Full text of a speech prepared for SACOSS Customer Engagement Conference - key sections only presented

Good afternoon. Thank you to SACOSS for the invitation to speak to you today.

My topic is Willingness to Pay.

Is it a means to precisely quantify the value of a product or service, a black art, or a sophisticated technique to guide complex decisions?

I want to talk about my perspective based on experience within industry as someone who has been involved in making those decisions using tools such as Willingness to Pay. I have come to realise that sometimes I was using a Willingness to Pay regime without knowing it and certainly not understanding it. And I am sure there is not a sufficient understanding across the industry and I very much doubt in the wider community.

Before proceeding, I want to note that earlier this year two of my colleagues provided assistance to the AER, to review the Willingness to Pay components of SAPN's regulatory submission. They criticised some aspects and endorsed others. I do not propose to revisit or court argument on those views here today, as the ball is still in play on those matters.

I speak today as an industry practitioner. In over 40 years in the power sector I have done stints in network planning, been involved in power system operation and worked with panels and businesses setting standards and other criteria for investment decisions in different parts of Australia, including the NEM, Western Australia and in the Darwin area, as well as internationally.

When it has involved standards, the work has often turned to what is the appropriate level for standards for basic reliability of supply and performance of various technical characteristics of power systems. Sometimes these have been set simply on the basis of historical practice, sometimes political expediency, and increasingly, and some might say finally, on their value to customers. Where the decisions have been based on economic or commercial criteria, such as in a commercial negotiation, valuing what the market will pay is really about what the customer on the other side of the table will pay.

Now it is interesting to note this conference is being held as the industry goes through yet another transition. The very idea that a conference organised by a body such as SACOSS would consider a topic such as Willingness to Pay is testament to that change.

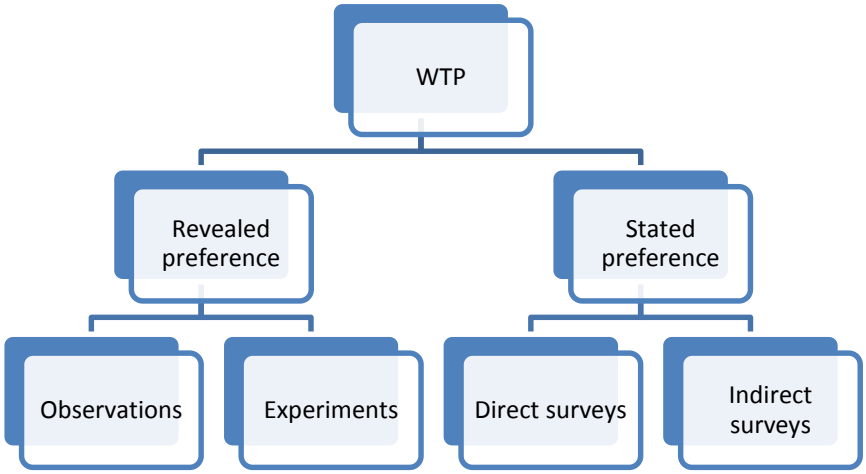
One has to give credit to the high level policy emphasis on customer engagement driven by government. I can recall early consideration of the design of the NEM, where the philosophy was all power to the customer (excuse the pun). However, for years this was a somewhat empty phrase and I have to say government dropped the ball for a while, but things are now changing – note I say changing, not changed.

Another transition that is important for what I want to say, is the impact of technological change. I used to give presentations to groups of IT and communications experts who considered themselves somewhat remote from all this weird reform and market 'stuff'. I would tell them it was all their fault, which had the desired effect of getting their attention.

I would explain that much of the reform to allow the electricity industry to function with disaggregated players essential to competition, was only possible with advances in IT and communications. And this is why it was their fault. These are the same advances that have given us internet and mobile communication. Further advance in that technology is leading to smart meters and growing capability for much finer control of loads within individual premises by customers. The Power of Choice work by the AEMC is an apt name for this work.

How is this relevant to Willingness to Pay?

First a very basic summary of the common Willingness to Pay framework - with apologies to those in the audience who have seen this before: I will make it brief.



The two broad approaches to assessment are to obtain values from actual observations or through experiments where test subjects make choices – termed *revealed preference* approach, or alternatively to conduct surveys to find *stated preference*.

