Jemena Gas Networks (NSW) Ltd - Initial response to the draft decision

Appendix 3b.9

Metering Forecast Capital Expenditure

19 March 2010

Public version

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1 Metering replacement

1.1 Introduction

Jemena Gas Networks contracts Jemena Asset Management (JAM) for the provision of metering services. JAM subcontracts this work to Select Data and Measurement Solutions (DMS).

The contract between JAM and DMS covers the provision, installation and repair of meters. The accuracy and performance requirements of meters are covered by law.

The purchase of all meters and regulators is efficient as it is competitively tendered. Forecast purchase costs for all meters are based on either historic purchase prices or the known cost of new meters.

Generally the most significant cost associated with changing meters and regulators is the labour rate for travel time and access to the meter. JAM where ever possible plans and programs this work with other maintenance activity to ensure efficient costs are achieved. This is the case for meter and regulator replacement which are scheduled together to reduce set up costs. Where this can not be achieved programs are structures and established were possible to allow the existing JAM labour force to carry out the activity. This drives efficient cost structures as the existing JAM labour costs are significantly below those of external contractors?

1.2 Gas meter in service life extensions

In NSW gas meters are given a legal life under NSW Gas Supply (Gas Meters) Regulations. Based on this regulation meters can be given a service life of up to 15 years. This can be extended based on sampling in compliance with AS4944-2006. The Office of Fair Trading has mandated that JGN can only extend the meter life by 5 years. In order to get the Office of Fair Trading approval for an in service life extension the sample meters must measure within a +/-2 per cent accuracy.

Sampling is conducted by removing a small portion of the meters of that class and taking it away and testing it for accuracy and leakage at an approved laboratory.

1.3 Residential meter aged replacement

AS4944-2006 was introduced in 2007 and become obligatory in NSW in 2008 this means that the first meters to have received an in service life extension under this standard are due to reach the end of 5 year in life extension in the proposed access arrangement period.

Prior to the introduction of AS4944-2006 a meter's initial life could be up to 15 years and based on sampling the meter could receive a further in service life extension of 10 years. Meters whose life was extended under the previous regulations are also reaching the end of the extension in service life in the proposed access arrangement period.

JGN has a policy of seeking an initial extension to a meters life where it is prudent and efficient to do so. There are a limited number of circumstances where JGN will not seek to sample a meter population to extend the life of that class of meter. These relate to meters where JGN is of the view that it is unlikely that the sampled meters will be found to warrant a life extension or where the meter population is small so that it is not economically efficient to sample the meters.

At the current time, sample testing has not been conducted for majority of the meters included in the 5-year meter replacement program.

JGN has forecast a replacement profile for its residential meters based on the meter accuracy requirements as laid down in the regulations, the age of JGN's meter population and the ability to extend a meters service life.

The forecast replacement rates for aged residential meters are based on the following information

- 15 year old meters with a proven history will be sampled to seek an in service life extension
- 15 year old meters with a history of problems will be replaced without sampling
- 20 and 25 year old meters are highly unlikely to pass sampling and will be replaced

This replacement profile is set out in Table 1-1.

Table 1-1: Residential meter replacement program

Year	Total Population of Meters in a year	Proposed for Replacement at 15, 20 or 25 years	Proposed for Life Extension from 15 to 20 years old	Proportion of population JGN will seek a in service life extension
2009-10	58,286	15,032	43,254	74%
2010-11	61,944	13,626	47,385	76%
2011-12	81,148	38,485	42,663	53%
2012-13	96,819	63,752	33,067	34%
2013-14	103,791	54,042	49,749	48%
2014-15	104,654	58,925	45,729	44%
Totals	**506,642**	**243,862**	**261,847**	**52%**

Table 1-1 shows that in the 2010-11 and 2011-12 programs the majority of meters will be extended from 15 to 20 years of in-service life. The decrease in the proportion of meters whose life will be extended from 2011-12 onwards reflects that meters, whose life was originally extended by ten years, are reaching the end of their expected life.

1.4 Aged residential regulator replacement

The volume of regulator replacement is assumed to be 60 percent of the meter replacement quantities.

