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Australian Energy Regulator

Review of DNSPs AMI Budget Submissions for 2012 to 2015

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List of Abbreviations

Abbreviation	Meaning
ACS	Alternative Control Service
AEMO	Australian Energy Markets Operator
AMI	Advanced Metering Infrastructure
AMIPO	AMI Program Office – cross industry program office that supports cross industry AMI work including supporting the ISC
B2B	Business To Business eHub – a part of MSATS used to send messages between NEM market participants
BAU	Business as Usual – referring to normal utility operations
CIS	Customer Information System – an IT system used by Utilities to manage customer and tariff information

Abbreviation	Meaning
CP	Citipower
CROIC	Cost Recovery Order In Council
CT	Current Transformer – used with meters for larger energy users
DB	Distribution Business – another term for a DNSP
DMS	Distribution Management System – an IT system used to manage and operate the distribution network
DNSP	Distribution Network Service Provider (also called Distribution Business (DB))
DPI	Department of Primary Industries
DR	Disaster Recovery
DUOS	Distribution Use of System
EDPD	Electricity Distribution Price Determination
EDPR	Electricity Distribution Price Review
FTE	Full Time Equivalent – of human resources
HAN	Home Area Network – AMI meters include an interface to a home area network
ISC	Industry Steering Committee – a committee of representatives of Retailers, DNSPs, Government and Regulators which has the oversight of the AMI rollout in relation to cross industry matters.
IEE	Itron Enterprise Edition – an MDMS system
JAM	Jemena Asset Management
JEN	Jemena Electricity Networks
MAMP	Meter Asset Management Plan
MDMS	Meter Data Management System – an IT system which receives interval energy data from meters and performs validation and if there is missing or incorrect data, substitutions.
MMS	Meter Management System – an IT system to manage metering assets
MRO	Mass Rollout
MSATS	Market Settlement and Transfer System - operated by AEMO
MTS	Market Transaction System – an IT system used to communicate with MSATS and B2B
NEM	National Electricity Market
NIC	Network Interface Card – an electronics module put into a meter to allow connectivity to the AMI communications network
NMI	National Meter Identifier
NMS	Network Management System – an IT system used to manage the AMI communications network
NOC	Network Operations Centre (for communications network)

Abbreviation	Meaning
NST	Neutral Service Testing
OMS	Outage Management System – an IT system used to manage the Utilities response to outages on the electricity network
PAL	Powercor Australia Limited
PMO	Project Management Office
PSTN	Public Switched Telephone Network
RU	Rack Units – a measure of the height of equipment racks used for IT and electronic systems
SPI	Singapore Power International
SSN	Silver Spring Networks – a vendor of wireless mesh networks for AMI
TOU	Time of Use tariff
UED	United Energy Distribution
USB	Utility Service Bus – a middle ware layer to allow connectivity of various IT applications
WiMAX	Worldwide Interoperability for Microwave Access – a wireless communications technology in accordance with IEEE 802.16

1 Executive Summary

1.1 Background

The Victorian Government mandated the rollout of Advanced Metering Infrastructure (AMI) over the period 2009–15 for all customers consuming less than 160MWh per annum. In late October 2009, the Australian Energy Regulator (AER) released its final determination on the Distribution Network Service Providers (DNSPs) AMI budgets and charges for 2009–11. The DNSPs lodged their AMI budget and charges submissions for 2012 to 2015 with AER in late February 2011 and the AER has engaged Impaq Consulting (Impaq) to assist the AER in its review of the DNSPs' budget submissions.

1.2 Approach

This review by Impaq has been based on the requirements in the Cost Recovery Order in Council and is to assist the AER in making its determination on the DNSPs budget and charges applications. For each item of Capital and Operating expenditure Impaq has made its own assessment of whether the expenditure:

- is in scope;
- is a cost from a contract that has been let in accordance with a competitive tender process; and
- is not a contract cost, but is prudent.

In the course of undertaking this review Impaq has, together with the AER, met with all DNSPs to seek clarification of the nature and detail of many items of cost. Impaq acknowledges with thanks the responses provided by all the DNSPs to the questions raised. Due to timing constraints, some responses provided after the due dates have not been able to be taken into account in this report.

1.3 Impaq Assessment of proposed costs

Table 1 to Table 6 shows a summary of the capital and operating expenditure proposed by the DNSPs and the Impaq Assessment.

Table 1 – Citipower – Summary of proposed and assessed costs

Citipower – ($,000 real 2011)	2012	2013	2014	2015	Total
Capital Expenditure proposed	50,350	36,391	8,055	7,591	102,387
Operating Expenditure Proposed	13,726	13,168	14,091	13,550	54,535
Total proposed expenditure	**64,076**	**49,559**	**22,146**	**21,141**	**156,922**
Impaq assessment of Capital Expenditure	35,230	23,878	2,526	2,704	64,339
Impaq assessment of Operating Expenditure	5,541	5,425	5,563	5,481	22,009
Total – Impaq Assessment	**40,771**	**29,303**	**8,089**	**8,185**	**86,348**

Table 2 – Jemena – Summary of proposed and assessed costs

Jemena - ($,000 real 2011)	2012	2013	2014	2015	Total
Capital Expenditure proposed	33,573	17,562	7,398	7,074	65,607
Operating Expenditure Proposed	19,422	17,227	15,820	15,941	68,410
Total proposed expenditure	**52,995**	**34,789**	**23,218**	**23,015**	**134,017**
Impaq assessment of Capital Expenditure	25,137	12,795	4,976	3,205	46,113
Impaq assessment of Operating Expenditure	12,724	10,932	9,486	9,556	42,698
Total – Impaq Assessment	**37,861**	**23,727**	**14,461**	**12,761**	**88,811**

Table 3 – Powercor - Summary of proposed and assessed costs

Powercor - ($,000 real 2011)	2012	2013	2014	2015	Total
Capital Expenditure proposed	116,274	81,651	16,209	13,471	227,605
Operating Expenditure Proposed	27,875	28,240	27,454	26,435	110,004
Total proposed expenditure	**144,149**	**109,891**	**43,663**	**39,906**	**337,609**
Impaq assessment of Capital Expenditure	80,762	52,680	6,702	6,451	146,596
Impaq assessment of Operating Expenditure	12,229	13,254	13,049	12,856	51,388
Total – Impaq Assessment	**93,049**	**65,987**	**19,750**	**19,306**	**198,092**

Table 4 – SpAusNet - Summary of proposed and assessed costs

SpAusNet ($,000 - real 2011)	2012	2013	2014	2015	Total
Capital Expenditure proposed	171,025	49,081	7,367	3,999	231,472
Operating Expenditure Proposed	48,550	40,149	26,441	24,351	139,491
Total proposed expenditure	**219,575**	**89,230**	**33,808**	**28,350**	**370,963**
Impaq assessment of Capital Expenditure	108,239	26,534	3,035	1,883	139,690
Impaq assessment of Operating Expenditure	15,343	13,326	9,467	8,695	46,831
Total – Impaq Assessment	**123,582**	**39,860**	**12,502**	**10,578**	**186,521**

Table 5 – UED - Summary of proposed and assessed costs

United Energy Distribution ($,000 - real 2011)	2012	2013	2014	2015	Total
Capital Expenditure proposed	104,586	20,891	10,086	9,868	145,431
Operating Expenditure Proposed	28,300	22,810	21,430	22,730	95,270
Total proposed expenditure	**132,886**	**43,701**	**31,516**	**32,598**	**240,701**
Impaq assessment of Capital Expenditure	71,548	14,636	5,525	3,972	95,681
Impaq assessment of Operating Expenditure	18,486	15,096	13,422	12,522	59,525
Total – Impaq Assessment	**90,034**	**29,732**	**18,947**	**16,494**	**155,206**

Table 6- All DNSPs- Summary of proposed and assessed costs

All DNSPs ($,000 - real 2011)	2012	2013	2014	2015	Total
Capital Expenditure proposed	475,808	205,576	49,115	42,003	772,502
Operating Expenditure Proposed	137,873	121,594	105,236	103,007	467,710
Total proposed expenditure	**613,681**	**327,170**	**154,351**	**145,010**	**1,240,212**
Impaq assessment of Capital Expenditure	320,973	130,576	22,763	18,214	492,526
Impaq assessment of Operating Expenditure	64,324	58,033	50,986	49,109	222,452
Total – Impaq Assessment	**385,296**	**188,609**	**73,749**	**67,324**	**714,978**

The Impaq assessments for all DNSPs are considerably lower than that proposed by the DNSPs.

In relation to Capital expenditure there are a number of key drivers of the reductions:

- Exchange rate – a major proportion of the capital items are contracted and priced in US$. The DNSPs have assumed US$ to AU$ exchange rates between 0.85 and 0.95, whereas the Impaq Assessment is 1.05.
- Business as usual metering supply and installation – DNSPs have assumed higher numbers of meters post rollout than the increase in customer numbers. Some DNSPs have also included the installation cost of these meters which is already recovered in Alternative Control Services (hence out of scope).
- IT reflective of further significant development – the forecasts for IT expenditure are reflective of significant system development which should have been completed at this stage of the rollout. Capital expenditure on IT systems during the 2012 to 2015 period should reflect ongoing refinement only and not significant system development.

- Overhead costs required to support meter installation – DNSPs have assumed a high level of overhead costs in the support of contract installation of meters. This may have been appropriate in the 2009 to 2011 period when business processes and work procedures were being bedded down. However in the 2012 to 2015 period many of these non-contract costs are not prudent because these business processes should be well established.

In relation to Operating expenditure there are a number of key drivers of the reductions:

- The current phase of the AMI rollout – The DNSPs have been rolling out AMI since 2009. To date, all indications are that the rollout has, in most cases, been very successful and is operating as well or better than was expected at this point in time. Some cost items reflect more planning phase costs than implementation costs.
- Automation of AMI business processes - At this stage of the rollout, the major IT systems, such as the NMS and MDMS are operational and are meeting the performance and service level requirements. Consequently, the majority of data processing activities are automated, including meter reading, error correction and sending data to the market. Manual intervention should only be required in very rare circumstances. Some costs reflect a requirement for significant manual intervention.
- Automation of associated business processes – along with the significant automation of AMI processes, the new and enhanced systems also provide increased automation of many associated processes, such as financial reporting and management, performance reporting and fault detection and correction. The costs forecast by the DNSPs reflect a much greater level of manual intervention than would be expected.
- New connection costs recovered through Alternative Control Services - much of the Customer service and related costs are for activities involved in new connections and these costs should be recovered under Alternative Control Services and hence are out of scope.

2 Background and scope

2.1Background

The Victorian Government mandated the rollout of AMI over the period 2009–15 for all customers consuming less than 160MWh per annum. Electricity distributors Citipower, Powercor, Jemena Electricity Networks, SP AusNet and United Energy Distribution were given an exclusive mandate to roll out the meters, and commenced their rollouts in late 2009. The Victorian rollout must be completed by the end of 2013. AMI charges enabling cost recovery for the rollout will apply until the end of 2015.

The regulatory arrangements relating to the rollout are set out in an August 2007 Order in Council (later referred to as the Cost Recovery Order in Council or CROIC) made under sections 15A and 46D of the Electricity Industry Act 2000, which was then amended on 25 November 2008 and again in early 2009 (revised Order). The revised Order sets out the regulator's role in determining cost recovery for the rollout and is the primary regulatory instrument that guides the determination of prices for metering services.

In late October 2009, the AER released its final determination on the AMI budgets and charges for 2009–11. In February 2011, the Victorian DNSPs submitted AMI budgets and charges proposals for the subsequent AMI budget period, 2012–15. The AER is required under the revised Order to make a determination on the 2012–15 budgets and charges by 31 October 2011. The AER intends to release a draft determination on these budgets and charges in July 2011.

The AER has engaged Impaq to assist in its review of the DNSPs' budget submissions. This document is Impaq's report to the AER on its assessment of the cost forecasts contained in the DNSPs' budget submissions, in accordance with the CROIC.

2.2 Scope of Impaq's Analysis

The scope of Impaq's review as required by the AER is to:

- provide advice regarding the technical requirements of the AMI rollout (as specified by the Victorian Government in various documents) in relation to the DNSPs' proposed AMI expenditure;
- provide advice regarding the likely market value of the DNSPs' proposed AMI expenditure, particularly in relation to metering, IT and communications equipment;
- review the DNSPs' budget proposals (and additional information provided following AER requests) as to whether each DNSPs' proposed expenditure meets the tests set out in the revised Order, particularly in relation to scope and prudency; and
- review the material provided by the DNSPs as part of the AER's 2009 review of AMI budgets for 2009-11.

However, this review does not include assessment of the reasonableness or otherwise of the DNSP's proposals on:

- forecast CPI;
- forecast real labour escalation rates; and
- margins payable to related party contractors.

For the sake of its analysis, Impaq have adopted the values for these factors proposed by the DNSPs in their respective submissions and other information. Assessment of the appropriateness of these factors and the values proposed is a matter for the AER.

2.3 About Impaq Consulting

Impaq Consulting is a management consulting firm dedicated to serving the needs of the Electricity, Gas, Water and Telecommunications industries. We assist clients in relation to strategy, operations, policy, technology, mergers and acquisitions. Impaq has specialist expertise in Smart Metering and AMI, including the related telecommunications technologies and IT systems. In these areas Impaq has provided advice to Retailers, Distributors, Governments and Regulators. The following are some examples of the projects in which Impaq has been involved.

National smart metering program

Impaq was engaged by the Victorian Government Department of Primary Industries (DPI) to provide advice on the national smart metering functionality working group. Impaq provided extensive advice on the technical requirements of smart metering as an input to the development of the national smart metering functionality specification.

Smart Grid Smart City

Impaq was appointed by the Commonwealth Government (DCCEE/DRET) to provide advice in relation to the Smart Grid Smart City project and the review of applications for Commonwealth grants.

Smart metering benefits realisation project

As part of a consortium of consultants, Impaq undertook a study for DPI on the benefits of smart metering for Victoria and the actions needed to be taken to realise those benefits. A component of this work was translating the technical functionality of smart meters into potential new services that provided benefits to DNSPs, Retailers and Customers.

National smart metering cost benefit analysis

As part of a consortium of consultants, Impaq undertook a study for MCE/DRET on the costs and network benefits of smart metering for each jurisdiction in Australia. This involved a detailed technical understanding of smart metering, communications and IT.

Victorian AMI functionality specification development and technology trials

Impaq Consulting was appointed as the Technical Adviser and project manager of the establishment phase of the AMI project for DPI. This involved facilitating a large number of workshops with industry to develop the AMI functionality specification and service levels specification. Impaq also led the co-ordinated AMI technology trials which involved all of the VIC DNSPs.

Asian Utilities

Impaq has provided advice to Utilities in Asia on smart metering cost benefit analyses, policy and implementation matters.

Advice to the AER and ESCV

Impaq has provided advice to the AER and ESCV on a range of regulatory matters.

3 Approach to this review

3.1 Requirements of the Order in Council

Impaq has approached this review of the DNSPs' AMI budget submissions for the 2012 to 2015 period with the CROIC as the basis. The requirements of section 5C.2 of the CROIC are:

5C.2 The Commission must approve the Submitted Budget unless the Commission establishes that the expenditure (or part thereof) that makes up the Total Opex and Capex for each year:

(a) is for activities outside scope at the time of commitment to that expenditure and at the time of the determination; or

(b) is not prudent.

5C.3 For the purposes of clause 5C.2 (b), expenditure is prudent and must be approved:

(a) where that expenditure is a contract cost, unless the Commission establishes that the contract was not let in accordance with a competitive tender process; or

(b) where that expenditure:

(i) is not a contract cost; or

(ii) is a contract cost and the Commission establishes that the contract was not let in accordance with a competitive tender process,

unless the Commission establishes that:

(iii) it is more likely than not that the expenditure will not be incurred; or

(iv) the expenditure will be incurred but incurring the expenditure involves a substantial departure from the commercial standard that a reasonable business would exercise in the circumstances.

3.2 Review of budget submissions

Impaq has reviewed each of the DNSPs' budget submissions in detail. Where DNSPs have presented expenditure as a contact cost, Impaq has made an assessment as to whether the contract was let in accordance with a competitive tender process. Where Impaq has assessed that a contract has resulted from a competitive tender process, the contract costs have been not been tested for prudency.

However where contracts have:

- been let without evidence of a competitive tender process; these costs have still been the subject of a prudency review. For example, where:
  - a contract has been let to a related party without evidence of a competitive tender process; or
  - reputable sources of relevant goods or services have been excluded from consideration;
- in the contract documentation provided to the AER, not included prices or costs for goods or services to be provided, these have not been considered to be contract costs;

- been in foreign currencies (eg: US dollars), the contract cost has been taken to be the foreign currency cost and the exchange rate applied to convert these costs to Australian dollars has been the subject of a prudency review; and
- been for unit prices of equipment (eg: meters); the quantities and combinations of such equipment have been the subject of a prudency review.

3.3Meetings with DNSPs

After an initial review of the DNSPs' Subsequent AMI Budget Application submissions, Impaq provided the AER with several questions for the DNSPs, seeking clarification of aspects of their submissions and also seeking further information in selected areas.

After the AER had provided these questions to the DNSPs, the AER and Impaq met with each of the DNSPs separately to consider these questions. Each of the DNSPs undertook to provide a written response to these questions. The responses from the DNSPs have subsequently been received and in many cases the additional information provided by the DNSPs allowed a better appreciation of the basis for the budgets being sought. Impaq is grateful to the DNSPs for their helpfulness in providing responses to its requests. Where responses have been received after the due date, some of the material in these responses has not been taken into account in this review.

3.4Key Assumptions

3.4.1 AU$ to US$ exchange rate

The DNSPs have made various assumptions for the AU$ to US$ exchange rate for 2012 to 2015. Impaq has assumed an exchange rate of 1.05 over the period because over the last 3 months the rate has been between 1.05 and 1.10 and because forecasts of the exchange rate consulted by Impaq were all 1.05 or above[1]. Furthermore it is the rate at the time of the AER's final determination that is likely to have most effect because at that time the DNSPs can commit to procurement over the 2012 to 2015 period and hedge at that point.

3.4.2 Human resource costs

The costs of many of the items are heavily affected by human resources costs. Where human resource costs are involved the Impaq view has been established using salary rates taken from the series of 'Hays Salary Guide – 2010' and adjusted to $, 2011 real.

[1] For example Westpac - www.westpac.com.au/docs/pdf/aw/economics-research/MarketInsights.pdf

On costs of 30% have been assumed, as detailed in Table 7. It is noted that these are relatively generous on-costs. Low case on-costs are 18%.

Table 7 – On Cost Calculation

Item	Low case On Costs	Assumed On Costs - %	Comment
Superannuation	9%	12%	The Superannuation guarantee value is 9%. The 12% makes allowance for the higher employer superannuation contributions associated with parts of the Power industry
Long Service Leave	1.7%	2.5%	The low case is based on Long service leave of 13 weeks after 15 years' service. The assumed case is 13 weeks Long service leave after 10 years of service (which has been characteristic of the public sector and parts of the Power industry rather than most of the private sector)[2]
Workcover (estimate)	1%	1.5%	Impaq estimates of typical DNSP rates.
Payroll Tax	4.95	4.95%	Victorian Payroll Tax Rate
Annual leave loading (17.5%)	1.3%	1.3%	Based on 17.5% loading on 4 weeks annual leave
Other employee benefits	0%	8%	Includes performance bonus, and other benefits
Total On costs	18%	30%	

An allowance for overheads, accommodation, office supplies, IT services, etc of $20,000 per annum has also been made.

3.5The structure of this report

This report reviews the submissions made by each of the DNSPs in order. Each section starts with a summary of the Capital Expenditure and Operating Expenditure proposed. The detail of the review of Capital Expenditure is provided first, followed by the Operating Expenditure.

The DNSPs reviewed in the following sections are:

- Section 4 – Citipower;
- Section 5 – Jemena (JEN);
- Section 6 – Powercor (PAL);
- Section 7 – SP AusNet; and

[2] Allowance has been made for the need to over accrue to take into account that when long service leave is taken salaries are higher than during the accumulation of the provision.

- Section 8 – United Energy Distribution (UED).

Unless stated otherwise the values in tables are $,000 real 2011.

4 Citipower

The Citipower budget submission for 2012 to 2015 is summarised[3] in Table 8 and Table 9. It is noted that the capitalised Project Management costs (see section 4.4) of $2,119,000 in 2012 and $1,576,000 in 2013 are incorporated in the costs in Table 8. It is noted that all values in tables are $,000 real 2011 unless otherwise stated.

Table 8 - Capital Expenditure Budget Summary

Capex	2012	2013	2014	2015	Total
Meter supply and installation	40,339	29,511	3,958	4,605	78,413
Communications supply and installation	1,136	1,047	423	52	2,658
IT	8,875	5,834	3,674	2,934	21,317
Other	-	-	-	-	0
Total	**50,350**	**36,391**	**8,055**	**7,591**	**102,387**

Table 9 – Operating Expenditure Budget Summary

Opex	2012	2013	2014	2015	Total
Meter data services	1,909	1,701	1,321	982	5,913
Meter maintenance	1,420	1,451	2,795	2,662	8,328
Customer service	2,722	2,221	507	523	5,973
Backhaul communications	45	71	73	74	263
Communication operations	1,323	1,323	1,323	1,322	5,291
Project management	-	-	1,429	1,287	2,716
Executive and corporate office services	300	309	403	392	1,404
IT	6,007	6,092	6,240	6,308	24,647
Total	**13,726**	**13,167**	**14,090**	**13,551**	**54,534**

Each of the cost items in the above tables are reviewed in order in the remainder of this section[4].

[3] Citipower AMI Budget and Charges Application 2012-15, Table 14, page 47 and Table 25, page 76

[4] Citipower provided two sets of responses to AER questions of 11 April. The second set of responses was more detailed than the first. Both of these have been considered in the Impaq analysis of Capital and Operating costs.

4.1 Capex – Meter Supply and Installation

The Citipower forecast for Meter Supply and Installation consists of the following categories.

- Meter Supply – contracted;
- Meter Supply – other;
- Meter Installation – contracted; and
- Meter Installation – other.

Each of these categories are analysed in the following sections.

4.1.1 Capex – Meter Supply - Contracted

Table 10 shows the meter supply volumes determined by Citipower for rollout and for Business as Usual (BAU) (i.e. New Connections, Additions and Alterations).

Table 10 – Meter Volume Summary[5]

Meter Type	2012	2013	2014	2015	Total
1 Phase 1 element	85,059	58,953	6,189	8,115	158,316
1 Phase 1 element + contactor	2,022	2,098	221	264	4,605
1 Phase 2 element + contactor	12,531	9,714	259	258	22,761
3 Phase Direct Connect	25,008	17,521	2,407	3,340	48,276
3 Phase Direct Connect + contactor	797	732	106	154	1,789
3 Phase CT Connect	1,652	808	188	277	2,925
Total	**127,069**	**89,826**	**9,369**	**12,408**	**238,672**

In relation to the unit prices of meters, the Citipower budget submission details that there are two meter vendors, Landis & Gyr and PRI (Secure Meters). The pricing for each vendor's meters is given in the budget submission and these correspond to the prices given in the respective vendor contracts with Citipower, copies of which were provided by Citipower. Impaq believes that these contracts have been let on a competitively tendered basis. Citipower has chosen to use Secure for 20% and Landis & Gyr for 80% of its meter requirements due to the latter providing the lower prices.

[5] Citipower Budget Application Template, Volume Summary tab

The resultant prices for meters[6] are shown in Table 11.

