Water Metering

1. Introduction

Water is taken for granted in New Zealand. As a country with one of the most plentiful supplies of fresh water in the world, there is a public misconception that it will never run out. In fact, accelerating increase in demand in several areas means water sources are under increasing stress and quality is becoming an increasing concern. This highlights a pressing need for a better understanding of water's value and greater efficiency in its use and consumption.

This paper proceeds on the premise that water resources in New Zealand require monitoring and management. It will examine water metering and volumetric charging as tools that can facilitate more efficiency in water use. It will present the current situation nationally and overseas, relate cost and benefit factors, look at current and emerging technologies, and the social dynamic around metering and volumetric charging.

The paper leaves the reader to draw their own conclusions as a 'one size fits all' approach is not necessarily the most cost effective outcome for each water supply authority (WSA). It is however inherent that each WSA undertake a comprehensive analysis of the factors for and against metering as relates to their situation before making a decision on water metering. Further reading on the subject is encouraged and in the New Zealand context there are many case examples referenced.

2. The case for metering

Water has moved to the political fore in New Zealand, demonstrated by government initiatives such as the "New Start for Fresh Water" strategy, which has led to the formation of the Land and Water Forum. The Forum is charged with addressing the governance, allocation, quality and land use issues around water.

"The Case for Demand Management in Council Water Supplies"[1] discussed the importance of demand management strategies for conserving our fresh water resources. Water metering and volumetric charging are among a suite of water management tools which can defer capital expenditure, improve network management and control water loss (elsewhere on this web page is a paper from Tauranga CC discussing the economics of metering in the broadest sense).They also help to raise consumer awareness of water use and promote the value of water. Without meters, residents have no idea how much water they are using, and so have no incentive to conserve. Metering enables variable charging regimes to be applied, with this incentivising the avoidance of excessive water use and encouraging customers to install water-saving devices and heed educational messages about water use.

Other commentary on water management cites three main reasons for implementing water metering: to enhance the water conservation efforts of individual households;

[1] The product of a joint project by Water New Zealand, the Ministry for the Environment, Local Government New Zealand and Beacon Pathway Ltd.

to implement a user-pay billing system that is equitable between users; and to improve system management (water loss, infrastructure costs and conservation).[2]

The feasibility of implementing water metering differs between councils. Each council must assess the potential benefits for their region and whether they outweigh the costs. The majority of councils in New Zealand appear to have not undertaken a comprehensive cost benefit exercise in respect of installing water meters, and have appeared to have reached the conclusion that they would prefer long-term capital demand growth costs over the (relatively) short-term capital cost and potential subsequent savings through reduced operational spend (efficiency gains) and deferred capital upgrades. It will be noted the Tauranga paper referred to above effectively rejects that conclusion. Understandably however the magnitude of each benefit and cost will vary from supply to supply and region to region.

It is also notable the Ministry for the Environment's then Natural Systems Policy Manager Craig Mallett stated in 2009, "we can't manage what we don't measure." Mallett went on to observe that the lack of accurate and reliable water use records would be better addressed through greater use of water metering.[3]. The Ministry for the Environment subsequently developed regulations under the Resource Management Act to require metering of all water take consents greater than 5 litres/second. This doesn't include individual domestic usage but a similar regulatory move may well happen for these in the foreseeable future. Such a move is a recommendation of the Land and water Forum that has been supported by both main political parties.

3. The current situation

Internationally a number of countries recognise that water metering is a tool that can raise consumer awareness, curb demand, and reduce water usage.

A study by Beacon Pathway Limited in 2008 looked at best practice water efficiency policy and regulations. This included international case studies for four countries with similar water supply technologies and delivery systems to New Zealand.[4]

One country considered was the United Kingdom, where the average current daily water use is 150l/pp/pd. There, metering is understood to be an effective way to improve water use efficiency. Currently one in four homes has a water meter, and there is a strong policy move to accelerate the uptake of meters that will see at least three-quarters of all households metered by 2025.[5] Studies by Ofwat; the UK's water services regulatory authority, have shown that a water meter raises consumer awareness, discourages waste, and can lead to a 5-15% reduction in household water use.

