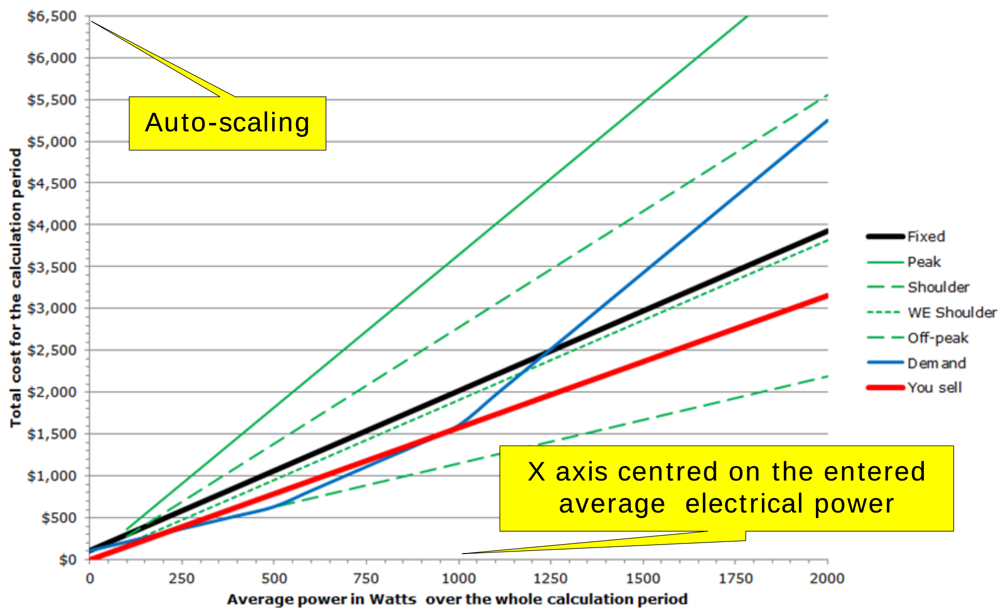
Residential example of the home screen



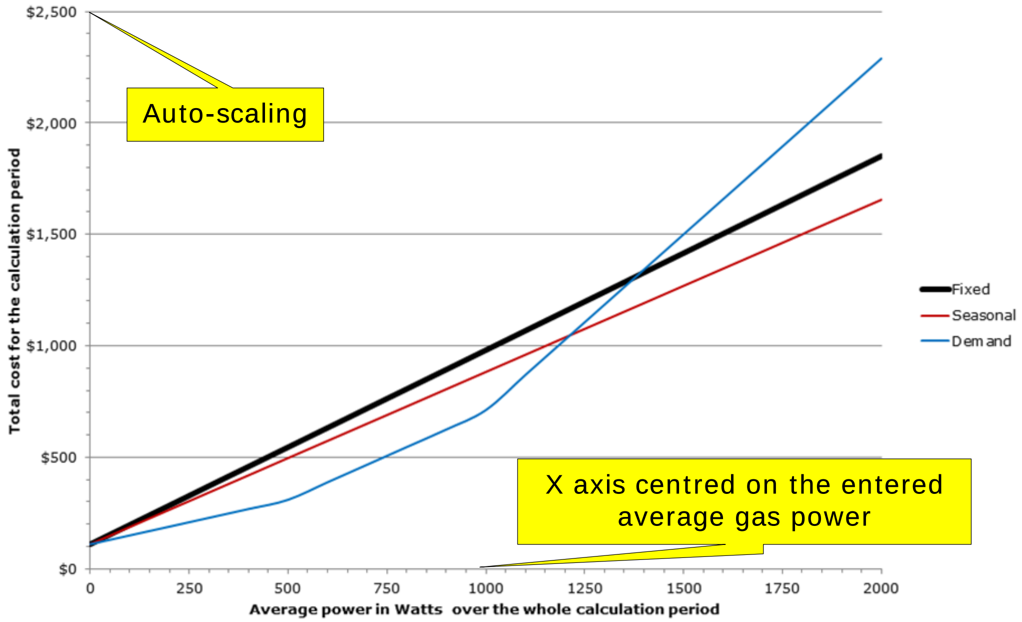
Retailer A | Retailer B | Retailer C | Retailer D

Annual Prices

Retailer A Electricity



Retailer A Gas



The power values (W) are those inputted on the home screen

Electricity

1000 Watts consumed for a tropical year = 31.56 GJ

CO_2 Emissions = 11.58 tonnes		$172.74
Supply Charge		$110.00
Fixed Energy charge for	1,000 W	$ 1,835.63
Total Cost for fixed tariff		**$2,212.00**