The majority of Willingness to Pay studies in electricity that I am aware of are from the Stated Preference family – AEMO is to speak shortly and will describe their work based on an indirect survey approach known as Discrete Choice Analysis that is part of the Stated Preference family

I noted how smart meters will change the landscape. Smart meters offer the capability for customers to have far more control over the level of their demand and transform the basis for investment decisions – maybe it is too much to expect, but the idea of centrally determined standards that I used to work on may become redundant. Smart meters will provide actual data or *revealed preference* information.

Clearly, to be of practical use any technique such as Willingness to Pay must find its way into efficient decisions about investment and operations including with due attention to factors such as equity and social impact. However, I am firmly of the view that the starting point is that it is in everyone's interests for the underlying investment and operation to be efficient. Only then will the industry operate at lowest cost and require the lowest overall set of tariffs and charges.

Turning to the mechanics of Willingness to Pay directly, I think about Willingness to Pay in three phases:

1. Selecting what products or services we need to understand the Willingness to Pay;
2. Making an assessment of Willingness to Pay for the selected products or services; and
3. Applying the knowledge gained from the assessment in decisions about investment and operations.

I want to spend most of my time today discussing the first and third of these phases – the selection of what it is we conclude we should assess and how to apply the knowledge gained.

Firstly a brief note about two important physical characteristics of electricity relevant to Willingness to Pay. The electricity sector is a network industry. Although storage technology is evolving very fast, as we speak, the majority of electricity consumed by customers still must be produced at the time of use. That is, the electrical power system is, for now, still a 'just in time' industry where we cannot pre-generate or simply be late delivering our product and keep customers waiting.

The network characteristic also means that, by and large, it is not possible to craft completely separate supply regimes for individual customers. For example, interruptions often occur across a suburb or along a street. This is not an uncommon situation and occurs in other industries, but is acute in electricity. But smart meters will change this too allowing higher or lower levels of reliability of supply for individual customers.

This will mean supply may be reduced, but not cut off in circumstances where this choice is not practical today. Although there is little that can be done about the pole knocked down at the corner of a street. Even with roof top solar, most installations on rooves today switch off if the grid supply fails, this is a safety measure and most, but not all of today's battery installations also work this way.

The inability to store, means the system must be able to generate and transport the peak demand – something that I am sure is not news to people in this room, as it is a key driver of capital cost. It is also a reason why SACOSS should be cheering development of storage to flatten peaks.

Given the topic of this section of the conference – let me ask, what is our collective Willingness to Pay for research and facilitation of storage, with the expectation of a longer term decrease in cost? I am yet to see this as a question on any Willingness to Pay survey, yet government is using our taxes to support this research. Similarly, we are implicitly willing to pay for renewable energy and at different times, emission reduction and efficiency schemes.

I make these observations as a way to highlight my next point. What characteristic or characteristics of electricity supply should we assess?

I see this as one of the areas where Willingness to Pay is undervalued. It is where significant value can be added, but only if used with skill. It is also very useful to balance the result with what we are doing working around one of the many standards.

What are the options? Reliability of physical supply of electricity can be reduced to one or possibly a combination of characteristics of interruption:

- frequency of occurrence;
- depth of occurrence; and
- duration.

These are the key variables. Distribution network statistics deal with the impact on end use customers who are regarded as either on (100% supplied) or off (0% supplied) and therefore relate only to duration and frequency. Depth of interruption is more important at transmission and total system where only part of the demand across an area is interrupted and can therefore be shared.

Interestingly even though the majority of interruptions to supply occur as a result of incidents due to the performance of distribution networks, it is the generation and transmission shortfalls that attract the media headlines and political interest. I will return to this point shortly.

Typical measures are:

- SAIDI, a measure of duration, in fact the annual average duration
- SAIFI, a measure the frequency of interruptions in number per customer per year
- MAIFI measures the number of momentary interruptions

These are output measures and are more closely related to customers than input measures that may also be used.

The most common input measure being N-1 or maybe N-2 at transmission level. This requires that enough assets be built to avoid interruptions even if the most critical element fails regardless of cost – the implied Willingness to Pay for this level of service is infinite.

I will pick up this point again in a minute, but the key to avoiding completely perverse outcomes is that the standard, be it N-1 or some other level must be chosen with an eye to not requiring extreme expenditure. You can see how greater customer control obviates the need for the central decision, at least over the long term for long lived assets.

Other measures of a network business performance include less direct issues such as call centre performance and response and in recent determinations traffic black spot and bushfire mitigation activities.