In the UK there is generally fairly wide policy support for metering, although water companies can only install water meters under particular circumstances. These include if the customer requests a meter, when people move home, when providing a supply to a newly-constructed building, where a customer uses excessive water for non-essential uses, or when an area has been designated as 'water scarce'.[6] A water scarce area is designated by the government upon application from the water company. The government must be convinced there is a significant, long-term deficiency in water supplies in its area. Companies that supply designated water

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[2] David Walker, Steve Carne, Bassam Halabi, "Demand management - for the environment and ratepayers," *New Zealand Local Government,* August 2009, p12.
[3] "We Can't Manage what we don't Measure," *Environz,* November 2009, p12.
[4] Beacon Pathway Limited, *Best practice water efficiency policy and regulations,* May 2008.
[5] *Best practice water efficiency policy and regulations*, p95.
[6] *Best practice water efficiency policy and regulations*, p96.

scarce areas are able to meter all their customers, however there are only two water companies with water scarcity status, and it is considered a slow and expensive way to increase metering.[7]

With regards to charging for water, the Water Industry Act 1999 gave people the right to either continue to pay for water on an unmeasured basis; or choose to pay on a measured basis with the meter fitted at no additional charge and with the option of reverting to unmeasured charging after 12 months. The Government introduced "The Water Industry (Charges) (Vulnerable Groups) Regulations" in 1999 which cap water and sewerage bills at the average for a company's areas. Households are eligible for the vulnerable group tariff if they are metered and either on certain income-related benefits, or suffer from medical conditions which cause a substantial increase in the use of water or have three of more dependent children under the age of 19.[8]

The Beacon Pathway study also looked at the United States and Canada. A survey of cities in the United States in 2005 showed that 73% of cities had traditional water meters, and 70% were interested in advanced metering if they could save water or money.[9] The situation in Canada, however provides a stark contrast to that of the UK. In Canada the average use is 335l/pp/pd, making them the second highest urban water users in the world. This is a result of fragmented management, lack of political leadership and entrenched, supply-oriented engineering approaches.[10]

It is difficult to quantify what New Zealand's average daily domestic water use is given the absence of universal metering, however reported figures show that it lies between 180-300l/pp/pd.[11] Reducing our domestic water use to 150l/pp/pd as per the United Kingdom is certainly a feasibility, given that we have a significantly lower population.

In New Zealand, one third of the population, that in the recently created Auckland City, is water metered and has a volumetric charging system. Other areas include Tauranga City, Nelson City, Whangarei District, and Tasman District.[12] Christchurch City Council has water meters, but does not volumetrically charge all users.[13] A number of other councils around the country are currently actively considering introducing residential water metering, including Hamilton and Kapiti.

As noted, Tauranga City Council is an example of successful efficiency gains through metering. Since the introduction of metering and volumetric charging in 2002, average per capita water consumption is 25% below levels prior to metering, and per capita peak use is 30% lower. As well as these significant reductions in water use, there have been clear financial advantages to the Council. The metering initiative has delayed estimated capital expenditure of $70 million on water supply investments for more than 10 years, and the city is saving a net amount of approximately $1million in depreciation costs for every year new infrastructure is delayed (not including any savings arising from the cost of committing the capital.)[14]

Another Council to introduce metering and related programmes is Carterton District Council. Here, water use has been reduced by a third in one year. This has been achieved through water metering, an active leak detection programme, and charging for excess water. Inspectors visit properties where meter readings indicate higher

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[7] *Best practice water efficiency policy and regulations*,p 96.
[8] *Best practice water efficiency policy and regulations*, p97.
[9] *Best practice water efficiency policy and regulations*, p99.
[10] *Best practice water efficiency policy and regulations*, p104.
[11] *Best practice water efficiency policy and regulations*, p11.
[12] "We Can't Manage what we don't Measure," p13.
[13] "Demand management – for the environment and ratepayers," p13.
[14] "The Case for Demand Management," May 2009, p3.

than normal use. A pricing scheme whereby customers are charged $1.50 per cubic meter for water above an annual cubic meter allocation discourages wasteful use.[15]

Nelson which introduced water metering in 1999, has reduced its peak water demand over summer by at least 37%.The maximum average usage has been reduced from 42,000 cubic meters per day to 37,000 cubic meters per day, even at peak demand[16]. The Auckland region has long been metered and consistently demonstrates the lowest per capita water use in the country.