Table 11 - Unit Meter Prices (US$, 2011)

Meter type	2012	2013	2014	2015
AMI 1 Ph 1e	140	142	141	138
AMI 1 Ph 1e + contactor	154	156	155	151
AMI 1 Ph 2e + contactor	166	168	167	163
AMI 3 Ph	263	267	265	259
AMI 3 Ph + contactor	278	282	280	274
AMI 3 Ph CT	334	339	337	330

When these unit prices are multiplied by their respective volumes, the resultant cost matches that given for the contract cost for meters in the Citipower budget submission.

In relation to meter volumes there is a difference between numbers of meters and numbers of customers. Historically a proportion of customers have had two meters; typically for customers that have off peak electric water heating. Overall the meter to customer ratio (or Meter to NMI ratio) in Citipower has been about 1.1. It is noted that the Citipower application states this is 1.27[7], however this does not agree with the figures in the AEMO MSATS system. However with the rollout of AMI the meter to customer ratio for Citipower will come down to about 1.03 because a high proportion of those customers that previously had two meters will now only have one meter. It is noted that the Citipower application[8] states that the ratio after rollout will be 1.1, however the meter volume data[9] provided by Citipower does not support this. The closing meter numbers in 2015 is forecast to be 345,359 and the forecast customer numbers are 337,050, which gives a meter to customer ratio of 1.024.

Table 12 shows the total volumes of meters to be procured for each year through to 2015. The overall meter total is 366,730 by the end of 2015 which is for a projected 337,050 customers by 2015[10] and the closing total meter quantity in that year is 345,359. Hence the forecast meter volume to be procured is too high.

Table 12 – Total AMI meter volumes

	2009	2010	2011	2012	2013	2014	2015	Total 2009-2015
1 Ph 1e	3,792	53,921	29,064	85,059	58,953	6,189	8,115	245,093
1 Ph 1e + C	0	122	2,439	2,022	2,098	221	264	7,166
1 Ph 2e + C	0	3,315	9,480	12,531	9,714	259	258	35,556
3 Ph	0	6,546	17,522	25,008	17,521	2,407	3,340	72,344

[6] Citipower Budget and Charges Application table 15

[7] Ibid page 45

[8] Ibid page 45

[9] Citipower Budget Templates, Volume Summary Tab, Closing meters divided by forecast customer numbers gives a ratio of 1.03

[10] Refer Vic EDPR final determination – page XVII - Table 1 Growth Forecasts Citipower

	2009	2010	2011	2012	2013	2014	2015	Total 2009-2015
3 Ph+1 Ph int C	0	14	1,005	797	732	106	154	2,808
3 Ph CT	0	0	837	1,652	808	188	277	3,763
Total	**3,792**	**63,918**	**60,348**	**127,069**	**89,826**	**9,369**	**12,408**	**366,730**

The reason the meter numbers are too high is that the effect of abolishments and meter changes (eg: Customer changing from single phase to three phase) has not flowed into the number of meters purchased – see Table 13. Historically when meters were removed from a premise (typically due to abolishments or meter type change) the meters removed were not worth re-using. The cost to re-verify the meters to allow them to be re-used was typically more than the written down value of the meter. Hence meters removed were scrapped. After the AMI rollout the meters on all properties are quite new. Further the re-verification cost is only a small proportion of the purchase cost of a new meter. Hence it is worth re-using meters removed.

Table 13 - AMI meter reconciliation[11]

	2009	2010	2011	2012	2013	2014	2015
Opening meters	0	3,785	67,011	125,847	250,396	335,835	339,622
Meter purchases	3,792	63,918	60,348	127,069	89,826	9,369	12,408
Abolishments	0	-89	-784	-1,187	-1,750	-2,050	-3,100
AMI meter for AMI meter replacements	-7	-603	-728	-1,332	-2,637	-3,533	-3,572
Closing meters	**3,785**	**67,011**	**125,847**	**250,396**	**335,835**	**339,622**	**345,359**
Projected Customer numbers[12]			316,818	322,742	327,190	331,100	337,050
Increase in Customer numbers				5,924	4,448	3,910	5,950
Ratio of meter purchases to increase in customer numbers						240%	209%

In Table 13 it shows that after the rollout is completed (in 2013), in the following two years (2014 and 2015) the ratio of number of meters purchased to the increase in customer numbers is over 200%. Hence the number of meters purchased needs to be reduced by about half and the meters recovered from abolishments and "AMI meter for AMI meter replacements" should be re-verified and then re-used.

Re-verification cost

[11] from Citipower Budget templates – Volume Summary tab

[12] Refer Vic EDPR final determination – page XVII - Table 1 Growth Forecasts Citipower

Citipower has contracts with L&G and Secure meters that provide for re-verification. The re-verification cost from L&G is $16.30 and from Secure meters is:

- Single Phase single element - $28;
- Single Phase two element - $35; and
- Three phase - $45.

Based on the relative proportion of meters purchased by Citipower from the two suppliers, Impaq's estimate of the weighted average cost of re-verification is $19.53. Impaq has used this cost in its revision to the Citipower meter purchase costs[13].

Exchange Rate assumptions

Citipower has assumed US$ exchange rates as shown in Table 14.

Table 14 - Citipower US$ exchange rate assumptions[14]

Exchange Rate	2012	2013	2014	2015
US$ per AU$	0.9565	0.9192	0.9028	0.902

Impaq is of the view that the exchange rate should be 1.05 as discussed in section 3.4.1.

Summary of proposed changes

Table 15 gives the results of:

- changing the exchange rate to 1.05; and
- adjusting the volume of meters by taking out abolishments and AMI meter for AMI meter changes.

Table 15 - Adjustment to cost of meters purchased under contracts[15]

	2012	2013	2014	2015	Total
Citipower Application	21,621	15,482	1,682	2,199	40,984
Impaq Revised Cost	19,355	12,977	694	1,005	34,030

4.1.2 Capex Meter Supply - Other

In addition to the contract costs considered above, the Citipower application has costs entitled "other". The budget application implies[16] that this is CHED services

[13] Impaq has modified the spreadsheet provided by Citipower entitled "Citipower contract costs" to calculate revised costs.
[14] from Citipower budget application, table 13
[15] Impaq has modified the spreadsheet provided by Citipower entitled "Citipower contract costs" to calculate revised costs
[16] Citipower budget and charges application section 6.1.1, page 48

overheads as indicated in Figure 1 (for the rollout period – 2012 to 2013) and Figure 2 (for BAU – 2014 and 2015)[17].

Figure 1 - Build-up of meter supply unit price – rollout

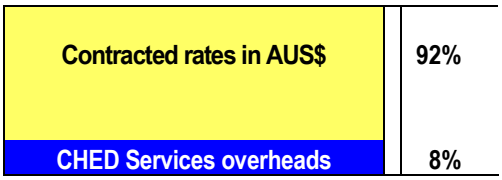


Figure 2 - Build-up of meter supply unit price - BAU

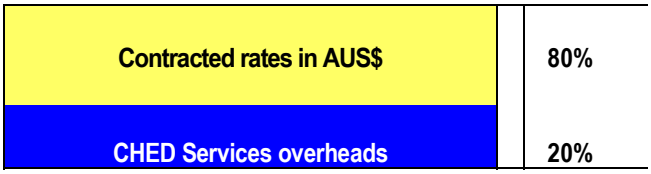


Table 16 shows a comparison of the "other" costs to the "contract cost" and the CHED overheads. It appears to confirm that the vast majority of the "other" costs are CHED overheads.

Table 16 - Comparison of "other" with "contract" values and CHED overheads

	2012	2013	2014	2015	Total 12-15
"Other" cost ($)	2,389	1,825	455	595	5,263
"Other" costs (proportion of contract costs)	11%	12%	27%	27%	
CHED overheads % of total cost	9%	9%	25%	25%	

Impaq (through the AER) asked Citipower for detail on the "other" costs. Citipower's response indicated that the "other" costs were CHED costs and related to the management of contracts and logistics for meter supply. Impaq expects that there may also be a need to undertake some testing of meters in conjunction with vendors to validate compliance to specification. Given that these "other" costs relate to manpower in the main, the equivalent number of FTEs is given in Table 17. This analysis assumes the total cost of tertiary trained resources appropriate to the tasks is $150,000[18] per annum.

Table 17 - FTE equivalent of "other" meter supply costs

	2012	2013	2014	2015
"Other" cost ($)	2,389	1,825	455	595
FTE equivalent	15.9	12.2	3.0	4.0

Given that 2011 is now the third year of rollout, the metering specification has not changed and the meters installed have been performing well, Impaq is of the view

[17] Citipower budget and charges application Figures 2 & 3
[18] Refer section 3.4.2

that there should not be a significant amount of activity in this area for the 2012 to 2015 period. It is Impaq's assessment that the activities in relation to meter procurement include:

- managing metering supply contracts;
- managing the logistics of returning meters removed from customers premises for abolishments and meter changes, re-verifying and returning to Citipower;
- dealing with meters that have failed in the field and investigating with the vendor the root cause of the failure;
- checking that vendors are doing the appropriate testing of meters to ensure compliance with the functionality specification; and
- reviewing proposed changes to meter software and hardware and its impact on Citipower.

Impaq considers that 1 FTE would be sufficient to undertake these tasks, – particularly since much of these activities will be shared with Powercor. Impaq's assessment of what is prudent expenditure on "other" costs is given in Table 18.

Table 18 – Impaq assessment of "other" costs.

	2012	2013	2014	2015	Total
Citipower proposal	2,389	1,825	455	595	5,263
Impaq Assessment	**150**	**150**	**150**	**150**	**600**

4.1.3 Capex – Meter Installation - Contract

The Citipower forecast for contracted AMI meter installation is $6,146,302 in 2012 and $4,178,794 in 2013[19]. Citipower has provided evidence that the mass rollout meter installation unit costs were competitively tendered. Hence Impaq accepts these costs as prudent. The meter unit installation costs multiplied by the meter volumes equates to the contract costs given above[20]. Table 19 shows the weighted unit costs compiled from the Citipower contracts with three meter installation companies. It is noted that the Citipower installation costs are comparable to those for other DNSPs. For example, for the installation of single phase non off peak meters other DNSPs are paying between $35 and $39**.**

Table 19 – Installation cost items[21]

Year ending	2012	2013
Single phase non-off peak meter	41	41

[19] Citipower Budget templates, AMI Capex Tab, N17, R17
[20] Citipower Contract costs spreadsheet, Summary tab, B4, C4
[21] Citipower budget and charges application table 17

Year ending	2012	2013
Single phase 'A' and 'C'	52	51
Single phase 2 meters and a time switch	85	84
Single phase 1/2 element and a contactor	49	49
Slab heating	85	84
3 phase DC	47	46
3 phase 'A' and 'C'	69	68
3 phase CT connected meter	153	151
Remove time switch	11	10

The total number of installations for 2012 and 2013 also includes installations for new connections. The installation cost of new connections is recovered through Alternative Control Services. Hence the new connections volume needs to be taken out of the total volumes for 2012 and 2013. Table 20 shows the calculation of the volume reduction.

Table 20 – Adjustment to installation volumes

	2011	2012	2013
Installs	60,348	127,069	89,826
Abolishments	-784	-1,187	-1,750
AMI meter for AMI meter replacements	-728	-1,332	-2,637
Projected Customer numbers	316,818	322,742	327,190
Increase in Customer numbers		5,924	4,448
New meter to new customers ratio		1.03	1.03
Total meters for new connections		8621	8968
Reduction in meter installation volumes		6.8%	10.0%

The reduction in meter installation volumes given above results in a reduction in the meter installation cost. The Impaq assessment of the contract meter installation cost is as shown in Table 21.

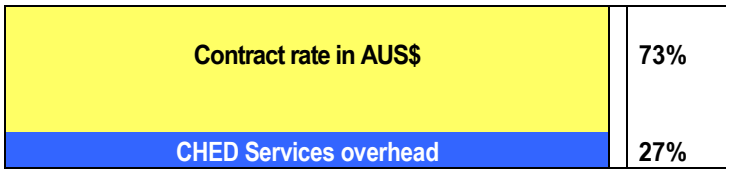
Table 21 – Impaq assessment of contract installation costs

	2012	2013	2014	2015	Total
Citipower proposal	6,146	4,178	0	0	10,325
Impaq Assessment	**5,729**	**3,762**	**0**	**0**	**9,491**

4.1.4 Capex – Meter Installation – Other

Citipower has provided some qualitative information in their submission[22] and in answers to questions in relation to the "other" installation costs but no spreadsheet to allow detailed analysis. Figure 3 shows the proportion of installation cost that is CHED services[23].

Figure 3 – CHED services proportion of total installation cost.



In Table 22 Citipower's proposed "other" installations costs, as given in the budget templates,[24] is shown. The table gives a comparison of the "other" costs to the "contract cost" and shows that the ratio of these costs does not match with the proportion of CHED services overheads[25] as shown in Figure 3.

Table 22 – Comparison of "Other" costs with CHED overheads and FTE equivalents

	2012	2013	2014	2015	Total
Citipower proposal	10,183	8,025	1,822	1,811	21,841
Proportion of contract costs	166%	192%			
CHED %	37%	37%	82%	82%	
FTE equivalent	67.9	53.5	12.1	12.1	

Impaq considers that the "other" installation costs are largely FTE costs and the calculated equivalent number of FTEs is excessive. Given that the AMI meter rollout is in its third year, that there are nearly 100,000 meters installed in the Citipower area and there are no major installation issues being reported to the AMI ISC, it is considered that the installation processes and work procedures are operating well and the level of technical and administrative support will be much less than required in the early years of the rollout. Further, there should not be a need for large numbers of overhead FTEs as the contractors are doing the field work.

Because Citipower has provided little quantitative information to allow reconciliation of the other activities in this cost category, Impaq has chosen to build up its own assessment of the likely activities in "other" costs for meter installation.

[22] Citipower budget and charges application 2012-15 section 6.2.1, page 51

[23] Ibid Figure 5

[24] Budget Templates – AMI Capex Tab, item 2 AMI installation services, columns headed "other" for each of the years 2012 to 2015

[25] CHED overheads in rollout period are supposed to be 27% and for BAU 45%. 27% as a proportion of the contracted value of 73% is 37% as shown in the table. Similarly the BAU 45% as a proportion of the contracted BAU 55% is 82%.

4.1.4.1 During Rollout – 2012 and 2013

It is considered that the following activities will be needed to support the installation of AMI rollout meters in 2012 and 2013:

- call centre support – to respond to customers who call in relation to the rollout and meter installation issues;
- customer advice of forthcoming AMI meter installations, involving sending the customer the pack of information as agreed by the AMI ISC;
- materials costs - provision of meter seals and fuse sticks to installation contractors;
- installation program management and administration of contractors; and
- metering logistics management – supply of meters to installation contractors and disposal of meters removed from customers premises.

The assessment of these cost items is considered in turn below.

Call centre costs.

The AMI ISC deployment dashboard[26] gives the number of calls received by DBs in relation to the AMI rollout. As at the March 2011 ISC meeting, the AMI deployment dashboard shows calls equal to 16.2% of the 534,500 meters rolled out to the end of February 2011. Impaq does not consider this percentage of calls will increase as the installation issues do not appear to be increasing. Hence this is considered to be an adequate representation of the likely call volumes for 2012 and 2013. For 2012, the number of meters installed in the rollout is 127,069, which equates to a call volume of 20,585 calls. Using industry standard per call cost of $10 per call[27], (incl wrap time) the cost for 2012 is $205,850. Similarly, for 2013 with 89,826 installs, Impaq calculates the call centre cost to be $145,518.

Customer communications

Table 23 lists the cost of each item involved in customer communications.

Table 23 – Customer Communications costs

Item	Cost ($)
DPI/DB Letter delivery[28]	1.40
DPI Letter Printing[29]	0.05
Meter Exchange Card[30]	0.05

[26] The AMI Industry Steering Committee (ISC) is a committee of industry and government representatives that meets monthly to review and direct the AMI rollout program as it affects cross industry issues. Each month a set of measures of progress and issues is presented as a dashboard to the ISC members.

[27] Refer Futura Consulting report for DPI on AMI benefits realisation, December 2009, section 5.7.2

[28] Estimated cost of mass mail out house addressing envelopes, inserting DPI and DB letter and posting (including Australia Post cost of $0.60 per letter).

[29] Based on Officeworks quote of between $0.03 and $0.05 per A4 page in black and white

Item	Cost ($)
DB Intro Letter - Printing	0.05
DB Intro Letter Envelope - Printing	0.04
Meter Exchange Letter Envelope - Printing[31]	0.10
No Access Letter (at $1.40 for 5% of sites – note ISC dashboard for to Feb 2011 shows "no access" at 4.67% of sites)	0.07
Total	1.76

This results in a total cost for 2012 of $223,641 and for 2013 of $158,093.

Meter deliveries to contractor

It is assumed that the normal practice of meter vendors supplying meter installation contractors directly is followed by Citipower. Hence there is no direct cost for this activity.

Transport and storage of removed meters

Based on typical meter sizes (for electro-mechanical or electronic meters) the volume per meter is approximately 0.003 cubic metres. It is assumed that about 1 month of old meters are stored at any time, which equates to 32 cubic meters of space. With 4 rack high storage, this is 8 square metres, which equates to $8,000 per annum (rental of storage space assumed at $1000/square metre per annum[32]).

Stores handling costs are assumed to be 0.1FTE at $100,000, or $10,000 pa. The transport of old meters to a recycler or other metro location (eg: port), would involve freight charges for 380 cubic metres (a year of old meters recovered). For this, an allowance of $30,000 is made[33].

Hence the total cost of transport and storage of removed meters is $48,000 pa.

Meter seals & fuse sticks

In response to questions, Citipower advised that the cost of meter seals and fuse sticks were included in the "other" installation costs. No details were provided on the costs. Hence Impaq has made an assessment of these costs. Typical high quality electricity meter seals cost about $0.25 each[34] including freight, although lesser quality items are available at closer to $0.10 each. Based on the quantities of meters to be rolled out the costs for 2012 would be $31,767 and for 2013 would be $22,456.

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[30] Based on Officeworks quotes for printing A5 sized card.

[31] Includes price of envelope (Officeworks) and printing at Officeworks

[32] http://melbourne.gumtree.com.au/f-warehouse-for-rent-Classifieds-W0QQKeywordZwarehouseQ20forQ20rent

[33] Refer http://transdirect.com.au/?gclid=CKqir6uMoakCFcSBpAod1VTXtA

[34] For example, http://universalmeterservices.co.uk/store/index.php?main_page=product_info&cPath=2&products_id=104

In relation to fuse sticks, since these would have already been provided to the installation contractors, there would appear to be no need for more.

Installation contract management and installation issues management

The overall management of meter installations includes:

- contract management;
- management of issues with difficult installations;
- management of collection of old meters & disposal; and
- management of the NEM meter exchange process including updating MSATS

Impaq believes that a maximum of 3 FTEs would be sufficient to carry out these activities, at a total cost per FTE[35] of $150,000 pa, or total costs of $750,000 per year.

4.1.4.2 After rollout – BAU in 2014 and 2015

The installation cost of BAU meters is already recovered under Alternative Control Services for new connections and meter changes. As the rollout is completed by 2013, all activities in 2014 and 2015 are BAU and, hence it is Impaq's assessment that the "other" installation costs for 2014 and 2015 should be zero.

Summary of Costs

Table 24 and Table 25 show the summary of installation "other" costs.

Table 24 – Summary of assessed installation "other" costs.

Item	2012	2013
Call Centre	206	146
Customer communications	224	158
Freight and storage of old meters	48	48
Meter seals	32	22
Installation management	450	450
Total	959	824

Table 25 – Summary of Citipower proposed cost and Impaq assessment

	2012	2013	2014	2015	Total
Citipower application	10,183	8,025	1,822	1,811	21,841
Impaq Assessment	**959**	**824**	**0**	**0**	**1,783**

4.2Capex – Communications Supply and installation

The Citipower forecast for Communications Supply and Installation consists of the following categories:

[35] Refer section 3.4.2.

- Communications Equipment Supply – contracted;
- Communications Equipment Supply – other; and
- Communications Equipment Installation – other.

Each of these categories are analysed in the following sections. It is noted that Citipower has not included costs in the Communications Equipment Installation – Contracted category.

4.2.1 Capex – communications equipment supply – Contracted

The communications equipment comprises Silver Spring mesh radio access points and relays. The unit prices given in Citipower's contract costs spreadsheet[36] of US$5,473 per access point (including Battery backup and mounting kit) and US$1,261 per relay (including Battery backup and mounting kit) are broadly in line with industry benchmarks (in $US) and what other DNSPs are paying. Citipower have assumed that the exchange rates given in Table 14 apply however, as discussed in Section 3.4.1, Impaq considers that an exchange rate of 1.05 is more appropriate. This has the effect of reducing the unit costs (in $AU) by 10% to 15%.

The resulting contract costs are summarised in Table 26.

Table 26 – Communications equipment Capex - contract

	2012	2013	2014	2015	Total
Citipower application	11	11	21	23	66
Impaq Assessment	**10**	**10**	**18**	**20**	**58**

4.2.2 Capex – communications equipment supply – other Costs

The "other" costs associated with the communications equipment supply (not including installation) in the Citipower application shown in Table 27 are not material and are not considered further.

Table 27 - – Communications equipment Capex - other

	2012	2013	2014	2015	Total
Citipower application	6	1	2	2	11

4.2.3 Capex – communications equipment installation – other Costs

The Citipower application states[37] that *"CHED Services concluded that the installation of communications equipment would be conducted in-house for risk mitigation purposes"*.

[36] Meter and com supply rates Tab, lines I28 to I30 and I33 to I35.
[37] Section 6.5, page 58

Table 28 shows the Citipower application for "other" installation cost[38] per year. It also shows the number of access points and relays by year[39]. The table also calculates the per communications unit installation cost.

Table 28 – Installation cost per communications device

	2012	2013	2014	2015	Total
Citipower application	1,119	1,034	400	27	2,580
Access points	2	2	3	3	10
Relays	0	0	3	5	8
Total Devices	2	2	6	8	18
Cost per device ($,000)	560	517	67	3,	143

Meter installation contractors have quoted rates to other DNSPs of about $800 to $1000 for the installation of an access point or a relay. Given that Citipower wants to ensure that their own staff undertakes installation to mitigate risk, it might be expected that the cost could be higher than what a contractor would charge. However the average is many times the cost of a contractor (eg: $560,000 per unit in 2012). In the absence of other information the Impaq assessment is $2000 per unit, which includes for the overheads of a DNSP.

In answers to questions[40] on this cost category Citipower advised that this category includes "*the Technology team which directly supports the rollout … and design the communication system which includes determining the volume of communications equipment and the location of the communications equipment. These costs are allocated 100% to communications installation".*

Impaq understands that with Mesh Radio systems that it does require detailed design work to determine the location of access points and relays to build a stable mesh with multiple redundant communications paths for each meter. By the end of 2011 Citipower will have over 30% of meters installed and will have the communications design done and implemented to support a thin mesh. In 2012 to 2015 there are only 18 access points and relays to install and hence there is not a huge amount of design work required for that. It is also understood that there is some work to be done to monitor the performance of the mesh network and the 3G Telstra back haul network which connects to each access point.

Silversprings has also advised that there is going to be a major release affecting access points and relays in 2013. Hence there is some additional work to manage the testing of the new release and the rollout of this to the access points and relays.