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1.5 Defective residential meter replacement

Defective meter replacement is simply replacing broken meters, including those meters no longer measuring accurately. Due to the unpredictable nature of meter failures JGN has based its forecast on its historic experience.

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1.6 Defective residential regulator replacement

JGN replaces defective regulators upon identification that there is a problem. Defective residential regulators replacement rates are based on historical data as it represents JGN best estimates of the volumes of failure rates.

1.7 Replacement of “106” regulators

These regulators are installed inside apartments in high-rise developments. There are 60,000 of these regulators in the field. Following an incident in January 2008 JAM has undertaken additional investigations into these regulators. This investigation found a systematic problem with these regulators allowing gas to pass through the diaphragm and escape from the regulator via an atmospheric breather located in the base. Due to the increased safety risk to consumers these regulators must be replaced.

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The major challenge in this program is to gain access to the regulator. First-visit access is less than 30 per cent. Many sites require multiple visits, phone calls, dealing with strata managers, security and retailers.

1.8 Water meters

JGN has a population of hot water meters, usually located in apartment buildings that are used for network purposes.

These meters are not subject to a statutory accuracy regime like the gas meters. As the water meters age JGN has experienced an increase in field failures for these meters. It has been JGN's experience that the accuracy of these meters deteriorates as they age.

As a means of ensuring that the accuracy of the population of meters is maintained and a cost efficient means of replacing meters, rather than waiting until the meters fail in the field JGN is instituting a water meter replace program.

As an initial starting position JGN has adopted an in service life of 25 years so as to minimise the cost of establishing the replacement program. JGN will continue to monitor the data of the performance of in field

As of 2010, there were more than 8,000 meters older than 25 years. It is proposed that these meters are gradually removed over 2011-2014. In 2015, the number of units is much greater than in previous years. This is due to increase in number of water meters in apartments due for replacement in that year.

Table 1-2 shows revised quantities and costs of meters to be replaced:

Table 1-2: Forecast units and capex for water meters

Residential hot/cold meter replacement	2010-11	2011-12	2012-13	2013-14	2014-15
Quantity [units]	3,262	2,895	3,622	4,551	8,259
Cost [$m]					

The unit rate contains material and labour components. The cost of water meters varies depending on the meter type and function.

1.8.1 Radio frequency data loggers

Currently installed water meters are linked by cable to dataloggers which report water consumption via telephone link. It is expected that many cables would be broken due to the aging process or rodent activity. Cable replacement would be impossible in existing buildings due to construction and fire protection. It is proposed to utilise a wireless system using radio frequency (RF) heads to replace cable data logging systems in such locations to continue remote billing.

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Even if some cables in a building were found to be sound, all meters in that apartment would be installed with RF heads to prevent having two incompatible systems within.

The benefit of installing the RF head is to continue to allow the remote reading of these meters. This is important because as noted above access to the meters is problematic and would result in less frequent reads of the customer's water meters.

This rate is very conservative and assumes that access to individual apartments would be relatively easy.

1.9 Industrial and commercial meters

1.9.1 Turbine meters

The current five year replacement policy for turbine meters was based on accuracy and spin tests results of new meters and the old meters after field service conducted by AGL. The results showed the direct correlation of reduced metering accuracy and age, and based on these results and the economic costs associated with UAG and lost revenue five yearly replacements was determined to be the most prudent approach.

In Australia, WA have the same as Jemena's 5-year replacement intervals while Victorian networks share 10-years replacement developed by Gas and Fuel. Victorian meters are equipped with oiling pumps which allow periodical re-oiling of meter bearings. Jemena continues AGL's policy of installing meters without oiling pump.