It is important to note however that such reductions will only be maintained if supported by complimentary measures such as promotional campaigns and educational programmes.

Many councils as water supply authorities in recent years have implemented water demand management programmes, with a suite of measures available, ranging from comprehensive water balances to active leak management and public education. Tauranga City Council fund a water technician service free to households to advise on and fix domestic water leaks.

4. Capital & operating costs

The costs of putting in a meter to a house with an existing water supply connection can vary depending on the particular characteristics of the property involved. In Auckland costs averaged around $200 per property.

Tasman District Council quoted their costs of putting in a meter to an already connected property between $200-$250, depending on the size of the connection. The cost of an actual meter is approximately $60. There are 7,800 water meters in this area, and meters are read 6-monthly. The annual cost is approximately $35,000. The previous Waitakere City put costs of putting in a meter to an already connected domestic property at $275 for a 15mm and $300 for a 20mm connection.

It is important to stress that these costs are historical and may vary from those emerging as advanced metering technologies come to market.

5. The social dynamic – the equity / fairness issue

Water metering is a contentious issue, raising public concern in communities across the country. In their 2009 to 2019 draft Long Term Council Community Plan, council officers from one authority reported that the most common responses offered by members of the public who opposed water metering included: that metering was a money-making exercise for the council; that other water management tools should take priority, such as water tanks and education programmes; and that it was inequitable for low income households who would struggle to pay for water.[17]

There is a degree of concern, albeit unfounded that charging for water on a user-pays basis is the first step towards privatisation. Legislation currently prevents this and given the monopolistic aspects of water provision it is unlikely a move to privatisation would find public or political support.

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[15] "The Case for Demand Management," p4.
[16] "Demand management – for the environment and ratepayers," p12.
[17] "Demand management – for the environment and ratepayers," p13.

The public perception that councils should look into other methods of demand management misses the fact that water metering provides a comprehensive data set which enables efficient and effective use.

It has been suggested the more affluent consumers won't be affected by charges and will not necessarily decrease their consumption therefore reducing the overall conservation benefits. It has also been suggested that while water meters provide initial reductions in consumption, users become accustomed to paying for water over time and stop making reductions.[18] While this does occur, metering and appropriate pricing regimes, on all evidence, result in overall greater efficiency of water use.

Another concern is that low-income households will be the most affected, and that these are the very households that will struggle to pay their water bills. However, high water users are not necessarily in low-income households. Modelling carried out by the then Auckland City Council indicated that low value properties (used as indication of income) actually tend to have low-medium level of water consumption, whereas higher value homes have medium-high levels.

Research has shown that the strongest opposition to water metering comes from those who do not have it in place in their area. Those with metering (in Auckland for example) have come to view it as 'normal', and are surprised it is not universally implemented throughout the country. Research conducted by the Ministry for the Environment in May 2009 canvassed attitudes around water metering, particularly fears and objections. The resulting report looked at metering in areas that are currently metered (Auckland) and those that aren't (Wellington).[19]

There were marked differences in attitude to water between the two regions. In Auckland (metered), there was a feeling that user pays was generally fair, however this was partly because there was little choice. There was also a feeling that the cost of water was increasing and this was something out of the consumers' control. Concerns centred mainly on leaks and repairs, and double billing (where a household is billed for water in and wastewater out.)

In Wellington (non-metered) the attitude was that there was plenty of water and no need for metering. Water was considered to be a 'free' resource and a public good, which would be subject to privatisation if metering was introduced (this view apparently ignores the Uniform Annual Charge applying to water services). Interestingly some participants in the Wellington focus group commented that they themselves noticed a different attitude in metered households, e.g. a Wellington person visiting a friend in Auckland noticed they would never let them leave a tap running. Generally it was felt that user pays benefit a small group, but not the whole community.[20] The simple act of issuing a separate water rates bill in some areas may be sufficient to raise public awareness (of the cost of water to them).

Water was also viewed as a commodity which articulated a sense of freedom. There was a strong view that the introduction of water metering was a money-making exercise on behalf of the councils, and a step towards privatisation. Most felt that water metering would cause the majority of people to pay more and only a few to pay less for their water. Water was seen as a 'human right', that should be available to all.