The design of mesh networks is automated and to update the network for the addition of new access points or new relays is an automated process. Without going to the extent of analysing the work load in detail, Impaq believes that to

[38] Citipower AMI 2012-15 Budget Templates spreadsheet, AMI Capex Detail Tab, Line 18 AMI installation services – Communications equipment.

[39] Citipower contract costs spreadsheet - "contract" tab – lines 115 and 117.

[40] Citipower – second set of responses to AER questions of 11 April 2011

undertake these activities for Citipower would require a little more than 1 FTE and hence an allowance of 2 FTEs is made. After the rollout the communications network design will be stable and there will be only a small workload in monitoring performance and refining the network design by adding some relays in various places. It is estimated that a maximum of 0.5 FTEs would be required to look after access points and relays for Citipower after the rollout.

Table 29 shows the Impaq assessment of communications installation "other" costs.

Table 29- Impaq assessment of Communications installation "other"

	2012	2013	2014	2015	total
Citipower application	1,119	1,034	399	27	2,579,
Access points	2	2	3	3	10
Relays	0	0	3	5	8
Total Devices	2	2	6	8	18
Installation cost per device ($)	2000	2000	2000	2000	
FTEs	2	2	0.5	0.5	
FTE unit cost ($pa)	150000	150000	150000	150000	
Total Cost	**304**	**304**	**87**	**91**	**786**

4.3IT Capex

The Citipower application details a number of areas of proposed IT Capex which are detailed in Table 31[41].

Table 30 – Proposed IT Capex

	2012	2013	2014	2015
Asset management	60	-	-	-
Workforce scheduling and mobility	1,992	1,275	60	110
Connection point management	2,302	-	140	-
Outage management	126	36	-	-
Network management	710	1,960	409	410
Meter data management	1,947	922	527	527
Performance and regulatory reporting	285	285	285	285
Revenue management	260	120	-	-
IT program management	300	300	300	300
Infrastructure	893	936	1,952	1,301
Total	**8,875**	**5,834**	**3,674**	**2,934**

It is accepted that although the major IT build to enable AMI is complete, there will be some expenditure in the 2012 to 2015 period due mainly to some of the applications being somewhat immature (particularly the NMS and MDMS systems)

[41] Citipower AMI Budget and Charges Application 2012-15 table 22, page 65

and the need for additional meter data storage. However there are some areas where it is not considered that Capex should be required:

Workforce scheduling and mobility – the technology for this is mature and the rollout of AMI will be well bedded down in terms of business processes and work procedures by the end of 2011. Hence there does not appear to be a need for further investment in a system that is only required for another 2 years until the rollout is complete. If however the system is to be used in the rest of the business then the Capex cost should be a DUOS cost. Impaq does not accept this cost as a cost for AMI.

IT program management – by 2014 the level of IT program management should be minimal – the program is by then over and complete. If the functionality and services of AMI were to be enhanced, a new program of work would be agreed between Government and the industry; and industry would be able to submit a revised budget application for the new scope of work. Hence it is Impaq's view that program management should cease at the end of 2013.

Performance and regulatory reporting – there has been no change to the regulatory reporting required of DNSPs and, thus there are no requirements for enhancements or modifications to reporting systems. If changes to reporting requirements subsequently occur, this should be the subject of a revised budget application. It is Impaq's view that no costs are required for this area.

Infrastructure – as Citipower points out, there is an increasing requirement for data storage with AMI using interval data. However the industry transaction volume analysis[42] done before rollout started showed a combined VIC requirement of 1,200GB per annum by end of 2013. For Citipower this would be about 150GB per annum and over the 7 years required by law would be 1050GB, or just over 1TB. This is not a huge amount of data in relation to the enterprise class data storage devices available. There are rack mount or blade configuration, network storage servers of 6 to 60TB for around $10,000[43] to $40,000.

It is also understood that by 2014 many of the servers installed at the beginning of the rollout in 2009 will be at end of life and need replacing. An allowance has been made for this of $0.5m pa to cover cost of replacement hardware and the human resource effort involved in migrating applications and data from servers to be retired to new servers.

Table 31 details the resultant adjusted IT Capex.

Table 31 – Impaq adjusted IT Capex

[42] Industry Transaction Volume Analysis presented to the ISC June 2008, Item 61

[43] Eg: 4U rack mount HP network storage servers with hard drive capacities of 6TB (six hot swappable 1TB hard drives SATA)
www.estore.com.au/HP_X1800_6tb_Sata_Storage_Server_HPH9532.aspx?utm_source=shopbot&utm_medium=cpc&utm_campaign=HPH9532

	2012	2013	2014	2015	Total
Asset management	60	0	0	0	60
Workforce scheduling and mobility	0	0	0	0	0
Connection point management	2,302	0	140	0	2442
Outage management	126	36	0	0	0
Network management	710	1,960	409	410	3489
Meter data management	1,947	922	527	527	3923
Performance and regulatory reporting	0	0	0	0	0
Revenue management	260	120	0	0	380
IT program management	300	300	0	0	600
Infrastructure	893	936	500	500	2829
Total	**6,598**	**4,274**	**1,576**	**1,437**	**13,885**

Table 32 shows the Citipower proposed costs and the Impaq assessment.

Table 32 - Summary of Citipower proposed cost and Impaq assessment

	2012	2013	2014	2015	Total
Citipower application	8,874	5,834	3,673	2,933	21,314
Impaq Assessment	**6,598**	**4,274**	**1,576**	**1,437**	**13,885**

4.4Capex - Project Management Costs

The Citipower Budget Application[44] includes project management costs as shown in Table 33.

Table 33 – Project Management costs – Capex and Opex

	2012	2013	2014	2015
Project management costs capitalised	2,119	1,576	-	-

[44] Citipower budget and charges application table 24

	2012	2013	2014	2015
Project management costs remaining expensed	--	-	1,429	1,287
Total	**2,119**	**1,576**	**1,429**	**1,287**

Citipower has provided little information in relation to what is included in the project management costs. However given the level of total AMI Capex involved, which in Impaq's assessment is about $65m over the project, it does not seem unreasonable to have a project management cost of the order of that proposed by Citipower. The expensed project management costs are considered in the Opex section.

4.5Capital Expenditure Summary

Table 34 shows a summary of the Citipower forecast cost and Impaq's view for each item of Capex.

Table 34 – Citipower Capex summary – proposed and Impaq view

	2012	2013	2014	2015	Total
Meter Supply - Contract – Proposal	21,621	15,481	1,681	2,198	40,983
Meter Supply - Contract – Impaq view	19,355	12,977	694	1,005	34,030
Meter Supply other – Proposal	2,388	1,824	455	595	5,263
Meter Supply other – Impaq view	150	150	150	150	600
Meter installation - contract – Proposal	6,146	4,178	0	0	10,325
Meter installation - contract – Impaq view	5,729	3,762			9,491
Meter installation - other –Proposal	10,182	8,025	1,821	1,811	21,839
Meter installation - other – Impaq View	959	824	0	0	1,783
Communications equipment supply - contract - Proposal	11	11	21	23	66
Communications equipment supply - contract – Impaq view	10	10	18	20	58
Communications equipment supply -other– Proposal	6	1	2	2	12
Communications equipment supply –other – Impaq view	6	1	2	2	12
Communications equipment installation – other - proposal	1,119	1,034	399	27	2,579
Communications equipment installation – other – Impaq view	304	304	87	91	786
IT Capex - Proposed	8,874	5,834	3,673	2,933	21,314
IT Capex – Impaq view	6,598	4,274	1,576	1,437	13,885
Project Management - proposed[45]	0	0	0	0	0

[45] The Capitalised project management cost in the Citipower submission is not in one item but is across the capital expenditure categories. The Impaq assessment has not included project management costs in the other Capex categories and hence it is included as a separate item here..

	2012	2013	2014	2015	Total
Project management – Impaq view	2,119	1,576	0	0	3,695
Total – Proposal	**50,350**	**36,391**	**8,055**	**7,591**	**102,387**
Total – Impaq view	**35,230**	**23,878**	**2,526**	**2,704**	**64,339**

4.6 Operating Costs

Table 35 repeats the summary of each of the items of Opex with the value proposed by Citipower as presented at the beginning of section 4.

Table 35 - Operating Expenditure Budget Summary

Opex	2012	2013	2014	2015	Total
Meter data services	1,909	1,701	1,321	982	5,913
Meter maintenance	1,420	1,451	2,795	2,662	8,328
Customer service	2,722	2,221	507	523	5,973
Backhaul communications	45	71	73	74	263
Communication operations	1,323	1,323	1,323	1,322	5,291
Project management	0	0	1,429	1,287	2,716
Executive and corporate office services	300	309	403	392	1,404
IT	6,007	6,092	6,240	6,308	24,647
Total	**13,726**	**13,167**	**14,090**	**13,551**	**54,534**

Each of the above Opex items is considered in turn in the following sections. The costs of many of the items are heavily affected by human resources costs. Where human resource costs are involved Impaq's assessment is determined based on the assumptions given in section 3.4.2.

4.6.1 Meter Data Services

Table 36 shows the Citipower cost forecast and the Impaq assessment.

Table 36 – Meter Data Services Costs

		2012	2013	2014	2015	Total/Average
Citipower Forecast		1,909	1,701	1,321	982	5,913
Office Mgr FTE		1.0	1.0	1.0	1.0	1.0
Staff FTE		20.5	18.1	13.8	9.9	15.6
Impaq FTE	Office Manager	1.0	1.0	1.0	1.0	1.0
	Data management	1.0	1.0	0.5	0.5	0.8
	Manage NMI	2.0	1.0	0.5	0.5	1.0
	Data requests	1.0	1.0	0.5	0.5	0.8
	Data to AEMO	0.0	0.0	0.0	0.0	0.0

	2012	2013	2014	2015	Total/Average
IMPAQ cost	**465**	**378**	**246**	**246**	**1,336**

Citipower has stated that meter data services are services associated with the collection, validation and provision of data to the market, and include:[46]

- *collection and verification of data;*
- *processing of data from meters, including validation, estimation and substitution of data;*
- *management of National Metering Identifiers (NMI);*
- *handling of market participants' requests for data; and*
- *the provision of data to the Australian Energy Market Operator (AEMO).*

Further, costs are driven by the number of FTEs. Assuming that this cost category would require an office manager and a number of staff, the forecast cost equates to one office manager and 20 staff in 2012 reducing to one office manager and nearly 10 staff in 2015.

Collection and Processing of Data

It is Impaq's view that the Meter Data Management System (MDMS)[47] and Network Management System (NMS)[48] will fully automate the activity of collecting and verifying data from the AMI meters. The vast majority, if not all, of the processing of the data, including validation, estimation and substitution, will also be automated. It will only be a very small number of exceptional situations that will require manual intervention, which should have minimal impact on Citipower meeting its service level obligations.

The AMI performance levels[49] for the collection of daily meter readings require 99% by 4 hours after midnight and 99.9% within 24 hours. Hence there will be 99.9% of data delivered to the NMS from meters that will not require any kind of correction because it is correct data. Based on Citipower having 350,000 meters, a 0.1% rate of meter data inaccuracy equates to 16,800 data points per day. The vast majority of these errors will be addressed using standard and automated algorithms in the NEM validation and substitution procedures. Impaq assumes that at least 99% of the erroneous data points will be corrected by the MDMS, leaving 168 data points, or equivalent to 3.5 meters, which may require manual intervention per day.

Impaq accepts that prior to the completion of the AMI rollout, additional data management issues will arise due to the remaining non-AMI meters still in operation.

Impaq is of the view that a staff of 1 FTE in 2012 reducing to 0.5 FTE in 2015 would be sufficient to meet these requirements.

[46] Citipower 2011 – "Advanced metering infrastructure budget and charges application 2012-15", pages 76 to 78.
[47] Ibid, page 70.
[48] Ibid, page 71.
[49] Minimum AMI Functionality Specification (Victoria) Sept 2008, Ver 1.1 section 4.1

Management of NMIs[50]

Impaq accepts that errors that require manual intervention can occur in setting up and managing the NMI and associated standing data. However, the major effort is in the initial set-up, once this is done, ongoing management will be mostly automated. During the rollout, the standing data for a large number of sites is changing and additional FTEs would be required. However, as discussed later in this report (see section 4.6.3), Citipower has the contractual power to reduce errors in data at the time of meter changeover to 0.5%. On this basis, the maximum errors in NMI data for the rollout would be 635 for 2012 (or about 3 to 4 per day) and 450 for 2013 (or about 2 per day). Following the rollout, this should be as low as 62 for 2015 (or about 1 every 3 days). Impaq is of the view that 2 FTEs in 2012, reducing to 0.5 FTEs in 2015 would be sufficient to meet this activity.

In respect of new connections, the cost of developing and entering the NMI and standing data into MSATS and associated systems is recovered as part of the Alternative Control Service for new connections.

Handling of market participants' requests for data

Impaq accepts that Citipower is required to provide data to retailers when appropriate and valid requests are made. However, the relevant meter and metering installation data will be available to Retailers from MSATS. With the implementation of daily interval data for all meters, Retailers will receive current information on consumption and will therefore not need to make as many adhoc requests for information. Retailer requests for information pertaining to new connections or meter changes are covered by Alternative Control Services and are out of scope. Hence the vast majority of market participants' requests for data are either provided automatically anyway or are in relation to areas covered by Alternative Control Services. Impaq is of the view that a staff of 1 FTE in 2012 reducing to 0.5 FTE in 2015 will be sufficient for this activity.

Provision of data to AEMO

It is not clear what data would be required to be provided to AEMO that would require manual intervention and is not covered in the provision of market data discussed above. Impaq is of the view that this activity is already covered.

4.6.2 Meter Maintenance

Table 37 shows the Citipower cost forecast and the Impaq assessment.

Table 37 – Meter Maintenance Citipower cost forecast and Impaq assessment

	2012	2013	2014	2015	Total/Average
Citipower forecast	1,420	1,451	2,795	2,662	8,328

[50] Refer Citipower Budget and Charges application, section 7.1, 4th paragraph, page 76

Citipower revised Forecast[51]	1,420	1,451	1,668	1,534	6,073
Citipower tables[52]	1,518	1,561	1,776	1,749	6,605
IMPAQ assessment	**394**	**354**	**557**	**557**	**1,862**

In response to questions from the AER, Citipower provided a copy of the 'Citipower and Powercor Australia's Metering Asset Management Plan' plus additional information in relation to the scope and cost of meter maintenance activities[53]. Citipower advised that:

> *"Meter Maintenance" does not relate to metering fault activity (which are capitalised) but includes metering related maintenance activities such as:*
>
> - *National Electricity Rule (**NER**) compliance meter accuracy testing programs;*
> - *NER compliance current transformer accuracy testing compliance programs; and*
> - *unmetered supply audits.*

Citipower also provided tables of meter maintenance volumes and unit rates. The multiplication of volumes and rates give the costs shown in the row "Citipower tables" in Table 37.

The scope of the activities included in the Citipower metering costs appears to be wider than the CROIC scope. It appears to include some activities which relate to Alternative Control Services (such as new connections, customer requested meter testing etc) and some which relate to metering for customers with consumption above 160MWh pa. The "metering provision" activity for customers consuming more that 160MWh per annum is a contestable service where the Responsible Person engages the "Meter Provider"[54]. As such, for this class of metering activity, the costs are recovered separately.

Hence Impaq has built up costs for the meter maintenance activities that Citipower has indicated that they need to undertake and for which the costs are not recovered from other sources.

NER Meter accuracy testing

Meter Maintenance requirements are detailed in Citipower's Metering Asset Management Plan (MAMP), which has been approved by AEMO. The MAMP defines meter families as:[55]

[51] The Citipower forecasts for 2014 and 2015 were revised in the third set of responses to AER questions. These are as shown

[52] in the "second set of responses" to AER questions of 11 April.

[53] This was provided in the "second set of responses" to the AER questions of 11 April, pages 9 to 12

[54] AEMO Metrology procedure, Ver 2.01 section 2 "Meter provision"

[55] Citipower budget and charges application, attachment 49, pages 16 and 21.

Consistent with AS1284.13, section 8.2 (step 1), meter families are grouped according to:
a) Manufacturer; and
b) Design or pattern or type.
The population of each meter family is grouped into five year blocks based on the age of the meters.

This means that, according to this classification of meter families, all of the AMI meters of the same type and vendor would constitute one family and thus only require one sample for testing. Notwithstanding, Impaq believes that, given the very large number of new meters that have been installed in a very short period of time, it would be prudent to have more metering families.

Impaq's assessment of the required meter testing program for both Citipower and Powercor is summarised in Table 38. The meter numbers are the total meter numbers to be rolled out. The meter types are those nominated by Citipower and Powercor.

The number of meter families has been assumed based on the need to have at least two families for each meter type since there are two vendors and also to keep the number of meters in each family less than 35,000 to limit the number that would need to be replaced if there was a failure of a family of meters. It is assumed that these families would apply across both Citipower and Powercor.

Table 38 – Meter testing numbers and costs

Meter Types[56]	CP meter Nos[57].	PAL meter Nos[58]	Total Meter Nos	No of families	Meters per family	Sample Size	Meters to be tested	Unit cost to test meters ($)	Cost to test meters ($)
1 Ph 1e	245,093	477,005	722,098	22	32,823	315	6,930	250	433,125

[56] Meter types are as per Table 12
[57] Meter numbers are as per Table 12, It is noted that these numbers are too high as discussed in section 4.1.1. However the was no information for the reduced volume which related to each meter type.
[58] From the Powercor budget and charges submission.

Meter Types[56]	CP meter Nos[57].	PAL meter Nos[58]	Total Meter Nos	No of families	Meters per family	Sample Size	Meters to be tested	Unit cost to test meters ($)	Cost to test meters ($)
1 Ph 1e+C	7,166	57,901	65,067	2	32,534	315	630	250	39,375
1 Ph 2e+C	35,556	213,255	248,811	8	31,101	315	2,520	250	157,500
3 Ph	72,344	125,189	197,533	6	32,922	315	1,890	412.5	194,906
3 Ph+1 Ph int C	2,808	15,111	17,919	2	8,960	200	400	412.5	41,250
3 Ph CT	3,763	5,628	9,391	2	4,696	200	400		
Total	366,730	894,089	1,260,819	42	30,020		12,770		866,156

The sample sizes[59] are taken from AS1284.13:2002. AS1284.13 requires new meter types to be tested within 3 years of being placed into service[60]. It would appear that such testing can then be spread uniformly throughout the 2012 to 2015 period. Citipower advise that the unit cost to test a single meter in situ is $250 and for a three phase meter $412.50. The total annual testing cost is $866,156. It is noted that testing of CT meters is not included here as that is covered in the next subsection.

Impaq considers that a lower cost alternative would be to retrieve meters and test them in the laboratory, because then 10 to 20 meters can be tested at once. If a 10 head meter test bench (although many would be 20 head and hence quicker to test meters) is assumed and a testing time of 2.4 hours[61] (which is generous for doing the 4 tests in table 1 of AS1284.13) the total testing time is 766 hours. This translates to 0.51 FTE. This is across both Citipower and Powercor. Based on the top rate in the Hays Salary survey for an instrument technician[62], this equates to $68,234. The total cost to retrieve meters would be $257,000. The estimated cost to operate the meter testing facility is $40,000 per year for consumables and other costs. Total then for bench testing comes to $365,234, which is much lower than the cost of in-situ testing.

Nevertheless Impaq considers the option of in-situ testing to be reasonable.

NER compliance current transformer meter accuracy testing

Citipower have advised that[63]:

> *Chapter 7 of the NER require CT connected meters to be accuracy tested at least every five years.*

[59] Sample sizes are in AS1284.13:2002 table 1 – sampling by attributes

[60] AS1284.13, clause 6.2.2

[61] Also includes for packing, handling, recording results

[62] Rate is $87,371 pa. Plus on-costs and other costs gives $133,583 pa total employment cost for an FTE refer section 3.4.2

[63] Second set of responses to AER questions sent 11 April

The Businesses' CT meters will be replaced with AMI CT meters during the period 201113 (inclusive) as part of the smart meter rollout.

The 5 yearly CT meter test program will recommence in 2014 and is formulated as an annual test program of 1/5 of the entire CT meter population to smooth workload against available expert test technicians.

Impaq agrees that the NER requires 100% testing of CT connected meters every 5 years. Based on the number of CT AMI meters given in Table 38, this is 1,878 meters tested each year. The rate Citipower advised for each CT meter test is $325[64]. Hence this results in a cost of $610,415 for each of 2014 and 2015.

Unmetered supply audits

The NEM metrology procedure requires unmetered supplies to be regularly audited. Citipower and Powercor have forecast unit costs of $150 per audit and quantities of 1,100 in 2012 followed by 300 for each of the remaining years[65].

Validation of metering installations

The NEM metrology procedure also requires that the metering data base (in the DNSPs systems) must be validated against the metering data in type 5 and type 6 meters[66]. In respect of the validation of meter installations, Citipower states that the sample size is based on samples used in meter testing and validation must be conducted every twelve months. Hence the meters which are sampled for accuracy testing (as detailed above) can also be used for validation of the metering database. The interval data collected from these meters can be validated against what is stored in the MDMS. It is expected that this would be largely an automated process resulting in very few exceptions as AMI meters are remotely read over secure communications channels. The cost of this is included in the next category.

Other metering resources

Although not nominated by Citipower and Powercor it is assumed that this cost category would include a range of activities including metering strategy, review of metering technologies and products from metering vendors, meter data validation management and meter accuracy testing management. This task is estimated to require 1 FTE, assumed to be that of an engineer.

Summary of meter maintenance costs

Table 39 gives a summary of costs outlined above. It is assessed that an allocation of 1/3 to Citipower and 2/3 to Powercor is reflective of the cost drivers.

Table 39 – Summary of meter maintenance costs

	2012	2013	2014	2015	Total

[64] Ibid

[65] Ibid – tables of volumes and costs

[66] Metrology procedure part A, section 3.9 page 43

Meter testing	866	866	866	866	3,465
CT meter testing			610	610	1,221
Unmetered supply audits	165	45	45	45	300
Metering Engineer	150	150	150	150	600
Total	1,181	1,061	1,672	1,672	5,585
Citipower allocation	394	354	557	557	1,862
Powercor allocation	787	707	1,114	1,114	3,724

4.6.3 Customer Service

Table 40 shows the Citipower cost forecast and the Impaq assessment.

Table 40 – Customer Service – Citipower Forecast and Impaq Assessment

		2012	2013	2014	2015	Total/Average
Citipower Forecast		2,722	2,221	507	523	5,973
Impaq FTE	Call Centre	0	0	0	0	0
	Customer Interaction	0	0	0	0	0
	Revenue Management – billing	0.1	0.1	0	0	0.08
	Revenue Management – revenue protection	0.8	0.6	0.1	0.1	0.65
Impaq view - Cost of focus groups etc		100	100	100	100	400
IMPAQ FTE		0.9	0.7	0.1	0.1	0.73
IMPAQ cost		**212**	**187**	**114**	**114**	**627**

Citipower has stated that the activities in this cost category are:[67]

- call centre;
- customer interaction; and
- revenue management.

Further, Citipower has indicated that, for all these activities, the cost is a function of the number of customers who have their meters replaced with an AMI meter.

Impaq questions some of the statistics quoted by Citipower in respect of this category as they are not supported by industry statistics or other sources, including that:

- *32%, or 1 in 3, meter exchanges generate a telephone call from the customer to the call centre;*

[67] Citipower budget and charges application, pages 86 to 87.