Advantages of non-oiled meters:

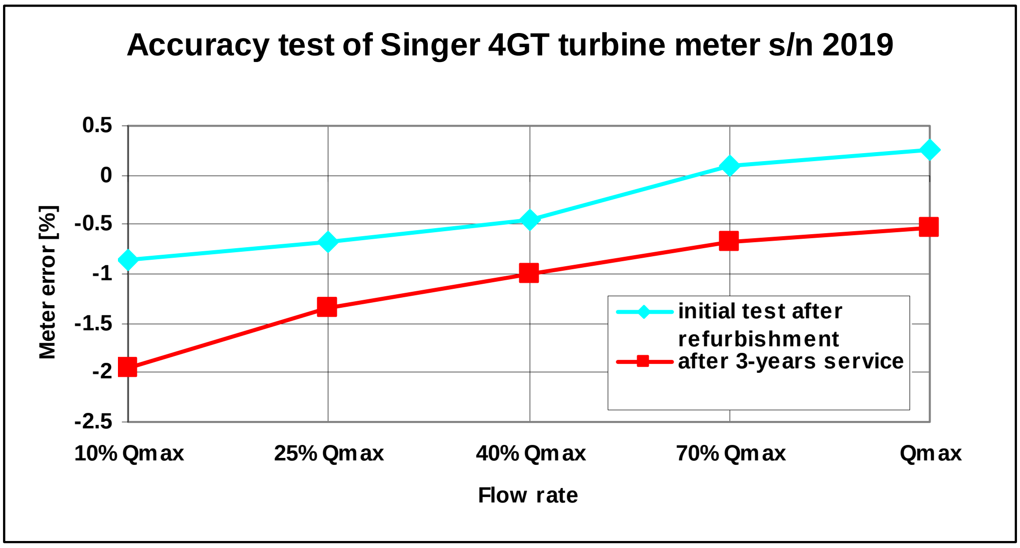
- Better accuracy especially at low flows (less friction)
- No maintenance costs
- No risk of feeding excessive oil into customer's piping

Disadvantage: more frequent replacement, but at low cost of few hundred dollars

Figure 1-1 shows a real example of Jemena turbine meter which was refurbished and tested in 2001, put into service and then removed in 2004 and tested "as found".

Meter shows clear degradation of metering accuracy across all flow rates and averaging -0.78 per cent.

Figure 1-1: Meter accuracy deterioration – real example



Turbine meters are installed mostly in Contract Customers meter sets, metering approximately 52.5PJ of gas per annum. Any under-registration of gas consumption results in increase of UAG at a cost to JGN of $6m/PJ. The current 5 year replacement program costs approximately $2m per annum, extending the replacement life to 10 years would save $1m pa in capital costs, however incur increased UAG. Assuming that a population of turbine meters deteriorates 50 per cent less than the above example (-0.39 per cent), the resulting increase in UAG costs due to meter deterioration would be $1.2m per annum across the population. In addition to this cost to JGN the lost commodity charge a Gas Retailer could recoup as a result of meter deterioration is at least equivalent to the UAG cost, which would further improve the financial justification of the JGN turbine meter replacement policy.

1.9.2 Rotary meters

Jemena's 10-years replacement of rotary meters is commonly accepted across gas networks in Australia and reinforced through meter manufacturer recommendations. Rotary meters are high-revving and tight-tolerance devices. Their high accuracy and stability is only achieved if:

- bearings are in good shape allowing small drag and no radial bending of shafts

- metering chambers are not damaged by foreign matters in gas or over-speeding
- metering chambers are not contaminated with solids or liquids.

Even small damage to metering chambers will result in under-registering as gas would ‘sneak” through meter lobes without being metered.

Much more serious failure mode of rotary meters is seizure of rotating chambers which would result in:

- permanent and unrepairable damage to a meter
- termination of gas supply to customer.

Rotary meters are installed at Contract Customers and larger tariff meter sets, metering approximately 11PJ and 3PJ of gas per annum of contract and tariff load respectively. Any under-registration of gas consumption in either market results in increase of UAG at a cost to JGN of $6m/PJ, it also results in the loss of network revenue in the tariff market of approximately $5m/PJ. The current 10 year replacement program of rotary meters costs approximately $0.75m per annum, extending the replacement life to 15 years would save $0.38mm pa in capital costs, however incur increased UAG. Assuming that the older population of rotary meters deteriorates 0.5 per cent greater than the previous population, the resulting increase in UAG costs due to meter deterioration would be $0.4m per annum across the population and lost tariff revenue of $0.1m. In addition to this cost to JGN, the lost commodity charge a Gas Retailer could recoup as a result of meter deterioration is at least equivalent to the UAG cost, which would further improve the financial justification of the JGN rotary meter replacement policy.