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[18] Kiran Chug, "Fix leaky pipes before charging for water use," *Dominion Post* (Wellington), October 13, 2009.

[19] Ministry for the Environment, "Appendix 1: Attitudes to household water metering" in *On Tap?: Attitudes, behaviours, and perceptions of household water use – informing demand management*, July 2009.

[20] MfE, "Attitudes to household water metering," p1.

Neither the metered or metered groups were able to gauge how much water they used or which activities had the greatest contribution to their overall use.[21] This, alongside the fact that the majority of the public has no idea what they pay for water, as the cost is included in rates, reflects a general lack of value placed on water (noting, however, that the proposed performance measures for water under the TAFM legislation may increase awareness).

6. Advanced metering

Traditional analogue metering is currently the most widely used metering technology in New Zealand. These meters require manual reading and as such are limited to measuring the total amount of electricity, gas or water used over a designated billing period.

Internationally, water metering is widely used and technology is moving at a rapid pace. A number of overseas countries in the last five years or so have started to implement advanced metering initiatives.[22] Automatic Meter Reading (AMR) allows the automatic collection of data from meters which is then transferred to a central database. AMR data can be collected via site-visits, drive-by collection, or through a fixed network method, whereby a network is permanently installed to capture meter readings.

There are numerous advantages to be had with AMR and Advanced Metering Infrastructure (AMI); fixed network meter systems that enable metering to venture into remote utility management; improved customer service; radically improved leak and fault detection; efficiency; capture of time-of-use and rate of use data; and water usage profiling. They can also achieve utility operational costs savings, and support dynamic pricing. The consumption and price information that advanced meters can provide has a positive impact on household use and demand, both at peak times, and temporally.[23]

Victoria, and other states in Australia are currently investigating how advanced water metering might help in the achievement of longer term water industry reform objectives.

There are possible synergies between the electricity and water sectors in New Zealand for advanced metering. The electricity sector has started a roll-out of advanced meters, with 1.3 million households due to be completed within the next 4 years. A report prepared for the Parliamentary Commissioner for the Environment estimated the cost of supplying an advanced electricity meter in New Zealand to be around $300-$350 per household, subject to currency variability. This figure includes the cost of the meter, installation costs and a proportion of the cost of the infrastructure needed to enable communication between the meter and the retailer.[24] Retro-fitting an advanced meter with home networking capability would cost an extra $75 per meter. Further costs could include the development of associated communications and IT infrastructure.[25]

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[21] MfE, “Attitudes to household water metering”, p1.
[22] Concept Consulting Group Limited, *Smart Metering in New Zealand: A Report Prepared for the Parliamentary Commissioner for the Environment,* June 2008, p22.
[23] Parliamentary Commissioner for the Environment, *Smart Electricity Meters: How households and the environment can benefit,* June 2009, p8.
[24] Concept Consulting Group Limited, *Smart Metering in New Zealand: A Report Prepared for the Parliamentary Commissioner for the Environment,* June 2008,pIV.
[25] Concept Consulting Group Limited, *Smart Metering in New Zealand: A Report Prepared for the Parliamentary Commissioner for the Environment,* June 2008, pIV.

The water sector may be able to establish an interface with the electricity AMI network for water meter data collection and customer communication, via an inexpensive, secure “clip on” to an existing meter. However, a recent report from the Parliamentary Commissioner for the Environment on smart meters in the electricity sector[26] does have a cautionary note. Advanced meters have the potential to facilitate demand management – *provided* they are capable of interaction in real time between electricity consumers and retailers (i.e. have a high level of functionality), and provided they are implemented in the most efficient way. New Zealand is unusual in that the roll-out of advanced meters is being undertaken by the market, with no direct government involvement or regulations specifying minimum functionality of the meters. It should, however, be noted this sector is subject to both Commerce Commission requirements and is party to a formalised customer complaints process (the Electricity & Gas Complaints Commission). Elsewhere on this web page is a further report from Tauranga City outlining their trial of advanced water metering technologies.

It is the intent of this overview paper, and the more specific papers found on the web page, to encourage an informed and reasoned discussion on the potential role and costs and benefits of modern water metering technologies within the new Zealand context.

[26] Parliamentary Commissioner for the Environment, *Smart Electricity Meters: How households and the environment can benefit,* June 2009