- *12%, or 1 in 8, final meter reads will be erroneous; and*
- *1.5% of meter installations require investigation for possible corrupt or fraudulent behaviour.*

Call Centre

In respect of call centre costs, these have been included in the meter installation capital costs (see section 4.1.4)

Customer Interaction

In respect of customer interaction, Citipower has stated that this activity includes the cost of:[68]

- *resolving exceptions where 5% of AMI meter exchanges generate exceptions;*
- *post and courier costs, stationery and printing for mail outs; and*
- *training, focus groups and surveys.*

In relation to 'resolving exceptions' and 'post and courier costs, stationery and printing for mail outs' these have been included in the meter installation capital costs (see section 4.1.4).

Impaq accepts the need for Citipower to be engaging customers and understanding customer response in respect of AMI and related metering issues. It is noted that this does not replace the interaction with customers by Retailers on these matters. Impaq considers that training of call centre and customer service staff is important and that conducting a few customer focus groups would provide useful understanding of customer perspectives. Impaq believes that three or four customer focus groups plus annual training sessions for all customer service staff would be in order. Impaq considers that $100,000 per annum for this purpose would be sufficient.

Revenue Management

In respect of revenue management, Citipower has stated that this activity includes the cost of:[69]

- billing which involves verifying final meter reads; and
- revenue protection which involves identifying whether meters have been corrupted.

Citipower expects that 12% of final reads will lead to errors, which will take a weighted average of approximately 10 minutes to process. Impaq accepts that errors in final reads of non-AMI meters will require manual intervention to resolve. However, Impaq does not accept a 12% incidence of errors. Final meter readings are the responsibility of the installation contractor. The performance management

[68] Ibid, page 86.
[69] Ibid, page 87.

clauses in its contracts with installers allows CHED to demand AMI meter installers perform meter reads to a much higher standard. Impaq considers that Citipower has adequate contractual power to reduce this to 0.5%. At 0.5%, the error rate in 2012 would be 635, or about 3 per day, and in 2013 the error rate would be 450, or 2 per day. In 2014 and 2015 this issue will disappear as all meters will be remotely read daily. Impaq believes that this will require[70] 0.1 FTEs in 2012, 0.1 FTEs in 2013 and 0 FTEs in 2014 and 2015.

Citipower expects that 1.5% of meters replaced during the roll out will need to be investigated to identify whether the meter has been corrupted. This figure is much higher than the meter fraud percentages of 0.1% to 0.5% being presented by other utilities at Revenue Protection Sessions at Metering Conferences[71]. Impaq believes a rate of 0.5% is more appropriate. Each investigation will take 110 minutes including site visit and reporting. Impaq considers that 0.8 FTEs will be required in 2012, 0.6 FTEs in 2013 and 0.1 FTEs in 2014 and 2015.

4.6.4 Backhaul Communications

Table 41 shows the Citipower cost forecast for Backhaul Communications from the budget submission and the revised forecast from spreadsheet information.

Table 41 – Backhaul Communications Costs

	2012	2013	2014	2015	Total
Citipower Forecast	45	71	73	74	263
Citipower revised Forecast	31	31	32	33	127

Based on the spreadsheet Citipower has provided[72] Impaq showing:

- the number of backhaul endpoints, including Mesh Radio Access Points, 3G point to point connections, PSTN phone lines and Satellite connections; and
- the per month rates for these connections;

Impaq considers the revised forecast costs as prudent.

Impaq does consider that the $19 per month rates for 3G connections is above what is available today, however given that this is a contract that Citipower has with Telstra which was let through a competitive tender process in accordance with the CROIC, Impaq accepts this forecast.

[70] Assuming it takes 10.5 minutes to fix each final read error. (this is the average of the times given in the Citipower Budget and charges application section 7.5.3)

[71] For example, The Australasian Utilities Revenue Protection Association ran conferences periodically until its merger with UMA in 2007. Revenue loss has been reported of the order of $80M to $160M in 2001 http://www.highbeam.com/doc/1G1-77779280.html. Total of 216,316 GWh in 2001 (http://www.abs.gov.au/ausstats/abs@.nsf/productsbytopic/0C2AA58A90E887B3CA256E60007BAB57?OpenDocument) at average price of $0.12. Gives non-technical .losses of 0.25% to 0.5%. Further if non-technical losses were of the order of 1.5% then distribution loss factors would be higher than they are.

[72] From spreadsheet “Backhaul communications rates” CP tab.

4.6.5 Communication operations

Table 42 shows the Citipower cost forecast for Communications Operations.

Table 42 – Communications Operations

	2012	2013	2014	2015	Total/Average
Citipower Forecast	1,323	1,323	1,323	1,322	5,291
Impaq View	633	633	633	633	2,533

Citipower has stated that:[73]

Communications operations involve four work streams:

- *AMI Technology, which provides management expertise with respect to the AMI project and is also responsible for fault detection, fault investigation, fault resolution and reporting;*
- *AMI Communications Control, which is responsible for operational aspects of the AMI network, including meter data delivery and prescribed market transactions;*
- *Technology Acceptance, which is responsible for quality testing, regression testing and functionality testing of new firmware and software released by SSN and other meter providers; and*
- *Home Area Network Support, which is responsible for assessing and testing HAN technology and its compatibility with the AMI meters and Citipower network.*

The Citipower forecast equates to 10 FTEs, which Impaq has assumed are a mixture of telecommunications engineers and technicians.

AMI Network Operations and fault rectification

Impaq would expect there would be a communication network operation centre (NOC) to service both the Citipower and Powercor AMI communications networks. Services in relation to operation, fault detection, investigation and resolution would need to be provided 24/7. However given the high reliability of the SSN network it is expected that the operators for the electrical network would, with training, be able manage the operation of the AMI network for the afternoon and night shift and for weekends, with an experienced AMI operator/technician on standby. During day shift, only one AMI operator would be required for the NOC. This is assumed to be a technician level role and one that could be shared with other AMI network technicians that would undertake fault investigation and rectification.

There are to be 69 Access points for Citipower and 738 for Powercor; a total of 807. There are to be 2471 relays in the Powercor area. There are also likely to be about 11,500 point to point meter reading communications links for Powercor (mainly 3G mobile and PSTN).

[73] Citipower budget and charges application, page 84.

With a failure rate of access points and relays of 5%pa (<1% is considered more likely) with 3,278 devices this gives 1 failure per day. With a failure rate of 3G and PSTN connections of 2% pa this gives 1 failure per day. If it is also assumed that there is a failure rate of meters of 0.5% pa[74], this translates to 14 meters per day to be investigated for comms failure. There will also be other comms issues, such as dead spots, new obstacles etc which will require attention.

In relation to fault investigation and rectification it is considered that a total of 9 technicians across both networks would be adequate; 8 doing field work and one to operate the NOC.

For overall technology and network design and management it is assumed that a telecommunications engineer would be required.

The total FTEs required then are:

- Section Manager;
- Engineer; and
- 9 technicians.

Table 43 summarises the Impaq estimate of the communications network operating costs

Table 43 – Network operating costs

	2012	2013	2014	2015	total
Technicians cost	1,350	1,350	1,350	1,350	5,400
Engineer cost	160	160	160	160	640
Section Manager	200	200	200	200	800
Vehicle operating costs	90	90	90	90	360
Consumables and equipment costs	100	100	100	100	400
Total	**1,900**	**1,900**	**1,900**	**1,900**	**7,600**
Citipower allocation	**633**	**633**	**633**	**633**	**2,533**
Powercor allocation	**1,267**	**1,267**	**1,267**	**1,267**	**5,067**

AMI Data Delivery

In respect of AMI communications control, Impaq believes that the activities of 'data delivery' and 'prescribed market transactions' are already sufficiently included in Meter Data Services. Any costs related to resolving issues with the IT systems that manage these processes are covered under IT operations.

Technology acceptance

[74] ENEL advise that failure rates are less than 0.3% pa

In respect of technology acceptance, Impaq is of the view that 'quality testing, regression testing and functionality testing of new firmware and software released by SSN and other meter providers' is a capital expense related to the relevant IT, Communications or Meter upgrade project. Reference to this is included in the review of capital expenditure in section 4.2.3. No operating costs are considered necessary.

Home Area Network support

In respect of home area network support, Impaq believes that, while this technology appears to be slow to progress in Australia, providing information and control to the customer is necessary in order for customers to gain the full benefits of AMI. Impaq considers that the implementation of HAN should be encouraged however this should be the subject of a separate program of work developed in conjunction with DPI and costs recovered through a revised budget submission.

4.6.6 Project Management

Table 44 shows the Citipower cost forecast and the Impaq assessment.

Table 44 – Project Management

	2012	2013	2014	2015	Total/Average
Citipower Forecast	0	0	1,429	1,287	2,716
Equivalent FTE	0.0	0.0	7.7	6.9	3.6
IMPAQ FTE	0.0	0.0	3.8	3.0	1.7
IMPAQ cost	**0**	**0**	**586**	**484**	**1,070**

Taking account of the CHED margin on project management[75] the Citipower forecast equates to 7 project manager FTEs in 2014 and 2015. Citipower has treated all project management costs before the completion of the rollout as capital.

Citipower has stated that after the rollout is finalised, the PMO will become part of the management of the new AMI Business unit, ensuring that the AMI Business unit runs smoothly and is able to deliver to the regulatory standards.[76]

> *The key projects expected under program management once the rollout reaches its final stages relate to the following:*
>
> - *operational review: once the rollout finalises the Business is going to be left with a sophisticated AMI Business unit that is far more complex than the pre-existing metering Business. In order to manage the transition from rollout to BAU, a comprehensive operational review is envisaged in order to help the Business transition in a cost effective manner. The operational review is expected to highlight key risk areas and areas with potential for process improvement.*

[75] Citipower budget and charges application, page 34.
[76] Ibid, page 75.

- *review of the meter supply contracts: relates to the end of the third party purchasing contracts that were negotiated for the purposes of the AMI rollout. The Business is forecasting for legal and consulting services in relation to the closing of the current contract and agreements and the scoping of the new agreements that will be required for metering BAU activities.*

In respect of the operational review, Impaq supports the need to review the AMI business unit following the completion of the roll out. At the completion of the rollout is an opportune time to review the structure, responsibilities and business processes to ensure that the business unit is optimised for BAU operations instead of rollout. There is also opportunity to review how the data from AMI can be leveraged for more efficient operation of the network and the business as a whole. It would be expected that business processes would be re-engineered through identification of opportunities to simplify process maps and to review the cost, quality and time performance measures and metrics to ensure that such performance measures are optimally aligned with business strategies and objectives. Such a project is similar to other strategic reviews of business units and does not require a large resource base perform the work[77]. The Impaq is of the view that this would require no more than 1 project manager and 2 business analysts for both 2014 and 2015.

In respect of the 'closing of the current contract and agreements and the scoping of the new agreements that will be required for metering BAU activities' it is Impaq's view that these costs should be capitalised. However, it appears that Citipower have chosen to expense these costs. All of the significant contracts have been let by CHED and apply for both Citipower and PAL. Consequently, the costs involved in closing the existing contracts and scoping the new contracts would be a shared cost.

Impaq is of the view that legal support of 0.5 FTEs as well as 1 FTE of experienced accounting support in 2014 would be sufficient for the closing of the existing contracts and supporting the scoping of the new contracts. In addition, a further 0.5 FTE with a technical background will be required to scope the new contracts. There is allowance in the Capital Expenditure for management of meter supply contracts. Refer section 4.1.2. (Meter installation contract costs are out of scope because these relate to new connection and meter changes which are recovered through Alternative Control Services.) The cost of these resources would be incurred by CHED and would be shared one third to Citipower and two thirds to PAL.

4.6.7 Executive and corporate office services

Table 45 shows the Citipower cost forecast and the Impaq assessment of cost.

[77] For example it would be expected that there would be about 4 to 8 top level business processes which would translate to about 20 to 40 main processes. The maps of these processes could be reviewed through 15 to 30 workshops – hence about 30 to 90 days for each member of a team of 3. This would also include review the measures of performance for each process.

Table 45 – Executive and Corporate Services[78]

	2012	2013	2014	2015	Total/Average
Citipower Forecast	300	309	403	392	1,404
Equivalent FTE	2.9	3.0	4.0	3.8	3.4
IMPAQ FTE	1.0	1.0	2.0	2.0	1.5
IMPAQ cost	**102**	**102**	**382**	**382**	**968**

The Citipower forecast equates to 3 accounting FTEs in 2012 increasing to 4 accounting FTEs in 2015.

Citipower has stated that:[79]

> *Executive and corporate office services are mainly regulatory costs associated with the preparation of budget and charge applications and financial accounting costs. Also included are costs associated with the preparations for the 2016-20 Victorian Electricity Distribution Price Review (Victorian EDPR 2016-2020) which will incorporate metering (only the incremental costs associated with metering at the Victorian EDPR 2016-2020 have been included in this Application). As is to be expected, costs increase in 2014-15 as preparations commence for the Victorian EDPR 2016-2020.*

This cost category includes two activities:

- accounting services; and
- support for the 2016 – 2020 EDPR (which will be required in 2014 and 2015).

In respect of accounting services, Impaq does not believe that the 'preparation of budget and charge applications and financial accounting' would require 4 incremental FTEs to Citipower's accounting activities for the rest of its business.

The preparation of the budget and charges application is an annual activity that should require no more than 3 FTEs for 2 months, or 0.5 FTEs for the year. The preparation of monthly reports, given the new automated systems that have been installed, should be sufficiently met with 1 FTE for 3 days per month, or 0.18 FTEs for the year.

In respect of other financial transactions that are related to 'in scope' activities, the amount of human intervention should not be significant. Predominantly, these activities will be related to the payment of a small number of contractors. This activity should be sufficiently met by 1 FTE for 5 days per month, or 0.3 FTEs for the year. Impaq is of the view that this activity would be sufficiently met by 1 accounting FTE.

[78] It is noted that the Impaq assessment of costs for this category is the same for Citipower and PAL. This is because the activities involved are largely not variable with numbers of customers

[79] Citipower budget and charges application, page 88.

Impaq accepts the need for additional resources to support the 2016-20 EDPR in respect of metering and metering services. Impaq believes that 1 additional FTE would sufficiently meet this requirement.

4.7IT Opex

Table 46 - summarises the IT Opex provided in the Budget Template.

Table 46 – Summary of IT Opex

	2012	2013	2014	2015	Total
Workforce Scheduling & Mobility	675	675	710	710	2,770
Connection Point Management	34	34	34	34	136
Network Management	562	606	615	626	2,409
Meter Data Management	3,744	3,804	3,857	3,913	15,318
Performance & Regulatory Reporting	54	54	54	54	216
Logistics Management	3	3	3	3	13
IT Infrastructure (incl middleware, B2B and B2M)	934	916	966	966	3,782
Total	**6,007**	**6,092**	**6,240**	**6,308**	**24,647**

4.7.1 Workforce scheduling and mobility

In response to a question about why this is such a large cost item, Citipower has provided the following information regarding workforce scheduling and mobility[80]:

> *Workforce scheduling and mobility is still required after the completion for the rollout by 2013. The workforce scheduling and mobility includes:*
>
> - *support and maintenance for service suite, device scanning software and meter data analytics;*
> - *telecommunications costs for fault devices; and*
> - *FTE support for these systems.*

It is Impaq's view that after the rollout is finished there is no requirement for a mobility solution dedicated to AMI. Should Citipower wish to use this system for scheduling and mobility for other parts of the business then this should not be a cost to AMI. Further meter installations in 2014 and 2015 are recovered under Alternative Control Services and hence should not be a cost to AMI.

[80] refer 2nd set of Citipower/PAL responses to questions from AER of April 11

4.7.2 Meter Data Management System

The Citipower application indicates that Citipower and Powercor have implemented the Itron Enterprise Edition (IEE) for their Meter Data Management System (MDMS)[81]. From the description of this cost category it would appear that the costs are for IEE only. However in response to a question about why this is such a large cost item, Citipower has provided the following information regarding MDMS cost[82]:

> *The MDMS allocation is made up of the following items:*
>
> - *maintenance and support for MTS, DAA, IEE & USB;*
> - *24hr*7 external support and internal FTE's support;*
> - *hosting for 100,000 CEDA customers information portal; and*
> - *HAN & demand side management.*

This is scant information to support a $15m Opex cost over the 2012 to 2015 period. Nevertheless in relation to this information:

- In respect of the Market Transaction System (MTS), it is noted that this would have required a major upgrade to handle the volumes required for AMI. However, this should not lead to high operating costs. For example, if Utilisoft Gatekeeper and FlowTalk were used for the MTS it is Impaq's view that Opex, including license costs and software support, would be about $250,000 per year[83]. Further, a large proportion of the MTS Opex cost should be recovered through other channels. Apart from sending interval data to the market the gateway is used mainly for B2B transactions and the costs of these are recovered either through Alternative Control Services or Excluded Services. Hence, in the absence of definitive data on the cost allocation for MTS, Impaq is of the view that this is not a material cost for AMI.
- In relation to Utility Services Bus (USB) the cost of this should be borne across the whole Citipower business as it services all the major applications that operate on it. The infrastructure cost of the USB is covered under IT infrastructure.
- The hosting of a customer information portal, although a project to be encouraged, is not within the scope of the CROIC.

Hence, in Impaq's view, the Opex cost of the MDMS comes down to the Opex for IEE. In the absence of detailed information from Citipower, Impaq has used information from other DNSPs which have implemented MDMS.

Table 47 shows Impaq's assessment of IT Opex.

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[81] Budget and Charges Application, section 6.7.8

[82] refer 2nd set of Citipower/PAL responses to questions from AER of April 11

[83] Based on discussions with Utilisoft in scoping out the gateway requirements for other market participants.

Table 47 – Impaq Assessment of IT Opex cost

	2012	2013	2014	2015	Total
Workforce Scheduling & Mobility	675	675			1,350
Connection Point Management	34	35	34	35	138
Network Management	562	606	615	626	2,409
Meter Data Management	1,439	1,450	1,338	1,345	5,571
Performance & Regulatory Reporting	54	54	54	54	216
Logistics Management	3	4	3	4	14
IT Infrastructure (incl middleware, B2B and B2M)	934	916	966	966	3,782
Total	**3,704**	**3,740**	**3,012**	**3,031**	**13,487**

4.8 Operating Cost Summary

Table 48 – Summary of Operating Costs – proposed and Impaq view

	2012	2013	2014	2015	Total
Meter Data Services – Proposal	1,909	1,701	1,321	982	5,913
Meter Data Services – Impaq view	465	378	246	246	1,336
Meter Maintenance – Proposal	1,420	1,451	2,795	2,662	8,328
Meter Maintenance – Impaq view	394	354	557	557	1,862
Customer Service – Proposal	2,722	2,221	507	523	5,973
Customer Service – Impaq view	212	187	114	114	627
Backhaul Communications –Proposal	45	71	73	74	263
Backhaul Communications – Impaq View	31	31	32	33	127
Communications operations - Proposal	1,323	1,323	1,323	1,322	5,291
Communications operations – Impaq view	633	633	633	633	2,533
Project Management – Proposal	0.0	0.0	1,429	1,287	2,716
Project Management – Impaq view	0	0	586	484	1,070
Executive & corporate services – Proposal	300	309	403	392	1,404
Executive & corporate services – Impaq view	102	102	382	382	968
IT Opex – Proposal	6,007	6,092	6,240	6,308	24,646
IT Opex – Impaq view	3,704	3,740	3,012	3,031	13,487
Total – Proposal	**13,726**	**13,167**	**14,090**	**13,551**	**54,534**
Total – Impaq view	**5,541**	**5,425**	**5,563**	**5,481**	**22,009**

5 Jemena

Table 49 and Table 50 summarise Impaq's understanding of the Jemena (JEN) Budget submission for Capital Expenditure and Operating Expenditure for AMI for 2012 to 2015. There are differences in the Capex costs provided in the budget application, the budget templates and the JEN Reconciliation spreadsheet. Impaq has chosen to use the JEN reconciliation spreadsheet as the JEN Capex proposal as this contains more detailed information. For example the Capex for New Connections Adds and Alts is a little different to the values in the JEN Budget Submission[84] (which totals to $14.0m). It is noted that all values in tables are $,000 real 2011 unless otherwise stated.

Table 49 – JEN Capex Budget Submission Summary[85]

	2012	2013	2014	2015	Total
Meters (Mass Rollout)	18,700	7,533			26,233
Installation (Mass Rollout)	8,564	3,547			12,111
New Connections, Adds and Alts	3,610	3,106	2,937	2,937	12,590
AMI technology and communications	1,317	997	647	747	3,710
IT Infrastructure and systems	606	2,135	3,814	3,390	9,945
MRO back office -	776	244			1,020
Total JEN Proposal	**33,573**	**17,562**	**7,398**	**7,074**	**65,607**

Table 50 – JEN Opex Budget Submission Summary

	2012	2013	2014	2015	Total
Asset Strategy and Planning-	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Asset Operations	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Customer Contact & Back Office	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
AMI Network Operations	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Meter Data Collection	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
AMI Transitional Business Activities	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Backhaul Communications	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Management	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Finance & HR	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Regulatory Audit	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Service Delivery & Contract Management	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Stakeholder Relations	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]

[84] Table 5.5, page 33

[85] From JEN Reconciliation spreadsheet, which also include the [C-I-C].

	2012	2013	2014	2015	Total
Premises	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
IT Opex	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Total – JEN Proposal	**19,422**	**17,227**	**15,820**	**15,941**	**68,410**

In this section of the report each of the cost items in the above tables are reviewed in order.

5.1Capital Expenditure Meters (Mass Rollout)

5.1.1 Meter Volumes

In the JAM substantiation document, the mass rollout meter volumes for JEN are given[86]. An excerpt from this for 2012 and 2013 is given in Table 51. It is noted that JEN expects to complete rollout by the end of 2013 and hence there are no rollout volumes for 2014 and 2015.

Table 51 – JEN meter rollout volumes from JAM substantiation document

Meter Types	2012	2013
Single Phase Single element	64,000	26,667
Single phase off peak	24,887	10,369
Three phase direct connect	13,217	5,507
Three phase CT connect	2,038	849
Total	**104,142**	**43,392**

The meter volumes given in JEN "Attachment 3 – Reconciliation" spreadsheet are shown in Table 52.

Table 52 – JEN meter rollout volumes for JEN attachment 3[87]

Meter Types	2012	2013
Single Phase, single element	61,990	25,829
Single Phase, single element, with 31.5A load control	24,887	10,369
3 Phase with no load control	9,773	4,072
3 Phase with 31.5A and 2A load control	3,272	1,364
3 Phase CT connect	2,038	849
Total	**101,960**	**42,483**

JEN has verbally advised Impaq that the volumes in Table 52 are the correct volumes.

[86] JAM substantiation document , table 5-1, page 51
[87] JEN Attachment 3 – Reconciliation spreadsheet, tab 8 JEN_MRO Vols

5.1.2 Meter Unit Prices

Table 53 summarises the unit prices for meters that are to apply from Jan 2012[88]. It is noted that these prices include the cost of the meter and the cost of the Silver Springs Networks Network Interface Card (NIC).

Table 53 – Meter Prices

Meter type	Price US$ Real 2010
Single Phase, single element	[C-I-C]
Single Phase, two elements with 31.5A load control	[C-I-C]
3 Phase with no load control	[C-I-C]
3 Phase two elements with 31.5A load control	[C-I-C]
3 Phase two elements with 31.5A and 2A load control	[C-I-C]
3 Phase CT connect	[C-I-C]
3 Phase CT & VT connect	[C-I-C]
LAN Antenna	[C-I-C]

In this table it is assumed that the 2 element meters are supposed to be single element meters as JEN have not indicated any intention to use 2 element meters. The pricing in this table is consistent with the PRI (Secure Meters) Jemena Contract[89]. Further the unit prices are quite similar to that given in the Citipower and Powercor budget submissions and the meter costs used in the National Smart Metering Cost benefit analysis of 2008. Impaq considers that the meter purchasing has been competitively tendered and the meter prices are reasonable.