At the level of the total system equivalent measures include:

- Loss of Load Hours (LoLH) a measure of the number of hours some demand is interrupted – common in Europe
- Loss Load Probability (LoLP) a probabilistic measure of an interruption occurring 0 widely used in the US
- Unserved Energy (USE – used in the NEM) measures the product of duration and depth – the basis for the NEM standard

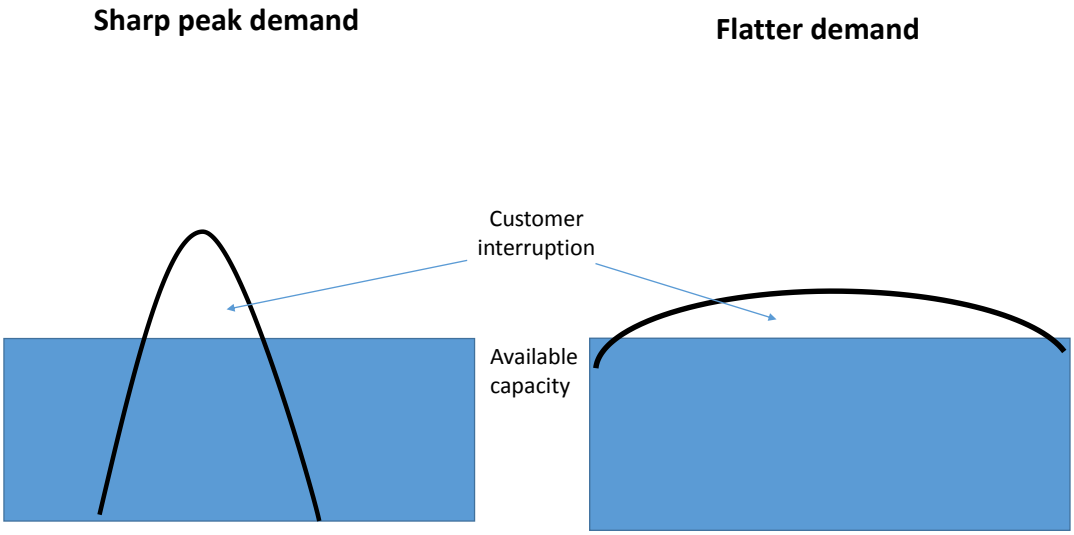
The interesting thing for the topic of today's session is that different measures are used as the primary characteristic from place to place. There is no common approach.

What does this tell us? Well, the physics of power systems is the same the world over. Even in first world cities of similar size and climate, the measures differ. It is simply the characteristic that is valued the most, often implicitly as the choice of characteristic is not reviewed or reassessed for decades.

Let me repeat that – in practice, performance standards are often based on what 'we' are assumed to value the most. For example, why would we rate a measure of SAIDI over a level of SAIFI? Why would we value a limit on unserved energy over a limit on the number of hours of interruption? And why does one community prioritise one characteristic and another community another? Indeed sometimes the highest priority is for information about the current interruption, to know someone is working to fix it. Sure we are all different. But here the possibly unintended influence of the regulator or network business is paramount and Willingness to Pay research can both control and guide that influence.

In some ways therefore the choice of the most critical characteristic of supply is at least, if not more, important than assessment of its value. It is after all illogical to have a good assessment of a characteristic that is of little interest.

That said, the networked nature and inability to store electricity comes to the rescue because the outcomes for each characteristic are not independent, at least while customers have little direct control of the minute to minute demand pattern. For example, over the peak of a hot summer afternoon in Adelaide, air-conditioning demand will grow and system and residential demand will reach a peak and typically then fall away fairly rapidly.



The shape and timing of that peak is being affected by roof top PV but it is still a sharp peak. If there is shortage of network capacity or of generation not all customer demand will be able to be met for say an hour either side of the peak, 2 hours in total.

Now consider the same situation in Brisbane, Darwin or cities in Asia. The shape of demand across the day is much flatter. If there is a shortfall it will last longer but likely be shallower, for the same amount of energy interrupted.

From this there are some justifications for different priorities in different locations for frequency, depth and duration of interruption.

Willingness to Pay literature deals with distinctions of this type quite extensively but it is also where the value of Willingness to Pay is under appreciated.

The choice is easier the closer to the individual customer one gets in that with current technology supply is either on or off. This makes minutes off supply and number of interruptions very logical measures.

I want now to make a few comments about what seem to be inconsistencies in the how the Willingness to Pay may be being compromised.