Timed Energy Charge for

Peak 11:00 – 17:00, 07:00 – 11:00, 17:00 – 21:00	208 W	$ 722.02
Shoulder 07:00 – 11:00, 17:00 – 21:00, 11:00 – 17:00	208 W	$ 541.52
WE Shoulder 07:00 – 21:00	167 W	$ 289.85
Off-peak 21:00 – 07:00	407 W	$ 353.20
Total Cost for timed tariff		**$2,282.96**

Demand Energy charge for	1,000 W	$ 1,606.27
Total Cost for demand tariff		**$1,699.90**

Fixed Energy for sale by the customer	500 W	**$ 788.92**

Gas

1000 Watts consumed for a tropical year = 31.56 GJ

CO_2 Emissions = 0.126 tonnes		$2.90
Supply Charge		$110.00
Fixed Energy charge for	1,000 W	$ 867.82
Total Cost for fixed tariff		**$980.72**

Seasonal Energy Charge for

Winter 21/6/2012 21:05 –21/09/2012 04:32	250 W	$ 76.70
Balance of the year	750 W	$ 345.17
Total Cost for seasonal tariff		**$882.85**

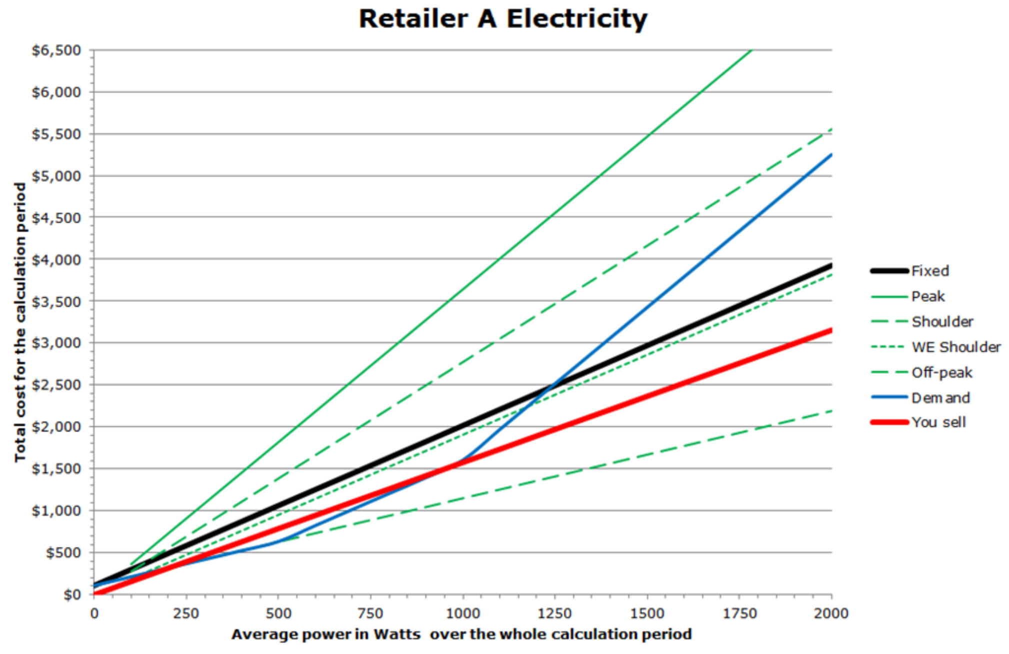
Demand Energy charge for	1,000 W	$ 601.60
Total Cost for demand tariff		**$711.60**

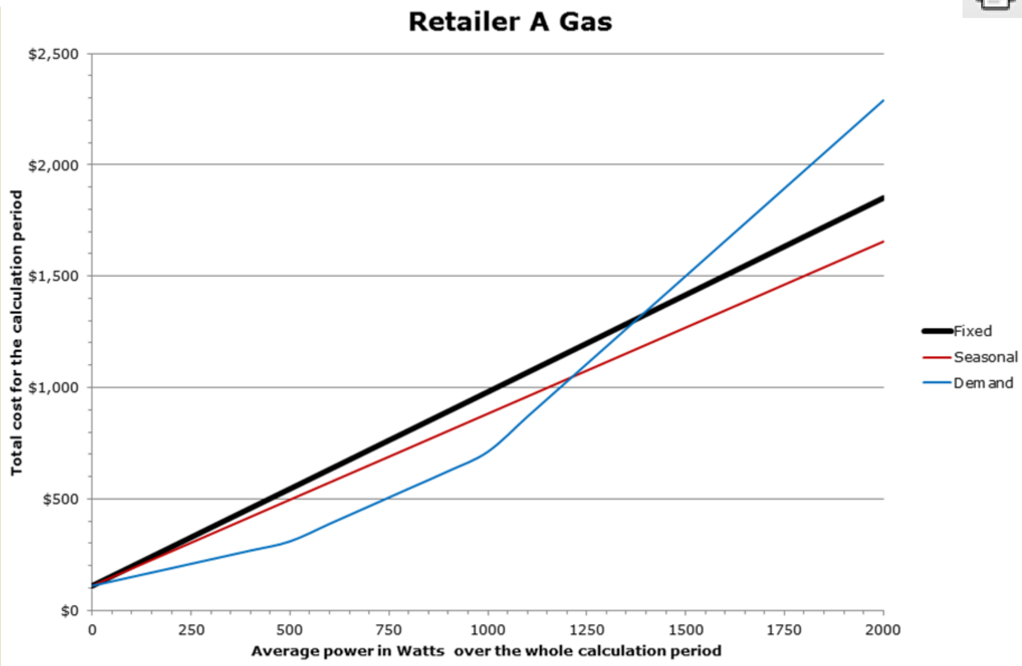
Meter reading discount for a pair of meters	$ 10.00