The JEN submission has assumed a US$ exchange rate of [C-I-C] throughout 2012 to 2015. As outlined in section 3.4.1, Impaq considers that an exchange rate of 1.05 is more appropriate.

5.1.3 Impaq assessment of meter (mass rollout) Capex cost

Table 54 shows the Impaq assessment of meter cost as compared to the JEN submission.

Table 54 – MRO Meter purchase Capex – Impaq view

	2012	2013	2014	2015	Total
JEN Proposal	18,700	7,533			26,234
Impaq view	14,941	6,018			20,959

[88] JEN "Attachment 3 – Reconciliation spreadsheet – Tab 9 – Meter_Comms unit rates cells AB3 to AB11

[89] Schedule 11 of the JEN/Secure (PRI) contract

5.2Capital Expenditure – Installation (Mass Rollout)

JEN's unit costs for meter MRO installation are given in Table 55. The prices for the first eight items have been validated against the revised JEN Service Stream contract[90]. JEN has also provided evidence that this contract was competitively tendered. The columns in the table headed "Aug-10%" and "Jan-13%" refer to the proportions of the items that were required in August 2010 and the proportions likely to be required from January 2013. This is understood to be due to the higher proportion of installs done after January 2013 that will be non-sequential (perhaps because they have been skipped up to now) or are difficult installations.

Table 55 – cost items for MRO installations[91]

Mass Rollout	Jan-13 %	Aug-10 %	$ Aug-10
Standard Install	[C-I-C]	[C-I-C]	[C-I-C]
Panel Rewire	[C-I-C]	[C-I-C]	[C-I-C]
Panel Replacement	[C-I-C]	[C-I-C]	[C-I-C]
Asbestos	[C-I-C]	[C-I-C]	[C-I-C]
NST Appointments	[C-I-C]	[C-I-C]	[C-I-C]
Revisit	[C-I-C]	[C-I-C]	[C-I-C]
Out of Sequence Revisit	[C-I-C]	[C-I-C]	[C-I-C]
Antenna extension cable	[C-I-C]	[C-I-C]	[C-I-C]
DPI/DB Letter	[C-I-C]	[C-I-C]	[C-I-C]
DPI Letter Printing	[C-I-C]	[C-I-C]	[C-I-C]
Meter Exchange Card	[C-I-C]	[C-I-C]	[C-I-C]
DB Intro Letter - Printing	[C-I-C]	[C-I-C]	[C-I-C]
DB Intro Letter Envelope - Printing	[C-I-C]	[C-I-C]	[C-I-C]
Meter Exchange Letter Envelope - Printing	[C-I-C]	[C-I-C]	[C-I-C]
No Access Letter	[C-I-C]	[C-I-C]	[C-I-C]
Multi-Site Panel Replacement	[C-I-C]	[C-I-C]	[C-I-C]

Impaq makes the following comments in respect of a number of these items.

- The instance of panel replacements at 10.10% is higher than other DNSPs are experiencing. In response to questions about this JEN (JAM) have advised that in the rollout up to 2011 sites requiring panel replacement have been skipped. Impaq considers that although this may be an easier approach for JEN it nevertheless adds cost to the AMI program as it results in a revisit cost and an out of sequence visit cost, effectively adding another $43.32 to the cost of these sites. Sites with off peak water heating can reasonably be skipped due to the TOU moratorium and the lack of 2 element metering,

[90] JEN attachment 4, contract schedule 11
[91] JEN Attachment 3 – Reconciliation spreadsheet, Tab 10, MRO installation unit rates, cells A3 to D18

however it does not seem prudent to skip panel replacement sites. Impaq considers a panel replacement rate of 5% to be more appropriate.

- In respect of the incidence of "No Access Letter", the AMI ISC Dashboard for February 2011 shows that the cumulative proportion of no access is 4.67% and for refused access is 1.63%. The total of these is 6.3%. Hence it is considered reasonable to use 6.3% as the percentages of No Access letters required.
- In respect of NST appointments, NST testing is not a requirement of the AMI program. There is no obligation in the Distribution Code nor the Service and Installation rules. Although it is advantageous to undertake such testing while on site doing a meter replacement, it is nevertheless a cost to be recovered under DUOS. Hence Impaq's assessment is that this activity is out of scope.

In addition to the above installation items, JEN has included costs for Truck support[92] for MRO installation as shown in Table 56.

Table 56 – Truck support costs

Truck Support	Incidence	Unit Cost ($)
Customer Isolation	2.10%	[C-I-C]
Customer Defect	0.82%	[C-I-C]
POA Defect	0.31%	[C-I-C]
Network Asset Rectification or NST Failure	0.04%	[C-I-C]

It is noted that these truck support costs are well above the Alternative Control Service charge of $296.84 for a Truck for 30 minutes. It is Impaq's view that a 30 minute truck visit would be adequate for each of these categories. Impaq has therefore substituted the ACS truck visit costs in its cost assessment.

5.2.1 Adjusted MRO installation Capex cost

The JEN submission has a total budget of $12.1m for MRO meter installation costs. With the adjustments detailed above the resultant cost is $9.74m, as shown in Table 57.

Table 57 – MRO meter installation Capex – Impaq view

	2012	2013	2014	2015	Total
JEN Proposal	8,564	3,547			12,111
Impaq view	6,892	2,851			9,743

[92] JEN Attachment 3, Reconciliation spreadsheet, Tab 10 MRO installation Unit Rates, cells A22 to C26

5.3Capital Expenditure – New Connections (Adds & Alts)

Impaq has broken this category into two parts – the cost of the BAU meters and the installation cost of BAU meters.

5.3.1 Cost of BAU or New connection meters

Table 58 shows the BAU AMI meter unit prices[93]. It is noted that the prices are marginally less than the MRO unit prices. Impaq considers these prices to be reasonable.

Table 58 – BAU meter unit prices

Meter type	Price US$ Real 2010
Single Phase, single element	[C-I-C]
Single Phase, with 31.5A load control	[C-I-C]
3 Phase with no load control	[C-I-C]
3 Phase with 31.5A load control	[C-I-C]
3 Phase with 31.5A and 2A load control	[C-I-C]
3 Phase CT connect	[C-I-C]
LAN Antenna	[C-I-C]

The new connection (and Adds and Alts) metering quantities forecast by JEN are shown in Table 59.

Table 59 – JEN New connections & other meter volumes[94]

New Connections/ Adds/ Alts	2012	2013	2014	2015	Total
Single Phase (1 Ph 1 element)	7,200	6,136	5,376	5,376	24,088
Single Phase off peak	-	70	120	120	310
Three Phase Direct connected (3 Ph)	1,680	1,722	1,752	1,752	6,906
Three Phase CT connected (CT)	-	56	100	100	256
Non-AMI Meters					
Accumulation meters	252	105	-	-	357
Manually Read Interval Meters	190	78	-	-	268
Total	**9,322**	**8,167**	**7,348**	**7,348**	**32,185**

[93] From JEN "Attachment 3 – Reconciliation" spreadsheet, Tab 12 JEN-BAU Purchase cost

[94] JAM substantiation document table 5-3, page 54. The totals columns are different since the JAM document includes meters in 2011. The meter numbers in this table agree with the BAU meter volumes in the JEN "Attachment 3 – Reconciliation" spreadsheet Tab 11

The forecast volume of meters is somewhat different to the growth in customer numbers given in the AER's Victorian Distribution Determination[95] for the 2011 to 2015 period as shown in Table 60. The ratio of meters to customers in the forecast is between 1.6 to 17. It is noted that prior to the AMI rollout the ratio of meters to customers (ie: meters to NMIs) in JEN was 1.09[96] It would be expected that this would reduce to about 1.03 after AMI rollout due mainly to customers with off peak water heating having one AMI meter after rollout compared to two electromechanical meters before rollout.

Table 60 – Comparison of meter numbers to growth of customer numbers

	2011	2012	2013	2014	2015
JEN Customer Numbers	310,165	315,890	320,889	325,174	329,428
Increase in customer numbers		5,725	4,999	4,285	4,254
Meter numbers		9322	8167	7348	7348
Ratio of proposed meter numbers to increase in customer numbers		163%	163%	171%	173%

Hence the meter volume is too high and most of this is due to abolishments and meter changes (eg: single phase to three phase); the adjustment for which has not flowed into the procured volume. In these situations meters retrieved can be re-used for new customer connections after the meters are re-verified. Prior to the AMI rollout most meters retrieved from abolishments or meter changes were not worth having re-verified for re-use on other customers' premises. However after the AMI rollout all installed meters are new meters and worth re-certifying and reusing.

Impaq's assessment is that the number of new AMI meters that need to be procured is 1.03 time the increase in customer numbers. The difference between that and the meter numbers forecast by JEN will be meters requiring re-certification. The cost to recertify meters does not appear to be in the contracts that JEN has with its meter vendors and hence Impaq has used a typical value of $20 per meter, which is approximately what other DNSPs are being charged.

The Impaq assessment for BAU meters includes two other adjustments:

- using an exchange rate of 1.05 instead of 0.85; and

[95] Victorian Distribution Final Decision 2011-2015, page XVIII table 3. It is noted that JEN provided a customer number forecast in the JEN AER financial model submitted on 17 May, tab 2.2. However the forecast customer numbers are really forecast meter numbers.

[96] Based on AEMO MSATS data for numbers of small customer NMIs and number of small customer meters.

- inclusion of external antennas for 5% of meters not 100% of meters. JEN has used external antennae on 5% to 10% of MRO meters in the period through to end of 2011[97] but it is expected that 5% will be adequate for BAU meters.

Table 61 shows the Impaq assessment of BAU metering supply cost which takes into account the above adjustments.

Table 61 – Impaq assessment of BAU metering supply cost

	2011	2012	2013	2014	2015	Total
BAU metering purchase cost proposed	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Metering cost adjusted for reduction in antennas to 5% and exchange rate of 1.05	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
JEN Customer Numbers	310,165	315,890	320,889	325,174	329,428	
Increase in customer numbers		5,725	4,999	4,285	4,254	19,263
Meter numbers proposed by JEN	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Impaq cost estimates for new meters		899	776	730	725	3,130
Meter re-verification cost		69	60	59	59	247
Impaq Total Metering purchase cost		**968**	**836**	**789**	**784**	**3,377**

5.3.2 Installation cost of new connection meters

The installation cost for “new connections, adds and alts” is part of the Alternative Control Services for new connections and hence the cost is recovered directly from the customer requiring these services. It is Impaq’s view that this item is out of scope.

5.3.3 Adjusted New Connections - Capex cost

Table 62 shows the JEN proposed BAU meter supply and installation cost and the Impaq assessment.

[97] JEN Attachment 3- reconciliation spreadsheet, Tab 10 “MRO Installation Unit Rate” It is noted that on tab 8 of this spreadsheet it indicates LAN antennas on 10% of meters. However Impaq is aware that JEN has been establishing a thin mesh so that by the end of 2011 all the JEN territory will be covered by the thin mesh. This requires more antennae to make up for the lower density of metering. From 2012 onwards there should be less need for antennae because the rollout will be giving a dense mesh instead of a thin mesh. Hence Impaq considers that from several perspectives that a 5% rate for antennae is appropriate.

Table 62 – BAU Meter supply and installation Capex

	2012	2013	2014	2015	Total
JEN Proposal	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Impaq assessment	968	836	789	784	3,377

5.4AMI Technology and Communications Capex

The AMI Technology and Communications Capex in the JEN submission[98] is $3.7m for 2012 to 2015. The JEN Budget template gives $4.73m for 2012 to 2015[99]. The JEN Attachment 3 Reconciliation[100] gives $3.7m (after adding [C-I-C] and adjusting to 2011$) but excluding back office. It is this latter cost that has been used as the basis for evaluation because the Back Office Capex is considered separately in section 5.4.2

This item includes the purchase and installation costs of access points and relays. The purchase costs for Silver Spring access points and relays in US$ reconciles with the Silver Spring contract; however the exchange rate is assumed to be [C-I-C]. As discussed above Impaq's view is that an exchange rate of 1.05 is more appropriate. The installation costs for access points and relays reconcile to the Service Stream installation contract.

The costs include:

- Supply and installation of additional access points and relays at cost of $557,000. Impaq has reviewed the component costs and consider these reasonable;
- A battery replacement program for the batteries in the access points and relays. The total cost is about $94,000 which considering the number of batteries to be replaced and the cost of the battery packs seems reasonable;
- Silver Spring technology major release and minor releases. The cost of $1,080,000 for this is not substantiated but presumably is for testing releases before rolling them out to meters and communications equipment. This is considered reasonable;
- Network augmentation at a cost of $570,000. Given that there is already a similar amount for supply and installation of access points and relays listed above and that there is an allowance for costs for communications technology management in Opex (see section 5.6.1) this appears redundant. Hence Impaq does not consider the cost to be prudent;

[98] JEN Budget submission – table 5-6, total, page 34

[99] JEN Budget Templates, Comms Capex tab, total of 2012 to 2015 for contract columns and "other" columns

[100] JEN attachment 3 Reconciliation , tab 2 "JEN Comms Capex" – sum of all subtotals, then adding [C-I-C] and CPI to get from 2010$ to 2011$ (factor is 1.0279) gives $4.73m as total for 2012 to 2015. If the MRO back office subtotal is taken out it gives $3.7m

- SSN insurances at $109,000 – this is contract cost and is considered reasonable;
- Minor Secure Meters releases at $208,000. The software intensive nature of AMI meters will result in the need for software/firmware upgrades. This is considered reasonable; and
- Managing the AMI technology testing Lab for $1,172,000, which appears to be a JAM cost which is shared between JEN and UED as there is also an identical amount in the UED submission. Hence the real total cost is $2,350,000. It is presumed that this is the factory unit in Mt Waverley /Notting Hill which was used by JAM to undertake extensive bench testing of AMI technologies during the time JAM was undertaking technology trials before making a selection of AMI technology to rollout out. It is considered that this lab is likely to be quite underutilised now that all the AMI testing preliminary to rollout has been done. It is expect that the Lab would be infrequently used in relation to tests of major and minor releases of SSN software or Secure Meters software/firmware. Impaq's view is that this cost should be reduced to half its current level and reviewed in the EDPR for the 2016 to 2020 period to see whether such a capability is still required. Hence the Impaq assessed cost is $585,000 over the period.

Table 63 shows the JEN submission cost and the Impaq Assessment.

Table 63 – Communications Capex

($,000 – real 2011)	2012	2013	2014	2015	Total
JEN Proposal	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Impaq assessment	954	711	373	453	2,491

5.4.1 IT Infrastructure and Systems Capex

JEN has submitted a total cost of $9.9m for the period for IT Capex. Impaq met with JEN in May 2011 to understand the major costs that made up the IT Capex and Opex. JEN provided information outlining the major areas of expenditure required including:

- Server replacements;
- Firewall replacements;
- SAN refresh;
- Database upgrades;
- Operating system upgrades;
- Network component replacements;
- Network management system upgrades;
- Legacy CIS archive and decommissioning;
- Business intelligence – Major upgrade;
- Webmethods major upgrade; and

- System improvements and defect releases

Impaq accepts that all these activities need to occur. However it noted that a large number of servers are scheduled to be replaced in the second half of 2015. Given the dual redundant systems architecture and the extensive use of blade servers it would appear that the replacement time for servers could be extended into 2016. Hence Impaq's assessment shifts the replacement of servers from 2015 to a later time. Impaq has priced the servers listed in the spreadsheet provided by JEN[101] and considers that by deferring their replacement the reduction in cost is about $1.3M.

Table 64 – IT Capex

	2012	2013	2014	2015	Total
JEN Proposal	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Impaq view	606	2,135	3,814	1,968	8,523

5.4.2 MRO Back Office Capex

As indicated in section 5.4 the MRO Back Office Capex is included in the JEN Communications Capex category and the total cost (after [C-I-C] is added and adjusted to 2011$) is $1,020,698. The components of this cost are "Aegis" and "Other". JEN have provided the "Aegis Contract" which covers not just AMI services but a range of other back office services. From a previous engagement with the AER to review aspects of Alternative Control Services, Impaq is aware that some of the JEN back office resource for Alternative Control Services is provided by Aegis.

Part of the Service Stream contract ($14,462 per month included in the MRO installation cost Capex) is for the provision of customer contact centre services to deal with all customer questions in relation to the AMI rollout. The charges for Alternative Control Services & Remote AMI Excluded Services also include customer contact – eg, for remote connect and disconnect services. It is presumed that the MRO back office functions are for the support of updates to MSATS standing data and the provision of final reads on meter changes. Impaq accepts the JEN proposed cost as shown in Table 65.

Table 65 – MRO Back Office

	2012	2013	2014	2015	Total
JEN Proposal	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]

5.5 Summary of Capex adjustments

Table 66 shows a summary of the JEN submission Capex items together with the Impaq assessment.

[101] AMI IT Infrastructure roadmap 2012-2015_JEN

Table 66 – Summary of Capex

	2012	2013	2014	2015	Total
MRO Meter supply Proposal	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
MRO Meter supply - view	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
MRO Installation - Proposal	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
MRO Installation Impaq view	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
BAU metering Proposal	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
BAU metering Impaq view	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Communications- Proposal	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Communications - Impaq view	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
IT Capex - Proposal	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
IT Capex - Impaq view	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
MRO back office - Proposal	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
MRO Back office - Impaq view	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Total JEN Proposal	**33,573**	**17,562**	**7,398**	**7,074**	**65,607**
Total Impaq view	**25,137**	**12,795**	**4,976**	**3,205**	**46,113**

5.6 Operating Expenditure

Table 67 shows a summary of the operating expenditure proposed by JEN. Throughout this section, most of the Opex costs are driven by human resource costs. Where Impaq has made its own assessment of human resource costs it has used the assumptions detailed in 3.4.2 These rates have been escalated from 2010 to the relevant year by using the 'Outsourced Labour Escalation Rates' and CPI provided by JEN[102]. A [C-I-C] has then been applied.

Table 67 Summary of Operating Expenditure

	2012	2013	2014	2015	Total
Asset Strategy and Planning	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Asset Operations	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Customer Contact & Back Office	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
AMI Network Operations	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Meter Data Collection	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
AMI Transitional Business Activities	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Backhaul Communications	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Management	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Finance & HR	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Regulatory Audit	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Service Delivery & Contract Management	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]

[102] Letter from Jemena to AER 21 April 2011 – Attachment 3.

	2012	2013	2014	2015	Total
Stakeholder Relations	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Premises	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
IT Opex	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Total	**19,422**	**17,227**	**15,820**	**15,941**	**68,410**

Each of these operating costs is analysed in turn in the following sections.

5.6.1 Asset Strategy and Planning

Table 68 details JEN's cost forecast[103] and Impaq's assessment.

Table 68- Asset Strategy and Planning costs

	2012	2013	2014	2015	Total/Average
Contract cost – competitive tender	0	0	0	0	0
Other	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Total	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Equivalent FTE	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
IMPAQ FTE	1.0	1.0	1.0	1.0	1.0
IMPAQ cost	**145**	**148**	**152**	**154**	**599**

The cost of this activity would be substantially labour and the level of expenditure forecast represents approximately 9 tertiary qualified FTEs, likely to be telecommunications engineers.

JEN has described the activities in this cost category in the following way.[104]

> *AMI technology remains a relatively new technology, but is rapidly maturing as AMI experience grows both locally and internationally. This activity helps ensure that experience drives the strategy for managing AMI communications and metering assets. In this way, the activity reduces the risks of technology obsolescence, and ensures that, as technology evolves, a roadmap from the existing to the future remains available.*

and[105]

> *AMI Strategy and Planning ... includes costs related to:*
> - *validating vendor releases,*
> - *overseeing communication network security (including regular audits and penetration testing to ensure ISO 27001 accreditation is maintained),*

[103] JEN Budget Application – Table 5.2.

[104] JEN Budget Application – Appendix A page 103.

[105] Letter from Jemena to AER 21 April 2011 – Attachment 2 page 7.

- *developing AMI technology roadmaps and strategies (to protect the investment in the AMI infrastructure and to determine cost effective paths to transition to newer technologies in the future)*
- *network maintenance and augmentation programs*
- *managing major AMI technology releases, and*
- *AMI technology vendor management.*

Impaq is of the view that 'validating vendor releases' and 'managing major AMI technology releases' would be capital expenses and are covered in IT Capex (section 5.4.1) and Communications Capex (section 5.4). Further, the cost of 'AMI technology vendor management' is included in the cost category 'Service Delivery & Contract Management.' (section 5.6.11).

JAM provides the bulk, if not all, of the remaining service to JEN. Given that JAM provides AMI services to multiple clients, utilising common meter and communications vendors and technologies, many of these activities will be common and the costs will be shared.

The remainder of this category is fundamentally developing, maintaining and updating the expertise within the business on the latest advances and technologies, as well as updating the roadmap and AMI strategy accordingly. While Impaq accepts the need to ensure that JEN is abreast of the current developments and initiatives in respect of AMI, the technology that has been deployed in the form of meters, communications and IT systems is leading edge. Consequently, it is unlikely that there will be a need over the period for significant reviews of the current technology roadmaps or strategies.

It is Impaq's view that the provision of this service for JEN will be sufficiently met with 1 FTE telecommunications engineer.

5.6.2 Asset Operations

Table 69 details JEN's cost forecast and Impaq's assessment.

Table 69 – Asset Operations costs

	2012	2013	2014	2015	Total/Average
Contract cost – competitive tender	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Other	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Total	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Impaq Cost	**406**	**406**	**544**	**544**	**1,899**

JEN's description of this activity is given below.[106]

[106] JEN Budget Application – Appendix A page 104

> *While the AMI roll-out continues, ... JEN (has) obligations to continue regular testing of the meters installed in the field, in accordance with AEMO approved asset management plans. This includes both AMI and non-AMI metering. From 2012, AMI meters will be included in the testing sample programs. The expenditure in this category is for the management and planning to support the field activity. This is performed by in-house JAM staff.*

JEN has also supplied a copy of their metering services agreement with SpAusNet. It is however noted that the agreement excludes AMI[107]. Further the agreement includes services which pertain to Alternative Control Services, such as new connections metering, meter changes and customer requested meter testing. It would appear that some services also apply to metering for installations above 160MWh pa for which the "Metering Provision" activities are contestable and cost recovery is through separate means.

In the absence of a JEN metering asset management plan, Impaq has made its own assessment of the metering maintenance activities required.

Based on the requirements of the NER chapter 7 and the Metrology Procedure, there are four main activities required in relation to AMI metering and other metering for customers with consumption <160MWh pa:

- Testing of meters in service;[108]
- 100% testing of CT connected meters every 5 years (and the CTs);[109]
- Audits of unmetered supplies; and[110]
- Meter data validation.[111]

Testing of meters in service

The NER[112] requires that meters be accuracy tested in accordance with the requirements of AS1284.13. In AS1284.13:2002 it requires that all new meter types installed are tested within 3 years for in service accuracy. It further requires[113] that, meter families are grouped according to:

a) Manufacturer; and

b) Design or pattern or type.