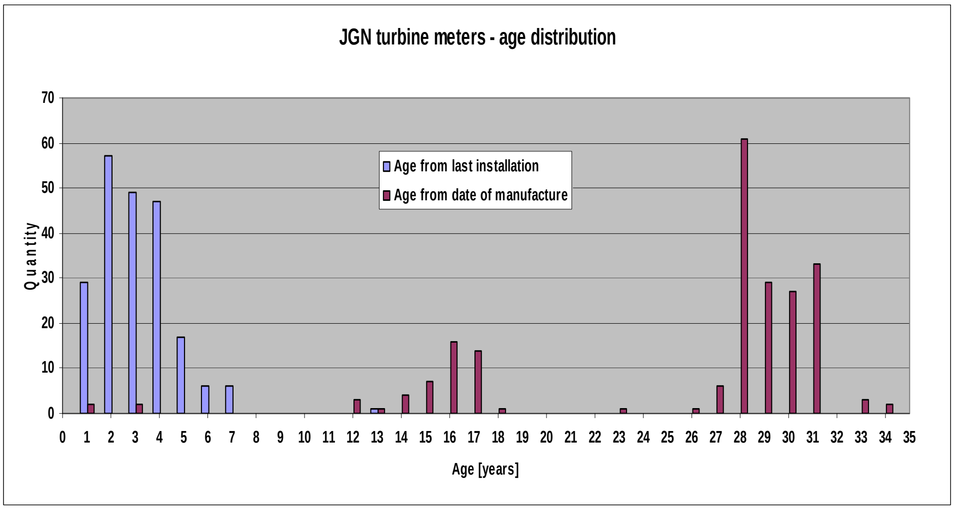
1.10 Turbine and rotary meter procurement strategy

Historically JGN has used refurbished meters in its turbine and rotary aged meter replacement program. Refurbishment costs are generally significantly lower that than the cost to purchase a new meter.

1.10.1 Turbine meters

Figure 1-2 shows that majority of turbine meters were purchased between 28 and 31 years ago. These meters would be refurbished every five years, some meters have been refurbished up to 6 times. The costs to refurbish meters has significantly increased over time as the refurbishment requirements become greater with age.

Figure 1-2: Age distribution of Jemena turbine gas meters



Last year, there were 10 turbine meters that failed prematurely, i.e. not reaching five years of service. These failures resulted in meters stopping gas registration and resulted in major disruption to Jemena's operation and billing estimations.

This figure is unacceptable and shows that 30-years old meter are significantly less reliable than new products.

JGN proposes to cease refurbishing turbine meters and purchase new meters for its aged replacement program as they are more economical and beneficial to Jemena and its customers.

Advantages of new meter over refurbished ones:

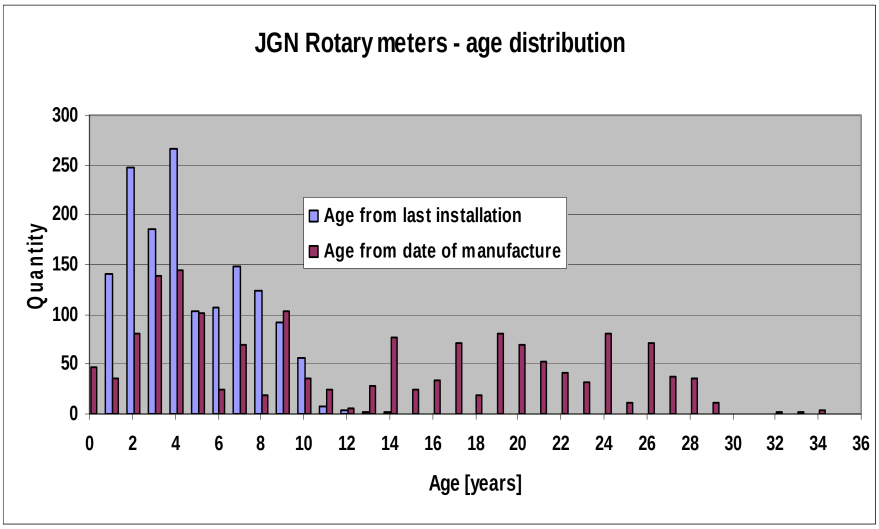
- better accuracy over larger range of flow rates
- better accuracy due to modern design and integrated flow conditioners
- less likely to fail within 5-year in-service period.