Note: The average power is continuous over the calculation period for example:
For a calculation period of a year, it is assumed that the average power transferred is unchanged during that time. (Input the long term average)
This data is for **Domestictown, State.** The data is for tropical year at the tariff rates which are in current use.
Included is GST @ 10 % Electricity emission factor 0.258 t/GJ, Gas emission factor 0.004 t/GJ. CO_2 emissions at $23.00 /tonne.

Retailer A | Retailer B | Retailer C | Retailer D

Annual Prices





Electricity

1000 Watts consumed for a tropical year = 31.56 GJ		
CO2 Emissions = 11.58 tonnes		$172.74
Supply Charge		$110.00
Fixed Energy charge for	1,000 W	$ 1,835.63
Total Cost for fixed tariff		**$2,212.00**

Timed Energy Charge for		
Peak 11:00 – 17:00, 07:00 – 11:00, 17:00 – 21:00	208 W	$ 722.02
Shoulder 07:00 – 11:00, 17:00 – 21:00, 11:00 – 17:00	208 W	$ 541.52
WE Shoulder 07:00 – 21:00	167 W	$ 289.85
Off-peak 21:00 – 07:00	407 W	$ 353.20
Total Cost for timed tariff		**$2,282.96**

Demand Energy charge for	1,000 W	$ 1,606.27
Total Cost for demand tariff		**$1,699.90**

Fixed Energy for sale	500 W	**$ 788.92**

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Total Cost for fixed tariff		**$980.72**

Seasonal Energy Charge for		
Winter 21/6/2012 21:05 –21/09/2012 04:32	250 W	$ 76.70
Balance of the year	750 W	$ 345.17
Total Cost for seasonal tariff		**$882.85**

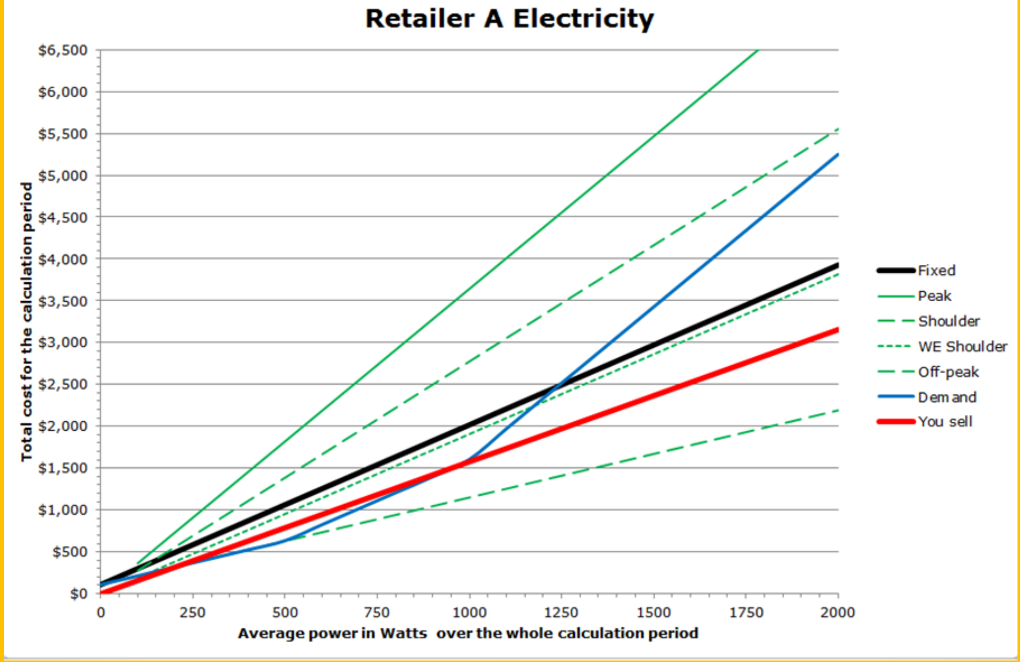
Demand Energy charge for	1,000 W	$ 601.60
Total Cost for demand tariff		**$711.60**