The population of each meter family is grouped into five year blocks based on the age of the meters. This means that, according to this classification of meter

[107] Metering services agreement – clause 3.11
[108] Metrology procedure schedule 2, section 5.2. NER S7.3.1(c)
[109] Metrology procedure schedule 2, section 5.15 and NER S7.3.2
[110] Metrology procedure section 10
[111] Metrology procedure section 3.9
[112] National Electricity Rules, Chapter 7
[113] AS1284.13 Clause 8.2

families, all of the AMI meters of the same type and vendor would constitute one family and thus only require one sample for testing. Notwithstanding, Impaq believes that, given the very large number of new meters that have been installed in a very short period of time, it would be prudent to have more metering families.

Impaq's assessment of the required meter testing program is summarised in Table 70. The meter numbers are the total meter numbers to be rolled out. The meter types are those nominated by JEN.

The number of meter families has been assumed based on the need to have at least two families and also to keep the number of meters in each family less than 35,000 to limit the number that would need to be replaced if there was a failure of a family of meters.

Table 70 – Meter testing numbers and costs

	Meter numbers [114]	No of families	Meter per family	Sample Size	Meters to be tested	Testing cost ($)	Annual test Cost($)
Single Phase single element	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Single Phase single element with contactor	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
3 Phase Direct Connect	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
3 Phase CT Connect	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Total	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]

The sample sizes[115] are taken from AS1284.13:2002. Based on this the number of meters to be tested is determined. AS1284.13 requires new meter types to be tested within 3 years of being placed into service[116]. It would appear that such testing can then be spread uniformly throughout the 2012 to 2015 period. The JEN Alternative Control Service price for testing meter accuracy is [C-I-C]. This then allows the total cost of in situ testing of meters for each year of the 4 year period.

Impaq considers that a lower cost alternative would be to retrieve meters and test them in the laboratory, because then 10 to 20 meters can be tested at once. If a 10 head meter test bench (although many would be 20 head and hence quicker to test meters) is assumed and a testing time of 2.4 hours[117] (which is generous for doing the 4 tests in table 1 of AS1284.13) the total testing time is less than 360 hours.

[114] JAM substantiation document table 5-1 page 51.

[115] Sample sizes are in AS1284.13:2002 table 1 – sampling by attributes

[116] AS1284.13, clause 6.2.2

[117] Also includes for packing, handling, recording results

This translates to 0.25 FTE. Based on the top rate in the Hays Salary survey for an instrument technician[118], this equates to $68,234.

NER compliance current transformer meter accuracy testing

Chapter 7 of the NER requires 100% of CT connected meters to be accuracy tested at least every five years. It would therefore be expected that such testing for AMI rollout meters would commence in 2014. It assumed there would be an annual test program of 1/5 of the entire CT meter population to smooth workload against available expert test technicians. Based on the number of CT AMI meters given in Table 38, this is 577 meters tested each year. The rate JEN advised for each three phase meter test is [C-I-C] (as shown above). Hence this results in a cost of [C-I-C] for each of 2014 and 2015.

Unmetered supply audits

The NEM metrology procedure requires unmetered supplies to be regularly audited. Based on other DNSP's charges a unit cost of $150 per audit is assumed and a quantity of 100 per annum is assumed based on the metrology procedure[119].

Validation of metering installations

The NEM metrology procedure also requires that the metering data base (in the DNSP's systems) must be validated against the metering data in type 5 and type 6 meters[120]. Sample testing is required every 12 months. The sampling for this is the same as that for accuracy testing. Hence the meters which are sampled for accuracy testing (as detailed above) can also be used for validation of the metering database. The interval data collected from these meters can be validated against what is stored in the MDMS. It is expected that this would be largely an automated process resulting in very few exceptions as AMI meters are remotely read over secure communications channels. The cost of this is included in the next category.

Other metering resources

Although not nominated by JEN it is assumed that this cost category would include a range of activities including metering strategy, review of metering technologies and products from metering vendors, meter data validation management and meter accuracy testing management. This task is estimated to require 1 FTE, assumed to be that of an engineer.

Summary of meter maintenance costs

Table 71 gives a summary of costs outlined above.

[118] Rate is $87,371 pa. Plus on-costs and other costs gives $133,583 pa. total employment cost for an FTE

[119] Metrology procedure table 14.1

[120] Metrology procedure part A, section 3.9 page 43

Table 71 – Summary of meter maintenance costs

	2012	2013	2014	2015	Total
Meter testing	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
CT meter testing	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Unmetered supply audits	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Metering Engineer	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Total	**406**	**406**	**544**	**544**	**1,899**

5.6.3 Customer Contact & Back Office

Table 72 summarises the JEN cost forecast and Impaq's assessment.

Table 72 – Customer Contact and Back Office

		2012	2013	2014	2015	Total/Average
Contract cost – competitive tender		[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Other		[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Total		[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Equiv FTEs - Proposal	Office Manager	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
	Staff	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
FTE – Impaq view	Office Manager	1	1	1	1	1
	Staff	2	2	1	1	1.50
Costs - Impaq		**311**	**317**	**227**	**231**	**1,086**

The forecast provided by JEN equates to an office manager and 23 staff in 2012, reducing to an office manager and 17 staff in 2015.

The JEN description of this category includes the following activities[121]:

- *manage meter data;*
- *provide and manage service desk;*
- *manage B2B service orders;*
- *manage B2B network revenue; and*
- *manage network metering connections.*

[121] Letter from Jemena to AER 21 April 2011 – Attachment 2 page 6

and[122]

- *managing service orders - servicing requests from retailers to perform work on AMI and non-AMI meters. It involves back office processing related to metering additions, alteration, supply abolishment, and meter reconfigurations;*
- *managing service desk - servicing customer and retailer enquiries related to work performed in the field, or to the provision of meter data.*
- *Managing faults and emergencies - dealing with faults and emergencies that directly relate to the Regulated Services; and*
- *Network metering connections - dealing with new connections, faults and emergencies that directly relate to the Regulated Services.*

Little information has been provided on the forecast quantities of these activities or the expected time taken to carry these activities out.

The management of B2B service orders is out of scope and, in many cases, costs are recovered through Alternative Control Services. The management of network revenue is also out of scope. The costs incurred in respect of new connections are recovered through Alternative Control Services.

Manage Meter Data

It is Impaq's view that the MDMS and NMS will fully automate the activity of collecting and verifying data from the AMI meters. The vast majority, if not all, of the processing of the data, including validation, estimation and substitution will also be automated. It will only be a very small number of exceptional situations that will require manual intervention, which should have minimal impact on JEN meeting its service level obligations. The performance level for daily collection of meter readings in the Victorian Functionality Specification[123] is 99% in four hours after midnight and 99.9% in 24 hours. It is therefore a requirement that at least 99.9% of data will be delivered complete and correct to the NMS from meters. Based on JEN having about 320,000 meters, this equates to an error rate of 14,880 data points per day. The vast majority of these errors will be addressed using standard and automated algorithms. Impaq assumes that at least 99% of the data points will be automatically corrected by the MDMS using the validation and substitution rules in the NEM procedures, leaving 149 data points, or 3.1 meters, that may involve manual intervention per day.

Impaq accepts that prior to the completion of the AMI rollout, additional data management issues will arise due to the remaining non-AMI meters still in operation. Impaq is of the view that a staff of 1 FTE in 2012 reducing to 0.5 FTE in 2015 would be sufficient to meet these requirements.

[122] JEN Budget Application – Appendix A page 102

[123] AMI Minimum Functionality Specification (Victoria), Section 4.1

Service Desk

Impaq accepts that JEN is required to provide data to retailers when appropriate and valid requests are made. However, the relevant meter and metering installation data will be available to Retailers from MSATS. With the implementation of daily interval data for all meters, Retailers will receive current information on consumption and will therefore not need to make as many adhoc requests for information. Retailer requests for information pertaining to new connections or meter changes are covered by Alternative Control Services and are out of scope. Hence the vast majority of market participants' requests for data are either provided automatically anyway or are in relation to areas covered by Alternative Control Services. Impaq is of the view that a staff of 1 FTE in 2012 reducing to 0.5 FTE in 2015 will be sufficient for this activity.

Faults and Emergencies

The cost for managing faults and emergencies is addressed in Section 5.6.4 of this report.

5.6.4 AMI Network Operations

Table 73 below shows JEN's cost forecast for AMI Network Operations.

Table 73 – AMI Network Operations

	2012	2013	2014	2015	Total
Contract cost – competitive tender	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Other	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Total	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]

This activity involves operating the 24/7 AMI communications network, including monitoring, identifying, correcting and reporting on AMI network operational and performance issues. Also, this service provides AMI network status and compliance reporting[124].

Impaq is of the view that, operationally, the operators for the electrical network would, after appropriate training, be able to manage the AMI network for afternoon shift, night shift and for weekends, with an experienced AMI operator on standby. Further, during normal hours, only one operator would be required. In addition it would be expected that some two or three technicians would undertake investigation and rectification of communications faults in access points, relays or meters. Taking into account standby allowances and overtime, Impaq accepts JEN's cost forecast as reasonable.

[124] JEN Budget Application – Appendix A page 104

5.6.5 Meter Data Collection

Table 74 shows the JEN cost forecast for Meter Data Collection. It is noted that this applies to the manual reading of legacy electricity meters until such time as AMI meters are rolled out to all customers.

Table 74 – Meter Data Collection Costs

	2012	2013	2014	2015	Total
Contract cost – competitive tender	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Other	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Total	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
FTE's approx.	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]

Impaq accepts JEN's cost forecast as reasonable.

5.6.6 AMI Transitional Business Activities

Table 75 shows the JEN cost forecast for AMI transitional business activities.

Table 75 – AMI transitional business activities

	2012	2013	2014	2015	Total
Contract cost – competitive tender	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Other	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Total	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]

JEN's description of this activity is given below[125].

> *This activity receives and responds to customer claims and complaints regarding the AMI mass roll-out. It includes responding to roll-out-related complaints that have been escalated to EWOV.*
>
> *Experience to date has shown a complaint or claim lodged for almost 1% of sites that have received an AMI meter. These rates are forecast to rise in line with the progress of the mass roll-out throughout 2011 and 2012 as more complex sites receive AMI meters, and customers focus on tariff implications.*

Impaq accepts JEN's cost forecast as reasonable.

[125] JEN Budget Application – Appendix A page 104

5.6.7 AMI Backhaul Communications

Table 76 shows the JEN cost forecast for AMI Backhaul communications together with the Impaq assessment of those costs.

Table 76 – AMI backhaul communications costs

	2012	2013	2014	2015	Total
Contract cost – competitive tender	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Other	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Total	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Impaq cost	**24**	**24**	**24**	**24**	**96**

Based on the information in the Budget templates it is assumed that there is a total of about 100 access points to cover the JEN area. This gives about 3200 meters per access point. The amount of data per day per meter[126] is 1272 bytes of payload. It is assumed that there would be a maximum of 18kB per meter per day taking into account communications overheads and communications for reasons other than meter reading. For an access point this is 55Mb per day or 20GB pa. At a retail level Telstra charges $60/month for this amount of data and it is known that other DNSPs pay about $20/month. Assuming $20/month per access point it is Impaq's view that $24,000 per annum would be sufficient.

5.6.8 Management

Table 77 shows the JEN cost forecast for AMI Management.

Table 77 - Management

	2012	2013	2014	2015	Total
Contract cost – competitive tender	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Other	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Total	152	182	187	190	711

JEN has forecast costs that approximately equate to one FTE to carry out management activities, including:

- assisting in developing regulatory submissions;
- participating in industry working groups and forums;
- engaging with Government stakeholders; and

[126] Refer Industry Transaction Volume Analysis report present to ISC May 2008 – 1.3TB per annum. Assuming 2,800,000 meters this is 1,272 bytes per meter per day

- supporting other regulatory and compliance activities.

Impaq considers these costs to be reasonable.

5.6.9 Finance & HR

Table 78 shows the JEN cost forecast for Finance and HR related to AMI together with the Impaq assessment of those costs.

Table 78 – Finance and HR costs

	2012	2013	2014	2015	Total
Contract cost – competitive tender	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Other	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Total	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
FTE's	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Impaq view - FTE's	1.0	1.0	1.0	1.0	1.0
Impaq view Cost	**110**	**112**	**115**	**117**	**454**

JEN has forecast costs for Finance and HR that represent approximately 3 FTEs in 2012 reducing to approximately 2.3 FTEs in 2015. JEN states that this is for:[127]

- *ensuring consistency and maintenance of financial reference data and asset management data;*
- *managing and paying installation service and meter providers for both the AMI roll-out and as a result of retailer requests;*
- *preparing financial reporting for accounts payable and reconciling acceptance certificates in preparation of payment to installation service vendors;*
- *managing remittances and payments for the mass roll-out program and other vendor contracts; and*
- *providing monthly reporting on expenditure to JEN including actual and forecasts for upcoming periods.*

Thus, it appears that this cost category consists of:

- the management of the financial asset register;
- the payment of contractors; and
- monthly reporting.

The financial asset register is automatically updated as work is completed and charged for. Human intervention is only necessary to provide reporting and to investigate anomalies. The new automated systems and the JEN financial systems

[127] JEN Budget Application – Appendix A page 105

should be sufficiently accurate that 1 FTE for 3 days per month, or 0.18 FTEs will be all that is necessary to meet this task

There are only a small number of contractors involved in the AMI program that would provide monthly invoices. Systems are in place to provide supporting information, such as meters delivered, installations completed to requirements, etc. This activity should be sufficiently met by 1 FTE for 10 days per month, or 0.6 FTEs for the year.

The preparation of monthly reports, given the new automated systems that have been installed, should be sufficiently met with 1 FTE for 3 days per month, or 0.18 FTEs for the year.

In total, Impaq believes that 1 FTE would be sufficient for this cost category.

5.6.10 Regulatory Audit

Table 79 shows the JEN cost forecast for Regulatory Audit in relation to AMI.

Table 79 – Regulatory Audit cost forecast

	2012	2013	2014	2015	Total
Contract cost – competitive tender	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Other	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Total	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]

Impaq accepts JEN forecast costs for Regulatory Audit as prudent.

5.6.11 Service Delivery & Contract Management

Table 80 shows the JEN cost forecast for Service Delivery and Contract Management and Impaq's assessment.

Table 80 – Service Delivery and Contract Management Costs

	2012	2013	2014	2015	Total
Contract cost – competitive tender	0	0	0	0	0
Other	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Total	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Impaq view – FTE	2.5	2.5	2.5	2.5	2.5
Impaq view – other costs	50	50	50	50	200
Impaq cost	**517**	**526**	**541**	**550**	**2,134**

JEN has stated that this category includes the activities of[128]:

- *ensure compliance;*

[128] JEN Budget Application – Appendix A page 106

- *contract management and procurement; and*
- *performance and reporting*

Ensure Compliance

Impaq believes that compliance would be a function that would be incorporated into the businesses' existing compliance and regulatory processes. A large part of this activity would be accessing, receiving and reviewing monthly reports on the performance of the AMI system, which would be automatically generated. Enquiries would be initiated if any unacceptable result is identified. This should take no more than 1 FTE for 2 days per month.

Further, on an annual basis, a more detailed analysis of systems, process and performance would be conducted to ensure regulatory and market compliance. This should require no more than 1 FTE for 20 days.

Overall, Impaq believes that this activity should be sufficiently met with 1 FTE for about 44 days, or 0.25 FTEs over the year.

Contract Management and Procurement

Given the extent to which the AMI program is being delivered by external providers, Impaq accepts that contract and procurement management is a necessary cost. Given the amount of work that is being carried out by contractors and the amount of materials being provided, this activity would require 2 FTE contract managers.

Contract management will also involve some legal support, utilising the businesses existing legal processes. Also, this activity will involve the management of existing contracts and the development of new or extended contracts. Impaq believes that contract management would incrementally require no more than $50,000 per year of external legal support, 0.25 internal legal FTE's and 2 contract manager FTEs.

Performance and Reporting

JEN has stated that this activity[129] 'involves a business intelligence dashboard that proactively manages key performance indicators (KPIs) to ensure compliance with CROIC Regulated Service obligations.' The development of this 'intelligence dashboard' is an IT capital expense. Analysing the information provided by this dashboard in respect of compliance or non-compliance has been addressed under 'Ensure Compliance' above.

5.6.12 Stakeholder Relations

Table 81 shows the JEN cost forecast for Stakeholder Relations and the Impaq assessment of these costs.

Table 81 – Stakeholder relations

[129] Ibid page 106.

	2012	2013	2014	2015	Total
Contract cost – competitive tender	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Other	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Total	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Impaq costs	**0**	**0**	**0**	**0**	**0**

JEN has provided forecast costs for Stakeholder management. Impaq notes that JEN has stated that the stakeholder management activities of:

- participating in industry working groups and forums; and
- engaging with Government stakeholders,

are included in the JEN cost forecast for management, which Impaq has accepted (see Section 5.6.8 of this report). Impaq is of the view that the activities of stakeholder management are already included in the management category and that there should be no additional costs allowed.

5.6.13 Premises

Table 82 shows the JEN cost forecast for Premises related to AMI.

Table 82 – Premises costs

	2012	2013	2014	2015	Total
Contract cost – competitive tender	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Other	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Total	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]

Impaq accepts the JEN forecast for premises as prudent.

5.7IT Opex

Impaq has used the JEN provided Attachment 3 Reconciliation spreadsheet[130] as the source of information for the JEN proposal. It is noted that the total cost of $40M agrees with the total of the Budget Template[131] and the JEN Budget Application[132].

[130] Attachment 3 Reconciliation Spreadsheet, tab 7 Opex – IT – After adding [C-I-C] and converting to 2011$

[131] Appendix F – JEN AMI Budget Template 2009-15, IT Opex tab – after adding [C-I-C] and converting to 2011$

[132] JEN Budget Application for 2012 to 15 table 5-8, page 35, after backing out IT Capex

Table 83 gives a summary of the IT Opex categories in the reconciliation spreadsheet.

Table 83 – Summary of categories of IT Opex in the Reconciliation Spreadsheet

	2012	2013	2014	2015	Total
Base IT allocation	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Software licence maintenance	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Hardware maintenance	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Operating Software maintenance	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Infrastructure support	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Metering IT Opex	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Subtotal Total	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Plus [C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Total	**11,231**	**10,304**	**9,247**	**9,301**	**40,083**

5.7.1 Outage Management System & DMS

It is noted that the budget templates include $519,772 of costs for licence maintenance for OMS & DMS systems which are outside the scope given in the CROIC[133]. Hence it is Impaq's view that these costs should not be allowed.

5.7.2 Infrastructure support

One of the larger costs ($15.4m over the period) is for Data Centre services which are contracted with Logica. In the Logica contract[134] there is the detailed breakdown of the costs and there is detail of the applications and the operating system images to be run as a managed service[135]. For JEN there are 11 racks for the production site and 12 racks for the Disaster Recovery (DR) site (which is also used for development). This is a very large amount of rack space. There are 42 rack units (RUs) per rack. Hence this translates to 966 rack units. Considering that:

- servers can be as small as 1RU;

[133] CROIC clause s2.4.2 (c) (ii) allows OMS for AMI but this is OMS and DMS for the electrical network. Hence out of scope. The CROIC does allow for the capital cost of changes to DMS and OMS because of AMI but not the operating cost.

[134] Logica contract schedule 7.1

[135] Logica contract schedule 2.1 "Facilities proposal framework"

- with blade servers there can be even more than one server per effective RU; and
- many applications now run on virtual servers,

this is a lot of rack units. Impaq has met with JEN to discuss this and other matters. JEN has provided data centre layouts of racking for both the production site and the DR site. The layouts show that there is about 30% to 50% free space. It is understood that the other JEN and UED systems are not hosted in this data centre and are hosted in data centres that will be closing in the near future. Hence it may be prudent, from a business perspective, for both JEN and UED to move their other systems to run from the data centres used for AMI. There is perhaps a case for having the additional rack space now so that when other systems are shifted in they are in contiguous racks rather than in other areas of the data centre. However it is noted that the AMI project is paying for this when it is the rest of the business which will be the beneficiary.

In the Logica contract information reference is made to the list of 131 operating system images for JEN. It is noted that for JEN there is a total of 12 images for Gateway (B2B) and 9 for OMS. These are out of scope as they are required for DUOS services. JEN maintained at the meeting with Impaq that the OMS is within scope. However in the CROIC[136] it is only an OMS for AMI outages that is in scope, which would be a relatively simple OMS. It is understood that the JEN OMS is used also for electrical network outages. Hence it is Impaq's view that the infrastructure support cost be reduced by 16% for these out of scope items and the managed services and data centre facilities fees be reduced by 30% due to the unused space in the racks.

5.7.3 Metering IT Opex

The Metering IT Opex cost[137] is $9,058,177 over the 2012 to 2015 period. The JEN reconciliation spreadsheet details a total of 27 IT resources supporting AMI as per Table 84 below. However there is no detailed information to support this level of resources.

Table 84 – Metering IT Opex Resources

Function	Role
IT Governance	IT Service Delivery Manager
	IT Service Delivery Coordinator
IT Service Provider Management - AMI	Infrastructure Service Provider Manager
IT Application Support - AMI	Itron Team Leader
	Snr Itron Technical / Functional Analyst
	Technical / Functional Analyst

[136] CROIC section s2.4.2 (c) (ii)
[137] Attachment 3 Reconciliation spreadsheet, tab 7 Opex IT, sum of cells C64 to AX64

Function	Role
	Itron Technical Analyst
	SAP Team Leader
	SAP CPM Senior Functional Analyst
	SAP NRM Senior Functional Analysts
	SAP MAM Functional Analyst
	BASIS/Security Technical Analyst
	CPM Functional Analyst
	Senior ABAP Developer
	Senior Workflow Developer
	Workflow Admin
	ABAP Developer
	Senior Technical Analysts
	Webmethods Team Leader
	Webmethods Senior Technical Analysts
	Webmethods Technical Analysts
	AMI Reporting Team Lead
	AMI Reporting Senior Technical Analyst
	AMI Reporting Business Analyst
	AMI Reporting Technical Analyst
	Test Analysts
	Test Manager

In reviewing this list it is Impaq's view that this number of resources is excessive and can be reduced to 14 based on the following:

1. The IT systems for AMI have now been operating on a BAU basis since mid-2010. The requirements for AMI have not changed and hence the systems should be reasonably stable by now; and
2. The application support can be shared with United Energy as they are using the same applications.

The following are Impaq's comments in relation to each of the resource categories.

- Two resources in IT Governance appears excessive. To have an IT delivery manager and an IT delivery co-ordinator is sufficient.
- Two resources for workflow seems excessive. Workflow should be well bedded down by now. One full time resource is sufficient.
- It is understood that the Itron Enterprise Edition MDMS may require some attention for some time. It would appear that utilities in other countries are also experiencing this. However 4 full time resources for just JEN, seems excessive. Impaq's view is that 2 resources are sufficient.

- The number of resources for the SAP applications appears very high. There is a total of eight:
  - SAP Team leader
  - SAP CPM Senior Functional Analyst
  - SAP NRM Senior Functional Analyst
  - SAP MAM Functional Analyst
  - BASIS (SAP)/Security Technical Analyst
  - CPM Functional Analyst
  - Senior ABAP Developer
  - ABAP Developer

  This appears high for non-challenging applications that should be well bedded down. For example, Impaq cannot see a need for two ABAP developers writing code in ABAP language for SAP applications. It is Impaq's view that this group of 8 should be reduced to 4.

- It is assumed that Webmethods is used for the integration layer (utility bus) and hence the three Webmethods resources are to support this. The middleware or integration layer must be all done for the AMI systems to have been handed over from the project team to the business for BAU operation. Hence 3 resources are excessive. Changes to BAU operations and business processes, together with new software releases should be able to be easily managed by 1 resource.