It is reasonable for relevant suppliers and providers to ask about Willingness to Pay for incremental changes to the status quo, as network providers are now doing. And heavily encouraged and required by the AER. One can either congratulate the industry or be frustrated it has taken so long and that change is not happening fast enough – depends on your perspective.

But recall we are not asking about the Willingness to Pay for the package that forms the status quo when it is locked into a standard. When investment is determined by a set minimum we spend whatever it takes to reach the standard.

In asking about Willingness to Pay for variations from the standard we are therefore starting from a position that is not validated but then attempting to validate changes from it.

In theory we might approach an equilibrium and reach the same point that we would reach if we designed on the basis of customer value from the start. But the discrete choice modelling commonly used stops short of finding the equilibrium.

To the extent the analysis is finding a marginal value that is good. To the extent it does not find an equilibrium I look at the process as one of transition from the old world of locked in remotely set standards and say we are making progress. Besides, the speed with which delivered reliability can be changed is not all that great – a bit like changing direction or speed of the Queen Mary. No warp speed option here.

In addition, increasingly standards, where they are used are being subjected to tests for reasonableness. For example here in South Australia, the current transmission reliability standards embedded in ElectraNet's licence sets different standards for different types of demand – meaning the relative priority is at least cross checked against implied economic value.

I would also like to make note of another branch of the Willingness to Pay framework to comment on how standards have been applied in a number of high profile situations.

If it is not an oxymoron, another branch provides an appealing rationale to explain the logic for some politically motivated standards. Namely a 'regret' framework'. This is an approach that considers the value that someone will regret not having paid to avoid interruptions to customers. For example, often, knee-jerk reactions from politicians who need to be seen to 'do something' following a major event and impose new standards. The difference in cost between an existing standard and the new standard is the price the politicians are prepared to pay to avoid regret, just that at its worst it is regret about political longevity, not customer reliability.

The regret framework certainly describes reactions in New Zealand after many customers in Auckland were without power for weeks following a major failure of transmission. Also from 2007 network service providers were required to meet new jurisdictional standards for supply to Sydney, effectively n-2. This still stands for TransGrid's assets but in 2014 standards for distribution assets were reconfigured and expressed in terms of SAIDI and SAIFI. A more considered argument and a rationale for high major city standards relates to how cities and regions compete for investment on the basis of reliability of supply. In practice this competition is a more important matter for regions outside Australia, for example the high reliability of supply in Singapore is a competitive advantage for it. Of course, costs are also different in a very concentrated city state compared to Australian situation.

Now, a comprehensive willingness to pay assessment could no doubt consider all of the issues I have raised so far. But the way we organise ourselves with a combination of standards based on historical practices, and increasingly, an economic test plus some explicit consideration of willingness to pay, is better than it used to be and is certainly more transparent but still somewhat chaotic.

On the other hand, a quick review of websites of electricity businesses around the country shows most businesses provide sponsorship for cultural and sporting activities. Very worthwhile in their own right, and may represent just cents on the bill, but it begs the question about whether the Willingness to Pay has been tested? Similarly, my earlier question about Willingness to Pay for research and facilitation of storage? In short Willingness to Pay is being used selectively.

I want now to turn to the application of Willingness to Pay.

As I hope you will appreciate from what I have said so far, I see Willingness to Pay analysis as creating valuable, but unavoidably uncertain information.

Uncertainty in the Stated Preference approach comes from the need for choice of characteristics to be analysed. One has to question why, in practice different characteristics are given top priority in different places. Maybe it is just what we are used to.

And there is the risk of forcing some people who are unwilling to pay, to pay, even though we now know they don't want it, or I am sure as SACOSS would note, have limited disposable income and therefore have other more pressing priorities. What if the magnitude of the majority is changed to reduce the number of unwilling customers? When Willingness to Pay is expressed as a single number it appears as a change in the value. This is a danger in over simplification of the results of Willingness to Pay by reducing the result to a single headline number. Life is more complicated than that.

At some point a policy judgement re-enters the equation. Judgements used to dominate the setting of standards but are just if not more important in the design and application of Willingness to Pay. Too often industry stakeholders and external officials do not see the grey – just black and white. With care Willingness to Pay can make these more informed.

So to answer my opening question to myself – is Willingness to Pay a black art, sophisticated guidance for complex decisions or a bright line test?

Clearly Willingness to Pay is sophisticated and complex guidance for complex decisions. Technology is doing what technology does and changing the nature of those decisions and will change the nature of the analysis that helps us make them.

Thank you for your attention