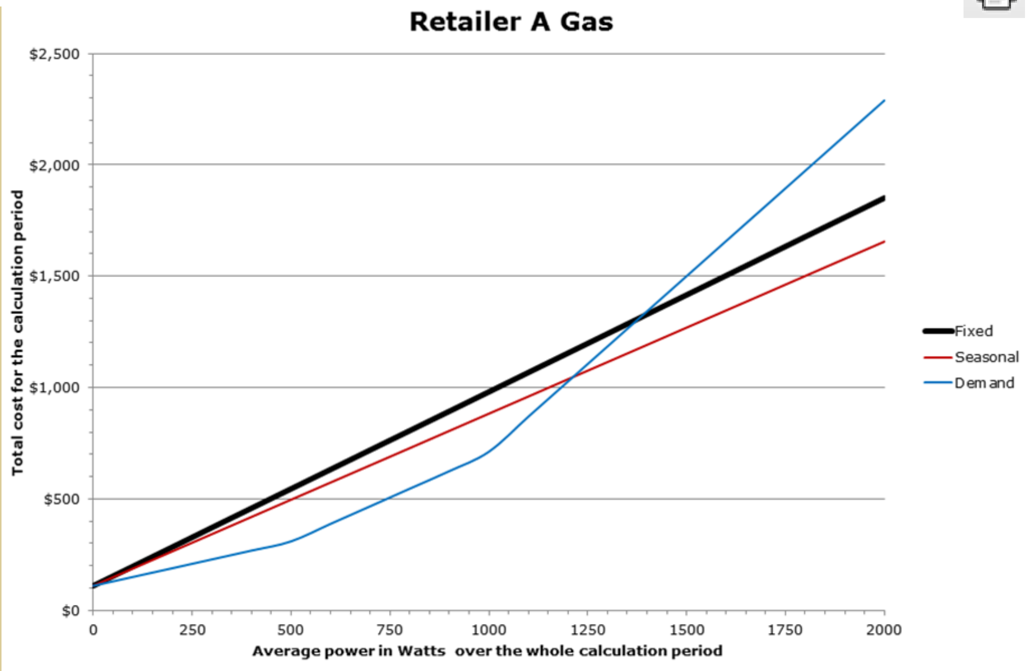
Meter reading discount for a pair of meters	$ 10.00

Note: The average power is continuous over the calculation period for example:
For a calculation period of a year, it is assumed that the average power transferred is unchanged during that time. (Input the long term average)
This data is for **Domestictown, State.** The data is for tropical year at the tariff rates which are in current use.
Included is GST @ 10 % Electricity emission factor 0.258 t/GJ. Gas emission factor 0.004 t/GJ. CO_2 emissions at $23.00 /tonne.

Retailer A | Retailer B | Retailer C | Retailer D

Quarterly Prices





750 Watts consumed for a quarter = 5.917 GJ
CO2 Emissions = 1.611 tonnes $37.06
Supply Charge $37.94

Fixed Energy charge for 750 W $ $409.03
Total Cost for fixed tariff **$484.03**

Timed Energy Charge for

Peak 11:00 – 17:00, 07:00 – 11:00, 17:00 – 21:00	156 W	$ 156.66
Shoulder 07:00 – 11:00, 17:00 – 21:00, 11:00 – 17:00	156 W	$ 83.48
WE Shoulder 07:00 – 21:00	126 W	$ 56.94
Off-peak 21:00 – 07:00	313 W	$ 95.70
Total Cost for timed tariff		**$467.79**

Demand Energy charge for 750 W $ 301.18
Cost for demand tariff **$376.17**

Fixed Energy for sale 500 W **$ 788.92**

750 Watts consumed for a tropical year = 5.917 GJ
CO2 Emissions = 0.4358 tonnes $10.02
Supply Charge $16.93

Fixed Energy charge for 750 W $ 867.82
Total Cost for fixed tariff **$980.72**

Seasonal Energy Charge for

Winter 21/6/2012 21:05 –21/09/2012 04:32	250 W	$ 76.70
Balance of the year	750 W	$ 345.17
Total Cost for seasonal tariff		**$882.85**

Demand Energy charge for 1,000 W $ 601.60
Total Cost for demand tariff **$711.60**

Meter reading discount for a pair of meters $ 10.00

Note: The average power is continuous over the calculation period for example:
If your quarterly power average power transfer for the same season last year is inputted then you may estimate this quarter. If the long term average is used then it will display the price of a quarter at the average power (Use long term average)
This data is for **Domestictown, State.** The data is for tropical year at the tariff rates which are in current use.
Included is GST @ 10 % Electricity emission factor 0.272 t/GJ, Gas emission factor 0.0736 t/GJ. CO_2 emissions at $23.00 /tonne.