5.7.4 Base IT allocation

In the reconciliation spreadsheet the "Base IT allocation" is a constant per month cost of $157,594 until June 2013. After this it ceases. Hence this would appear to be the IT Opex cost for the legacy metering systems and CIS system required for manually read meters. Impaq considers this to be reasonable.

5.7.5 Impaq assessment of IT Opex

Table 85 shows the Impaq assessment of IT Opex.

Table 85 – Impaq Assessment of IT Opex

	2012	2013	2014	2015	total
Base IT allocation	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Software licence maintenance	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Hardware maintenance	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Operating Software maintenance	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Infrastructure support	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Metering IT Opex	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Total	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Plus [C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Total	**8,765**	**7,851**	**6,758**	**6,785**	**30,159**

5.8 Summary of Operating Expenditure

Table 86 – Summary of Operational Opex – JEN application and Impaq's Assessment

	2012	2013	2014	2015	Total
Asset Strategy and Planning - Proposal	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Asset Strategy and Planning – Impaq view	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Asset Operations – Proposal	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Asset Operation – Impaq view	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Customer Contact & Back Office - Proposal	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Customer Contact & Back Office – Impaq view	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
AMI Network Operations - Proposal	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
AMI Network Operations – Impaq view	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Meter Data Collection - Proposal	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Meter Data Collection – Impaq view	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
AMI Transitional Business Activities - Proposal	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
AMI Transitional Business Activities – Impaq view	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Backhaul Communications - Proposal	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Backhaul Communications – Impaq View	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Management - Proposal	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Management – Impaq view	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Finance & HR - Proposal	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Finance & HR – Impaq view	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Regulatory Audit - Proposal	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Regulatory Audit – Impaq view	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Service Delivery & Contract Management - Proposal	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Service Delivery & Contract Management – Impaq view	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Stakeholder Relations - Proposal	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Stakeholder Relations- Impaq view	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Premises - Proposal	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Premises – Impaq view	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
IT Opex – proposal	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
IT Opex - Impaq view	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Total – JEN Proposal	**19,422**	**17,227**	**15,820**	**15,941**	**68,410**
Total – Impaq Assessment	**12,724**	**10,932**	**9,486**	**9,556**	**42,698**

6 Powercor

The Powercor Australia Limited (PAL) budget submission for 2012 to 2015 is summarised[138] in Table 87 and Table 88. It is noted that the capitalised Project Management costs of $4,716,000 in 2012 and $3,509,000 in 2013 do not seem to be included in the Capex summary. It is noted that all values in tables are $,000 real 2011 unless otherwise stated.

Table 87 – Capital Expenditure Budget Summary

Capex	2012	2013	2014	2015	Total
Meter supply & installation	91,075	65,634	7,364	7,123	171,196
Communications supply & installation	13,308	5,262	1,038	189	19,797
IT	11,682	10,366	7,402	5,795	35,245
Other	210	390	405	364	1,369
Total	**116,276**	**81,652**	**16,210**	**13,472**	**227,607**

Table 88 – Operating Expenditure Budget Summary

Opex	2012	2013	2014	2015	Total
Meter data services	5,343	4,663	3,577	2,824	16,407
Meter maintenance	1,274	2,004	2,429	2,299	8,006
Customer service	6,192	5,083	1,274	1,315	13,864
Backhaul communications	2,195	3,487	3,564	3,638	12,884
Communication operations	3,082	3,082	3,082	3,083	12,329
Project management	-	-	3,180	2,864	6,044
Executive & corporate office services	424	436	638	609	2,107
IT	9,365	9,485	9,710	9,803	38,363
Total	**27,877**	**28,241**	**27,454**	**26,435**	**110,004**

In this section of the report each of the cost items in the above tables are reviewed in order.

6.1 Capex – Meter Supply and Installation

The PAL forecast for Meter Supply and Installation consist of the following categories:

- Meter Supply – contracted;
- Meter Supply – other;

[138] Powercor Australia's Budget & Charges Application 2012-15 – Table 14, page 50 and Table 26, page 81

- Meter Installation – contracted; and
- Meter Installation – other.

Each of these categories are analysed in the following sections.

6.1.1 Capex – Meter Supply - Contracted

Table 89 shows the meter supply volumes[139] determined by PAL for rollout and for BAU (New Connections, Additions and Alterations).

Table 89 – Meter Volume Summary

Meter Type	2012	2013	2014	2015	Total
1Phase 1 element	140,309	72,100	16,988	16,492	245,889
1Phase 1 element + contactor	18,104	16,517	953	938	36,512
1Phase 2 element + contactor	83,698	58,546	2,165	2,158	146,567
3 Phase Direct Connect	39,714	34,174	2,648	2,580	79,115
3 Phase Direct Connect + contactor	4,172	5,103	281	278	9,835
3 Phase CT connect	1,853	1,575	132	128	3,686
Total	**287,850**	**188,015**	**23,167**	**22,573**	**521,604**

In relation to the unit prices of meters the PAL budget submission details that there are two meter vendors, Landis & Gyr together with PRI (Secure Meters). The pricing for each vendor's meters are given in the budget submission and these correspond to the prices given in the respective vendor contracts with PAL, copies of which were provided by PAL. These contracts appear to have been let on a competitive tendering basis. PAL have chosen to use 20% of meters from Secure and 80% of Landis & Gyr due to the latter providing the lower prices. The resultant prices[140] in US$ for meters is shown in Table 90.

[139] PAL Budget Application Template, Volume Summary Tab
[140] Powercor AMI Budget and Charges Application 2012-15, table 15, page 52

Table 90 – Unit Meter Prices (US$, 2011)

Meter type	2012	2013	2014	2015
AMI 1Ph 1e	140	142	141	138
AMI 1Ph 1e + contactor	154	156	155	151
AMI 1Ph 2e + contactor	166	168	167	163
AMI 3 Ph	263	267	265	259
AMI 3 Ph + contactor	278	282	280	274
AMI 3 Ph CT	334	339	337	330

When these unit prices are multiplied by their respective volumes, the resultant cost matches that given for the contract cost for meters in the PAL Budget Application.

Adjustment to volume of meters

There is however a difference between numbers of meters and numbers of customers. Historically a proportion of customers have had two meters; typically for customers that have off peak electric water heating. PAL has stated that the overall meter to customer ratio[141] (or meter to NMI ratio) has historically been 1.27. This agrees with the MSATS meter to NMI ratio for PAL. PAL has also stated that after the rollout the meter to customer ratio[142] will come down to 1.1[143] because a high proportion of those customers that previously had two meters will now only have one meter.

Table 91 shows the total volumes of meters for each year through to 2015. The overall total of 894,089 by the end of 2015 is high since PAL is projected to have 772,544 customers by 2015[144]. The meter to customer ratio of 1.1 does not explain the difference.

Table 91 – Total AMI meter volumes

	2009	2010	2011	2012	2013	2014	2015	Total 2009-2015
1Ph 1e	6,971	149,201	74,944	140,309	72,100	16,988	16,492	477,005
1Ph 1e + C	0	2,835	18,554	18,104	16,517	953	938	57,901
1Ph 2e + C	0	11,730	54,957	83,698	58,546	2,165	2,158	213,255
3Ph	0	6,696	39,379	39,714	34,174	2,648	2,580	125,189
3 Ph + 1 Ph int C	0	492	4,785	4,172	5,103	281	278	15,111
3 Ph CT	0	1	1,940	1,853	1,575	132	128	5,628
Total	**6,971**	**170,955**	**194,559**	**287,850**	**188,015**	**23,167**	**22,573**	**894,089**

[141] PAL budget and charges application, page 48.
[142] Ibid
[143] This approximates to the PAL budget template, Volume summary Tab, which gives a meter to customer ratio of 1.12
[144] Vic EDPD final determination – page XVII – Table 2

The reason the meter numbers are too high is that the effect of abolishments and meter changes (eg: Customer changing from single phase to three phase) has not flowed into the number of meters purchased – see Table 92. Historically when meters were removed from a premise (typically due to abolishments or meter type change) the meters removed were not worth re-using. The cost to re-verify the meters to allow them to be re-used was typically more than the written down value of the meter. Hence meters removed were scrapped. After the AMI rollout the meters on all properties are quite new. Further the re-verification cost is only a small proportion of the purchase cost of a new meter. Hence it is worth re-using meters removed.

Table 92 – AMI meter reconciliation[145]

	2009	2010	2011	2012	2013	2014	2015
Opening meters	0	6,959	176,594	368,849	652,348	832,762	846,520
Meter purchases	6,971	170,955	194,559	287,850	188,015	23,167	22,573
Abolishments	0	-131	-588	-1,196	-2,136	-2,739	-2,620
AMI meter for AMI meter replacements	-12	-1,189	-1,716	-3,154	-5,465	-6,670	-6,763
Closing meters	6,959	176,594	368,849	652,348	832,762	846,520	859,709
Projected Customer numbers			717,745	731,603	745,570	759,343	772,544
Increase in Customer numbers				13,858	13,967	13,773	13,201
Ratio of meter purchases to increase in customer numbers						168%	171%

In Table 92 it shows that after the rollout is completed (in 2013) in the following two years, 2014 and 2015, the ratio of number of meters purchased to the increase in customer numbers is about 170%. The reason for the difference, as outlined above is abolishments and meter replacements. Hence the number of meters purchased needs to be reduced to 1.1 times the increase in customer numbers and the meters recovered from abolishments and "AMI meter for AMI meter replacements" should be re-verified and then re-used.

AMI Meters removed as a result of abolishment or meter changes, can be reused after they have had their accuracy re-verified. The PAL contracts with L&G and Secure meters provide for this. The re-verification cost from L&G is $16.30 and from Secure meters is:

- Single Phase single element - $28;
- Single Phase two element - $35; and
- Three phase - $45.

[145] PAL Budget templates – Volume Summary tab

Based on the relative proportion of meters purchased by PAL, Impaq's estimate of the weighted average cost of meter re-verification is $19.53. Impaq has used this cost in its assessment of the PAL meter purchase costs.

Adjustment to exchange rate

As discussed above, PAL's meters are procured in US$ and PAL has assumed US$ exchange rates as shown in Table 93.

Table 93 – PAL US$ exchange rate assumptions[146]

Exchange Rate	2012	2013	2014	2015
US$ per AU$	0.9565	0.9192	0.9028	0.9028

Impaq is of the view that the exchange rate should be 1.05 as discussed in section 3.4.1. Table 94 gives the net results of volume and exchange rate adjustments.

Table 94 – Adjustment to cost of meters purchased under contracts

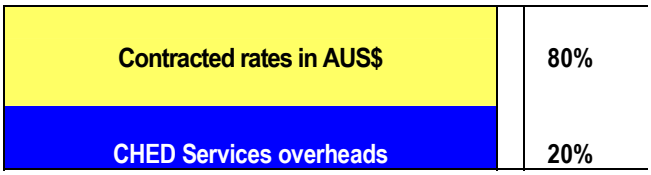
($,000 real 2011)	2012	2013	2014	2015	Total
Powercor Application	48,484	33,757	3,730	3,552	89,523
Impaq Revised Cost	43,584	28,506	2,089	1,968	76,147

6.1.2 Capex Meter Supply - Other

In addition to the contract costs considered above the Powercor application has costs entitled "other". The budget application implies that this is CHED services[147] overheads as indicated in Figure 4 (for the rollout period – 2012 to 2013) and Figure 5 (for BAU – 2014 and 2015).

Figure 4 – Build-up of meter supply unit price - rollout

Figure 5 - Build-up of meter supply unit price - BAU



[146] From the Powercor Budget and Charges application, table 13, page 50
[147] Ibid, Figures 3 and 4 on pages 51 and 52

Table 95 shows a comparison of the "other" costs to the contract cost and the CHED overheads. It appears to confirm that for 2012 the vast majority of the "other" costs is the CHED overheads. However this does not apply for 2013 through 2015.

Table 95 – Comparison of other with contract values and CHED overheads

($,000 real 2011)	2012	2013	2014	2015	Total 12-15
"Other" cost ($)	4,697	3,986	1,140	1,085	10,908
"Other" costs (proportion of contract costs)	10%	12%	31%	31%	12%
CHED %	9%	9%	25%	25%	

Impaq (through the AER) asked PAL for detail on the "other" costs. PAL's response indicated that the "other" costs were CHED costs and related to the management of contracts and logistics for meter supply. Impaq expects that there may also be a need to undertake some testing of meters in conjunction with vendors to validate compliance to specification. Given that these "other" costs relate to manpower in the main, the equivalent number of FTEs has been calculated as shown in Table 96. This analysis assumes the total cost of appropriately qualified and trained resources is $150,000[148] per annum.

Table 96 – FTE equivalent of "other" meter supply costs

	2012	2013	2014	2015
"Other" cost ($)	4,697	3,986	1,139	1,085
FTE equivalent	31.3	26.6	7.6	7.2

Given that 2011 is now the third year of rollout, the metering specification has not changed and the meters installed have been performing well, Impaq is of the view that there should not be a significant amount of activity in this area for the 2012 to 2015 period. It is Impaq's assessment that the activities in relation to meter procurement include:

- Managing metering supply contracts;
- Managing the logistics of returning meters removed from customers premises for abolishments and meter changes are re-verified and returned to PAL;
- Dealing with meters that have failed in the field and investigating with the vendor the root cause of the failure;
- Checking that vendors are doing the appropriate testing of meters to ensure compliance with the functionality specification; and
- Reviewing proposed changes to meter software and hardware and its impact on PAL.

[148] Components of cost – refer section 3.4.2

Impaq believes that 2 FTEs would be sufficient, particularly since Citipower is also contributing to the recovery of CHED costs.

Impaq's assessment of what is prudent expenditure on "other" costs is given in Table 97.

Table 97 – Impaq assessment of "other" costs.

	2012	2013	2014	2015	Total
Powercor "Other" cost	4,697	3,986	1,140	1,085	10,908
Impaq Assessment	300	300	300	300	1,200

6.1.3 Capex – Meter Installation - Contract

The PAL budget templates show the contract cost of AMI meter installation as $17,008,729 in 2012 and $10,429,182 in 2013. PAL has provided evidence that the mass rollout meter installation unit costs were competitively tendered. Hence Impaq accepts these costs as prudent. The meter unit installation costs multiplied by the meter volumes equates to the contract costs given above[149]. Table 98 shows the weighted unit costs compiled from the PAL contracts with three meter installation companies.. It is noted that the installation costs there are somewhat above those for other DNSPs.

Table 98 – Installation cost items[150]

Installation costs by meter type & application	2012	2013
Single phase non off peak	46	46
Single phase 'A' and 'C'	60	59
Single phase 2 meters & time switch	87	86
Single phase 2 element & contactor	56	56
Slab heating	87	86
Climate Saver 1	47	47
Climate Saver 2	65	65
3 phase DC	52	52
3 phase 'A' and 'C'	68	67
3 phase CT	182	181
Remove time switch	11	11

The total number of installations for 2012 and 2013 also includes installations for new connections. The installation cost of new connections is recovered through Alternative Control Services. Hence the new connections volume needs to be taken out of the total volumes for 2012 and 2013. Table 20 shows the calculation of the volume reduction.

[149] Powercor Contract costs spreadsheet, Summary tab
[150] Powercor Budget and Charges application Table 17, page 53

Table 99 – Adjustment to installation volumes

	2011	2012	2013
Installs		287,850	188,015
Abolishments		-1,196	-2,136
AMI meter for AMI meter replacements		-3,154	-5,465
Projected Customer numbers	717,745	731,603	745,570
Increase in Customer numbers		13,858	13,967
New meter to new customers ratio		1.1	1.1
Total meters for new connections		19,594	22,965
Reduction in meter installation volumes		6.8%	12.2%

The reduction in meter installation volumes given above results in a reduction in the meter installation cost. The Impaq assessment of the contract meter installation cost is as shown in Table 100.

Table 100 – Impaq assessment of contract installation costs

	2012	2013	2014	2015	Total
Citipower proposal	17,009	10,429	0	0	27,438
Impaq Assessment	15,851	9,155			25,006

6.1.4 Capex – Meter Installation – Other

PAL has provided some qualitative information in relation to the "other" installation costs but no spreadsheet to allow detailed analysis. Figure 6 shows the proportion of installation cost that is CHED services.

Figure 6 – CHED services proportion of total installation cost[151].

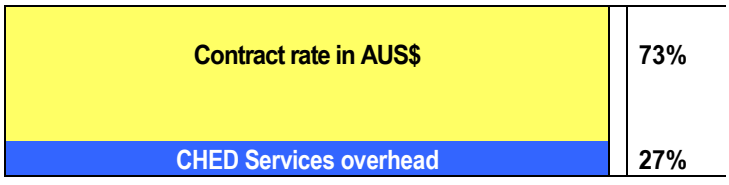


Table 101 shows a comparison of the "other" costs to the "contract costs" and the CHED services overhead. In this case, the CHED proportion does not appear to explain the quantum of costs.

[151] Ibid figure 5, page 54

Table 101 – Comparison of "Other" costs with CHED overheads and FTE equivalents

	2012	2013	2014	2015	Total 12-15
Other cost	20,885	17,461	2,494	2,486	43,326
Proportion of contract costs	123%	167%			
CHED %	37%	37%			
FTE equivalent	139.2	116.4	16.6	16.6	

Impaq considers that the "other" installation costs are largely FTE costs and that the calculated equivalent number of FTEs is excessive. Given that the AMI meter rollout is in its third year, there are about 200,000 meters installed in the PAL area and there are no major installation issues being reported to the AMI ISC it would appear that the installation processes and work procedures are operating well and the level of technical and administrative support will be much less than required in the early years of the rollout. Further, there should not be a need for large numbers of overhead FTEs as the contractors are doing all the field work.

Because PAL has provided little quantitative information to allow reconciliation of the other activities in this cost category, Impaq has chosen to build up its own assessment of the likely remaining activities in "other" costs for meter installation.

6.1.4.1 During Rollout – 2012 and 2013

It is considered that the following will be needed to support the installation of AMI rollout meters in 2012 and 2013:

- call centre support – to respond to customers who call in relation to the rollout and meter installation issues;
- customer advice of forthcoming AMI meter installations, involving sending the customer the pack of information as agreed by the AMI ISC;
- management of installation exceptions;
- materials costs - provision of meter seals and fuse sticks to installation contractors;
- installation program management and administration of contractors; and
- metering logistics management – supply of meters to installation contractors and disposal of meters removed from customers premises

The assessment of these cost items is considered in turn below.

Call centre costs.

The AMI ISC deployment dashboard gives the number of calls received by DBs in relation to the AMI rollout. As at the March ISC meeting the AMI deployment dashboard shows calls equal to 16.2% of the 534,500 meters rolled out to the end of February 2011. Impaq does not consider this percentage of calls will increase as the installation issues do not appear to be increasing. Hence this is considered to be an adequate representation of the likely call volumes for 2012 and 2013. For 2012, the number of meters installed in the rollout is 288,326, which equates to a call volume of 46,708 calls. Using an industry standard per call cost of $10 per

call[152], (incl wrap time) the cost for 2012 is $467,080. Similarly, for 2013 with 188,197 installs, Impaq calculates the call centre cost to be $304,879.

Customer communications

Table 102 details the cost items involved in customer communications (in $ 2011).

Table 102 – Customer Communications costs[153]

Item	Cost
DPI/DB Letter delivery	1.40
DPI Letter Printing	0.05
Meter Exchange Card	0.05
DB Intro Letter - Printing	0.05
DB Intro Letter Envelope - Printing	0.04
Meter Exchange Letter Envelope - Printing	0.10
No Access Letter (at $1.40 for 5% of sites – note ISC dashboard for to Feb 2011 shows 4.67%)	0.07
Total	1.76

This results in a cost for 2012 of $507,454 & 2013 of $331,266.

Meter deliveries to contractor

It is assumed that the normal practice of meter vendors supplying meter installation contractors directly is followed by PAL. Hence there is no direct cost for this activity.

Transport and storage of removed meters[154]

Based on typical meter sizes (for electro-mechanical or electronic meters) the volume per meter is approximately 0.003 cubic metres. It is assumed that about 1 month of old meters are stored at any time, which equates to 80 cubic meters of space. With 4 rack high storage, this is 20 square metres which equates to $20,000 per annum (rental of storage space assumed at $1000/square metre per annum)[155].

Stores handling costs are assumed to be 0.1FTE at $100,000, or $10,000 pa.

The transport of old meters to a recycler or other metro location (eg: port), would involve freight charges for 960 cubic metres (a year of old meters recovered). For this an allowance of $60,000 is made[156].

Meter seals & fuse sticks

[152] Refer notes on section 4.1.4.1

[153] For assumptions underpinning these numbers refer to the notes to Table 23

[154] Sources of data are given in the footnotes to section 4.1.4.1

[155] http://melbourne.gumtree.com.au/f-warehouse-for-rent-Classifieds-W0QQKeywordZwarehouseQ20forQ20rent

[156] Refer http://transdirect.com.au/?gclid=CKqir6uMoakCFcSBpAod1VTXtA

In response to questions PAL advised that the cost of meter seals and fuse sticks were included in the "other" installation costs. No details were provided on the costs. Hence Impaq has made an assessment of these costs. Typical high quality electricity meter seals cost about $0.25 each[157] including freight, although lesser quality items are available at closer to $0.10 each. Based on the quantities of meters to be rolled out the costs for 2012 would be $72,081 and for 2013 would be $47,049.

In relation to fuse sticks, since these would have already been provided to the installation contractors, there would appear to be no need for more.

Installation contract management and installation issues management

The overall management of meter installations includes:

- contract management;
- management of issues with difficult installations; and
- Management of collection of old meters & disposal.

Impaq believes that a maximum of 5 FTEs would be sufficient to carry out these activities, at a total cost per FTE[158] of $150,000 pa

6.1.4.2 After rollout – BAU in 2014 and 2015

The installation cost of Business as Usual (BAU) meters (New Connections, Meter replacements and Abolishments) is already recovered under Alternative Control Services for new connections and meter changes. As the rollout is completed by 2013, all activities in 2014 and 2015 are BAU and, hence it is Impaq's assessment that the "other" installation costs for 2014 and 2015 should be zero.

Summary of Costs

Table 103 and Table 104 show the summary of installation "other" costs.

Table 103 – Summary of assessed installation "other" costs.

Item	2012	2013
Call Centre	467	305
Customer communications	507	331
Freight and storage of old meters	80	80

[157] For example http://universalmeterservices.co.uk/store/index.php?main_page=product_info&cPath=2&products_id=104

[158] Salary incl Super- $100k plus other costs as per section 3.4.2.

Meter seals	72	47
Installation management	750	750
Total	1,876	1,513

Table 104 – Installation other costs

	2012	2013	2014	2015	Total
PAL forecast	20,885	17,461	2,494	2,486	43,326
Impaq Assessment	1,876	1,513	0	0	3,390

6.2Capex – Communications Supply and installation

The PAL forecast for Communications Supply and Installation consist of the following categories:

- Communications Equipment Supply – contracted;
- Communications Equipment Supply – other; and
- Communications Equipment Installation – other.

Each of these categories are analysed in the following sections. It is noted that PAL have not included costs in the Communications Equipment Installation – contracted category.