1.10.2 Rotary meters

Figure 1-3 shows that large proportion of rotary meters are older than 20 years.

These meters would have to be refurbished at least once, and although they have passed acceptance tests, they do not have the same accuracy as new meters.

Figure 1-3: Age distribution of Jemena rotary gas meters



The cost of refurbishing rotary meters has significantly over the past 5 years (see table below) and is not economical for the large volume of smaller meters.

Table 1-3: Cost of refurbishing rotary meters

New replacement meter	New	% Refurbished/New	Typical existing meter	Refurbished with new index & tested
G-65			Roots 3M	
G-100			Roots 5M	
G-160			Roots 7M	
G-250			Roots 11M	
G-400			Roots 16M	

JGN proposes to cease refurbishing all small rotary meters and large rotary meters older than 20 years and purchase new meters for its aged replacement program as they are more economical and beneficial to Jemena and its customers.

Advantages of new meter over refurbished ones:

- better accuracy over larger range of flow rates
- less likely to fail within 10-year in-service period
- equipped with pulsing output for 3-rd party monitoring.

1.11 Industrial and commercial aged regulator replacement

I&C regulators' main function is to provide reliable gas supply to end user at the desired pressure. To ensure that customer's piping is not over-pressurised, regulators are equipped with different safety devices to either terminate gas supply or to vent gas to atmosphere thus preventing over-pressurisation. Over-pressurisation of customer pipework may result in damage to equipment, loss of production or even possible loss of life.

This program is restricted to the planned replacement of regulators with outlet pressure of less than 15kPa. Unlike regulators with outlet pressure larger than 15kPa, this group of regulators is not maintained on scheduled basis and replaced only on failure or due to gas demand increase.

Gas regulators started being installed at users' meter set from the time of natural gas conversion, i.e. 1976. In the past AGL, then Alinta and JGN have not recorded types, sizes and age of installed regulators. Unlike planned meter replacement which uses information from meter database, regulator replacement requires site visits to determine scope of replacement.

Jemena submission is based on the following:

- "Scope" regulator replacement during site visit
- when economically viable, use standard Jemena meter sets as a preferred to single-component replacement combined with site-specific pipe modification
- link regulator replacement with planned replacement of I&C meters to minimise cost of site visit and to replace regulators that are between 34 and 20 years old.
- create regulator database similar to meter database to effectively manage regulator assets in the future.

At the time of AA submission, Jemena has not scoped any regulator sites. Proposed volumes are based on meter replacement program. Costs of materials and labour used in the forecast are set out in Table 1-4.

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Table 1-4: Cost of labour and materials supporting I&C aged regulator forecast

Metering Pressure	2010/11
Quantity	
1.38kPa	
2.75kPa	
5kPa	
7kPa	
Unit cost	
1.38kPa	
2.75kPa	
5kPa	
7kPa	
Labour	
1.38kPa	
2.75kPa	
5kPa	
7kPa	
Total cost	**2,752,220**

1.12 Industrial and commercial defective meter replacement

By definition, it is impossible to predict accurately how many and of what type meters would prematurely fail in the field at certain time. Subsequently, submission was based on the past experience.

1.13 Total metering capex

For the reasons outlined above JGN is including the capex outlined in Table 1-5 as compliant with the requirements of the National Gas Rules in particular rule 79(2)(c).

Table 1-5: Total metering capex ($m)

Activity	2010-11	2011-12	2012-13	2013-14	2014-15
Residential Meter Aged Replacement					
Residential Regulator Replacement					
Defective residential meter and regulator replacement	1.1	1.3	1.4	1.4	1.4
Defective Residential Regulator Replacement	1.1	1.3	1.4	1.4	1.4
"106" Regulators					
Water Meters					
RF Data Loggers	0.2	0.3	0.3	0.3	0.3
I&C Meters	9.4	13.4	11.3	11.9	12.5
Total	24.7	27.1	31.9	31.0	34.4