6.2.1 Capex – communications equipment supply – Contracted

The communications equipment comprises Silver Spring mesh radio access points and relays. PAL's unit prices[159] of US$5,473 per access point (including Battery backup and mounting kit) and US$ 1,261 per relay (including Battery backup and mounting kit) are broadly in line with industry benchmarks (in $US) and what other DNSPs are paying. PAL have assumed that the exchange rates given in Table 93 apply however as discussed in Section 3.4.1, Impaq considers that an exchange rate of 1.05 is more appropriate. This has the effect of reducing the unit costs by about 10%. The contract costs resulting are summarised in Table 105

Table 105 – Communications equipment Capex - contract

($,000 real 2011)	2012	2013	2014	2015	Total
Powercor application	2,437	27	38	37	2,539
Impaq Assessment	2,220	23	32	31	2,306

6.2.2 Capex – communications equipment supply – other Costs

The "other" costs associated with the communications equipment supply (not including installation) in the PAL application are significantly greater than the contract costs. Refer Table 106.

[159] PAL Contract costs spreadsheet, meter and comms supply Tab, cells I26 to I29 and I32 to I33

As in the case of AMI meter supply the PAL application indicates that 8% of the total cost is CHED services. This does not explain the large "other" costs here. In the absence of further information Impaq has concluded that a contract administration charge of a maximum of 10% is justified.

Table 106 –Impaq Assessment of "other" costs

($,000 real 2011)	2012	2013	2014	2015	Total
Powercor application	2,725	1,891	108	105	4,829
Impaq Assessment	222	2	3	3	230

6.2.3 Capex – communications equipment installation – other Costs

PAL states[160] that *"CHED Services concluded that the installation of communications equipment would be conducted in-house for risk mitigation purposes"*.

Table 107 shows the PAL application for "other" installation cost per year. It also shows the number of access points and relays by year[161]. The table also calculates the per communications unit installation cost.

Table 107 – Installation cost per communications device

($,000 real 2011)	2012	2013	2014	2015	Total
PAL Comms installation	8,145	3,344	892	47	12,428
Access points	246	5	5	5	261
Relays	817	0	9	9	835
Total Devices	1063	5	14	14	1,096
Cost per device ($)	7662	668,943	63,748	3356	11,341

It is our understanding that Meter installation contractors quote rates of about $800 to $1000 for the installation of an access point or a relay. Given that PAL wants to ensure that their own staff to undertakes installation to mitigate risk, it might be expected that the cost could be higher than what a contractor would charge. However the average is 11 times the cost of a contractor. In the absence of other information on whether there are other activities involved with a PAL installation, the Impaq assessment of what a prudent cost would be is $2000 per unit.

In answers to questions on this cost category Powercor advised that this includes:

> "*the Technology team which directly supports the rollout … and design the communication system which includes determining the volume of communications equipment and the location of the communications equipment. These costs are allocated 100% to communications installation".*

Impaq understands that with Mesh Radio systems that it does require detailed design work to determine the location of access points and relays to build a stable

[160] PAL Budget application section 6.5
[161] PAL Contracts spreadsheet – Contract tab, lines 118 & 122

mesh with multiple redundant communications paths for each meter. By the end of 2011 PAL will have over 30% of meters installed. In the 2012 to 2015 there are 1063 access points and relays to install and hence there is reasonable amount of design work required for that. It is also understood that there is some work to be done to monitor the performance of the mesh network and the 3G Telstra back haul network which connects to each access point.

Silversprings have also advised that there is going to be a major release affecting access points and relays in 2013. Hence there is some additional work to manage the testing of the new release and the rollout of this to the access points and relays.

Without going to the extent of modelling the work load in FTE hours, Impaq believes that to undertake these activities for PAL would require 4 FTEs in addition to the direct staff undertaking access point and relay installation. After the rollout the communications network design will be stable and there will be only a small workload in monitoring performance and refining the network by adding the some relays in various places. It is estimated that a maximum of 1 FTE would be required to look after access points and relays for PAL after the rollout.

Table 108 shows the Impaq assessment of communications installation "other" costs.

Table 108- Impaq assessment of Communications installation "other"

($,000 real 2011)	2012	2013	2014	2015	total
PAL "Other" Comms installation Cost	8,145	3,344	892	47	12,429
Access points	246	5	5	5	261
Relays	817	0	9	9	835
Total Devices	1063	5	14	14	1,096
Installation cost per device ($)	2000	2000	2000	2000	
FTEs	4	4	1	1	
FTE unit cost ($pa)	150000	150000	150000	150000	
Impaq Assessment Total Cost	2,726	1,010	178	178	4,092

6.3IT Capex

The PAL application details a number of areas of proposed IT Capex[162] which are listed in Table 109.

Table 109 – Proposed IT Capex

($,000 real 2011)	2012	2013	2014	2015
Asset management	60	-	-	-

[162] PAL Budget application table 23, page 70

($,000 real 2011)	2012	2013	2014	2015
Workforce scheduling and mobility	2,035	1,317	60	110
Connection point	2,302	-	140	-
Outage management	174	84	-	-
Network management	1,657	4,573	955	957
Meter data management	2,307	1,282	887	887
Performance and regulatory reporting	505	505	505	505
Revenue management	260	120	-	-
IT program management	300	300	300	300
Infrastructure	2,083	2,185	4,555	3,036
Total	**11,682**	**10,366**	**7,402**	**5,795**

It is accepted that although the major IT build to enable AMI is completed, there will be some Capex in the 2012 to 2015 period due mainly to some of the applications being somewhat immature (particularly the NMS and MDMS systems) and the need for additional meter data storage. However there are some areas where it is not considered that Capex should be required:

Workforce scheduling and mobility – the technology for this is mature and the rollout of AMI will be well bedded down in terms of business processes and work procedures by the end of 2011. Hence there does not appear to be a need for further investment in a system that is only required for another 2 years until the rollout is complete. If however the system is to be used in the rest of the business then the Capex cost should be a DUOS cost.

IT program management – by 2014 the level of IT program management should be minimal – the program is by then over and complete. If the functionality and services of AMI were to be enhanced, a new program of work would be agreed between Government and the industry and industry would be able to submit a revised budget application for the new scope of work. Hence it is Impaq's view that program management should cease at the end of 2013.

Performance and regulatory reporting – there has been no change to the regulatory reporting required of DNSPs and, thus there are no requirements for enhancements or modifications to reporting systems. If changes to reporting requirements subsequently occur, this should be subject of a revised budget application. It is Impaq's view that no costs should be allowed in this area.

Infrastructure – as PAL points out[163] there is an increasing requirement for data storage with AMI using interval data. However the industry transaction volume analysis[164] done before rollout started showed a combined VIC requirement of 1,200GB per annum by end of 2013. For PAL this would be about 300GB per annum and over the 7 years required by law would be 2100GB. This is not a huge

[163] Powercor Budget Application – Figure 12, page 74 and related discussion
[164] Industry Transaction Volume Analysis presented to the ISC June 2008, Item 61

amount of data in relation to the enterprise class data storage devices available. There are rack mount or blade configuration, network storage servers of 6 to 60TB for around $10,000[165] to $40,000.

It is also understood that by 2014 much of the hardware installed at the beginning of the rollout in 2009 will be at end of life and need replacing. An allowance has been made for this of $2M pa for 2014 and 2015 to cover the cost of replacement hardware and the human resource effort involved in migrating applications and data from servers to be retired to new servers.

Table 110 details the resultant adjusted IT Capex.

Table 110 – Impaq adjusted IT Capex

	2012	2013	2014	2015	total
Asset management	60	0	0	0	60
Workforce scheduling and mobility	0	0	0	0	0
Connection point management	2,302	0	140	0	2,442
Outage management	174	84	0	0	0
Network management	1,657	4,573	955	957	8,142
Meter data management	2,307	1,282	887	887	5,363
Performance and regulatory reporting	0	0	0	0	0
Revenue management	260	120	0	0	380
IT program management	300	300	0	0	600
Infrastructure	2,083	2,185	2,000	2,000	8,268
Total	**9,143**	**8,544**	**3,982**	**3,844**	**25,513**

6.4Capex - Project Management Costs

The PAL Budget Application[166] includes project management costs as shown in Table 111.

Table 111 – Project Management costs – Capex and Opex

	2012	2013	2014	2015

[165] Eg: 4U rack mount HP network storage servers with hard drive capacities of 6TB (six hot swappable 1TB hard drives SATA) www.estore.com.au/HP_X1800_6tb_Sata_Storage_Server_HPH9532.aspx?utm_source=shopbot&utm_medium=cpc&utm_campaign=HPH9532

[166] PAL budget and charges application table 24

Project management costs capitalised	4,716	3,509	-	-
Project management costs remaining expensed	--	-	3,180	2,864
Total	**4,716**	**3,509**	**3,180**	**2,864**

PAL has provided little information in relation to what is included in the project management costs. However given the level of total AMI Capex involved, it does not seem unreasonable to have a project management cost of the order of that proposed by PAL. The expensed project management costs are considered in the Opex section. The capitalised project management costs do not appear as a separate Capex category in the PAL Capex proposal and hence are assumed to be included in the Capex categories.

6.5Capex - Project and administrative Costs

Although this item is not covered in the PAL's Budget Application in any detail it is present in the Budget templates. Table 112 details this.

Table 112 – Project and Admin Capex

	2012	2013	2014	2015	Total
Motor Vehicles	129	315	330	280	1,054
General Equipment and Test Lab	81	75	75	84	314
Total	**210**	**390**	**405**	**364**	**1,369**

In relation to Motor Vehicles it is assumed that:

- The vehicles are vans for field technicians servicing AMI field equipment (i.e.: not passenger vehicles included in an employee's remuneration);
- A field technicians van costs about $40,000 fitted;
- Powercor retains vehicles for 4 years; and
- The residual value of a vehicle is about 33% of its new price.

Based on the above, it would appear there are about 30 vans covered by this Capex. As outlined in section 6.7.5 Impaq expects there will be need for about 5 technicians to maintain the PAL communications network[167]. Hence it is Impaq's view that 5 vehicles would be needed.

In relation to General Equipment and Test Laboratory, it is assumed that this is test equipment required for a laboratory to support AMI technology. It is assumed this would be a shared facility with Citipower. This cost appears reasonable

[167] Section 6.7.5 gives a total of 9 technicians shared across the PAL and Citipower networks. One of these would be running the NOC. Of the 8 remaining, 5 would be for PAL and 3 for Citipower.

Table 113 shows the resultant adjusted Capex.

Table 113 – Adjusted Capex – Project and administrative costs.

	2012	2013	2014	2015	Total
Motor Vehicles	42	42	42	42	170
General Equipment and Test Lab	81	75	75	84	314
Total	**123**	**117**	**117**	**126**	**483**

6.6 Capital Expenditure Summary

Table 114 shows a summary of the PAL forecast cost and Impaq's view for each item of Capex.

Table 114 – PAL Capex summary – proposed and Impaq view

	2012	2013	2014	2015	Total
Meter Supply - Contract – Proposal	48,484	33,757	3,730	3,552	89,523
Meter Supply - Contract – Impaq view	43,584	28,506	2,089	1,968	76,147
Meter Supply other – Proposal	4,697	3,986	1,140	1,085	10,908
Meter Supply other – Impaq view	300	300	300	300	1,200
Meter installation - contract – Proposal	17,009	10,429			27,438
Meter installation - contract – Impaq view	15,851	9,155			25,006
Meter installation - other –Proposal	20,885	17,461	2,494	2,486	43,328
Meter installation - other – Impaq View	1,877	1,513	0	0	3,390
Communications equipment supply - contract - Proposal	2,437	27	38	37	2,539
Communications equipment supply - contract – Impaq view	2,220	23	32	31	2,306
Communications equipment supply - other– Proposal	2,725	1,891	108	105	4,829
Communications equipment supply – other – Impaq view	222	2	3	3	230
Communications equipment installation – other - proposal	8,145	3,344	892	47	12,429
Communications equipment installation – other – Impaq view	2,726	1,010	178	178	4,092
IT Capex - Proposed	11,682	10,366	7,402	5,795	35,245

	2012	2013	2014	2015	Total
IT Capex – Impaq view	9,143	8,544	3,982	3,844	25,513
Project Management - proposed[168]	0	0	0	0	0
Project management – Impaq view	4,716	3,509			8,225
Project Administrative - proposed	210	390	405	364	1,368
Project Administrative – Impaq view	123	117	117	126	484
Total – Proposal	**116,274**	**81,651**	**16,209**	**13,471**	**227,605**
Total – Impaq view	**80,762**	**52,680**	**6,702**	**6,451**	**146,596**

6.7 Operating Costs

Table 115 repeats the summary of each of the items of Operating Expenditure with the value proposed by PAL, as presented at the beginning of section 6.

Table 115 – Operating Expenditure Budget Summary

Opex	2012	2013	2014	2015	Total
Meter data services	5,343	4,663	3,577	2,824	16,407
Meter maintenance	1,274	2,004	2,429	2,299	8,006
Customer service	6,192	5,083	1,274	1,315	13,864
Backhaul communications	2,195	3,487	3,564	3,638	12,884
Communication operations	3,082	3,082	3,082	3,083	12,329
Project management	0	0	3,180	2,864	6,044
Executive & corporate office services	424	436	638	609	2,107
IT	9,365	9,485	9,710	9,803	38,363
Total	**27,877**	**28,241**	**27,454**	**26,435**	**110,004**

Each of the above Opex items is considered in turn. The cost of many of these items is heavily affected by human resources costs. Where human resource costs are involved the Impaq view has been established based on the assumptions in section 3.4.2.

6.7.1 Meter Data Services

Table 116 shows the PAL cost forecast and the Impaq assessment.

Table 116 – Meter Data Services Costs

[168] PAL has included project management costs in other Capex categories however Impaq has not done so, hence there is a separate cost item here for Impaq's view.

		2012	2013	2014	2015	Total/Average
PAL Forecast		5,343	4,663	3,577	2,824	16,407
Office Mgr FTE		1.0	1.0	1.0	1.0	1.0
Staff FTE		59.6	51.9	39.5	30.9	45.5
Impaq FTE	Office Manager	1.0	1.0	1.0	1.0	1.0
	Data management	3.0	3.0	2.0	2.0	2.5
	Manage NMI	5.0	3.0	2.0	2.0	3.0
	Data requests	3.0	3.0	2.0	1.0	2.3
	Data to AEMO	0.0	0.0	0.0	0.0	0.0
IMPAQ cost		**1,079**	**904**	**641**	**553**	**3,177**

PAL has stated that meter data services are services associated with the collection, validation and provision of data to the market, and include:[169]

- collection and verification of data;
- processing of data from meters, including validation, estimation and substitution of data;
- management of National Metering Identifiers (NMI);
- handling of market participants' requests for data; and
- the provision of data to the Australian Energy Market Operator (AEMO).

Further, costs are driven by the number of FTEs. Assuming that this cost category would require an office manager and a number of staff, the forecast cost equates to one office manager and nearly 60 staff in 2012 reducing to one office manager and nearly 31 staff in 2015.

Collection, verification and processing of data

It is Impaq's view that the Meter Data Management System[170] and Network Management System[171] will fully automate the activity of collecting and verifying data from the AMI meters. The vast majority, if not all, of the processing of the data, including validation, estimation and substitution will also be automated. It will only be a very small number of exceptional situations that will require manual intervention, which should have minimal impact on PAL meeting its service levels.

The AMI performance levels[172] for the collection of daily meter readings require 99% by 4 hours after midnight and 99.9% within 24 hours. Hence there will be 99.9% of data delivered to the NMS from meters that will be correct data. Based on PAL having 895,000 meters, this equates to an error rate of 42,960 data points per day. The vast majority of these errors will be addressed using standard and automated

[169] Powercor Australia 2011 – "Powercor Australia's Budget & Charges Application 2012-15", pages 81 to 83.
[170] Ibid, page 75.
[171] Ibid, page 77.
[172] Minimum AMI Functionality Specification (Victoria) Sept 2008, Ver 1.1 section 4.1

algorithms. Impaq assumes that at least 99% of the data points will be corrected by the MDMS, leaving 430 data points, or 9 meters, that may involve manual intervention per day.

Impaq accepts that prior to the completion of the AMI rollout, additional data management issues will arise due to the remaining non-AMI meters still in operation. Impaq is of the view that a staff of 3 FTEs in 2012 reducing to 2 FTEs in 2015 would be sufficient to meet these requirements.

Management of NMIs

Impaq accepts that errors that require manual intervention can occur in setting up and managing NMIs and associated standing data. However, the major effort is in the initial set-up, once this is done, ongoing management will be mostly automated. During the rollout, the standing data for a large number of sites is changing and hence additional FTEs would be required. However, as discussed later in this report (see section 6.7.3), PAL has the contractual power to reduce errors in data at the time of meter changeover to 0.5%. On this basis, the maximum errors in NMI data for the rollout would be 1,439 for 2012 (or about 7 per day) and 940 for 2013 (or about 5 per day). Following the rollout, this should be as low as 113 for 2015 (or about 1 every 2 days). Impaq is of the view that a staff of 5 FTEs in 2012, reducing to 2 FTEs in 2015 would be sufficient to meet this activity.

In respect of new connections, the cost of developing and entering the NMI and standing data into MSATS and associated systems is recovered as part of the Alternative Control Service for new connections.

Handling of market participants' requests for data

Impaq accepts that PAL is required to provide data to retailers when appropriate and valid requests are made. However, the relevant meter and metering installation data will be available to Retailers from MSATS. With the implementation of daily interval data for all meters, Retailers will receive current information on consumption and will therefore not need to make as many adhoc requests for information. Retailer requests for information pertaining to new connections or meter changes is covered by Alternative Control Services and is out of scope. Impaq is of the view that a staff of 3 FTEs in 2012 reducing to 1 FTE in 2015 will be sufficient for this activity.

Provision of data to AEMO

It is not clear what data would be required to be provided to AEMO that would require manual intervention and is not covered in the provision of market data discussed above. Impaq is of the view that this activity is already covered.

6.7.2 Meter Maintenance

Table 117 shows the PAL cost forecast and the Impaq assessment.

Table 117 – Meter Maintenance PAL cost forecast and Impaq assessment

	2012	2013	2014	2015	Total/Average
PAL Forecast	1,274	2,004	2,429	2,299	8,006
Impaq cost	**787**	**707**	**1,114**	**1,114**	**3,724**

In response to questions from the AER, Powercor provided a copy of the 'Citipower and Powercor Australia's Metering Asset Management Plan' plus additional information in relation to the scope and cost of meter maintenance activities[173]. Powercor advised that:

> *"Meter Maintenance" does not relate to metering fault activity (which are capitalised) but includes metering related maintenance activities such as:*
>
> - *National Electricity Rule (**NER**) compliance meter accuracy testing programs;*
> - *NER compliance current transformer accuracy testing compliance programs; and*
> - *unmetered supply audits.*

The scope of the activities included in the Powercor metering costs appears to be wider than the CROIC scope. It appears to include some activities which relate to Alternative Control Services (such as new connections, customer requested meter testing etc) and some which relate to metering for customers with consumption above 160MWh pa. The "metering provision" activity for customers consuming more that 160MWh per annum is a contestable service where the Responsible Person engages the "Meter Provider"[174]. As such, for this class of metering activity, the costs are recovered separately.

Hence Impaq has built up costs for the meter maintenance activities that Powercor has indicated that they need to undertake and for which the costs are not recovered from other sources.

NER Meter accuracy testing

[173] This was provided in the "second set of responses" to the AER questions of 11 April, pages 9 to 12

[174] AEMO Metrology procedure, Ver 2.01 section 2 "Meter provision"

Meter Maintenance requirements are detailed in Powercor's Metering Asset Management Plan (MAMP), which has been approved by AEMO. The MAMP defines meter families as:[175]

> *Consistent with AS1284.13, section 8.2 (step 1), meter families are grouped according to:*
> *a) Manufacturer; and*
> *b) Design or pattern or type.*
> *The population of each meter family is grouped into five year blocks based on the age of the meters*.

This means that, according to this classification of meter families, all of the AMI meters of the same type and vendor would constitute one family and thus only require one sample for testing. Notwithstanding, Impaq believes that, given the very large number of new meters that have been installed in a very short period of time, it would be prudent to have more metering families.

Impaq's assessment of the required meter testing program for both Citipower and Powercor is summarised in Table 118. The meter numbers are the total meter numbers to be rolled out. The meter types are those nominated by Citipower and Powercor.

The number of meter families has been assumed based on the need to have at least two families for each meter type since there are two vendors and also to keep the number of meters in each family less than 35,000 to limit the number that would need to be replaced if there was a failure of a family of meters. It is assumed that these families would apply across both Citipower and Powercor.

Table 118 – Meter testing numbers and costs

Meter Types[176]	CP meter Nos[177].	PAL meter Nos[178]	Total Meter Nos	No of families	Meters per family	Sample Size	Meters to be tested	Unit cost to test meters ($)	Cost to test meters ($)
1 Ph 1e	245,093	477,005	722,098	22	32,823	315	6,930	250	433,125
1 Ph 1e+C	7,166	57,901	65,067	2	32,534	315	630	250	39,375
1 Ph 2e+C	35,556	213,255	248,811	8	31,101	315	2,520	250	157,500
3 Ph	72,344	125,189	197,533	6	32,922	315	1,890	412.5	194,906

[175] Powercor budget and charges submission, attachment 49, pages 16 and 21.
[176] Meter types are as per Table 12
[177] Meter numbers are as per Table 12, It is noted that these numbers are too high as discussed in section 4.1.1. However there was no information for a reduced volume which related to each meter type.
[178] From the Powercor budget and charges submission.

Meter Types[176]	CP meter Nos[177]	PAL meter Nos[178]	Total Meter Nos	No of families	Meters per family	Sample Size	Meters to be tested	Unit cost to test meters ($)	Cost to test meters ($)
3 Ph+1 Ph int C	2,808	15,111	17,919	2	8,960	200	400	412.5	41,250
3 Ph CT	3,763	5,628	9,391	2	4,696	200	400		
Total	366,730	894,089	1,260,819	42	30,020		12,770		866,156

The sample sizes[179] are taken from AS1284.13:2002. AS1284.13 requires new meter types to be tested within 3 years of being placed into service[180]. It would appear that such testing can then be spread uniformly throughout the 2012 to 2015 period. Powercor advise that the unit cost to test a direct connected meter in situ is $250. The total annual testing cost is $866,156. It is noted that testing of CT meters is not included here as that is covered in the next subsection.

Impaq considers that a lower cost alternative would be to retrieve meter and test them in the laboratory, because then 10 to 20 meters can be tested at once. If a 10 head meter test bench (although many would be 20 head and hence quicker to test meters) is assumed and a testing time of 2.4 hours[181] (which is generous for doing the 4 tests in table 1 of AS1284.13) the total testing time is 766 hours. This translates to 0.51 FTE. This is across both Citipower and Powercor. Based on the top rate in the Hays Salary survey for an instrument technician[182], this equates to $68,234. The total cost to retrieve meters would be $257,000. The estimated cost to operate the meter testing facility is $40,000 per year for consumables and other costs. Total then for bench testing comes to $365,234, which is much lower than the cost of in-situ testing.

Nevertheless Impaq considers the costs of in-situ testing to be reasonable.

NER compliance current transformer meter accuracy testing

Powercor have advised that[183]:

> *Chapter 7 of the NER require CT connected meters to be accuracy tested at least every five years.*
>
> *The Businesses' CT meters will be replaced with AMI CT meters during the period 201113 (inclusive) as part of the smart meter rollout.*

[179] Sample sizes are in AS1284.13:2002 table 1 – sampling by attributes

[180] AS1284.13, clause 6.2.2

[181] Also includes for packing, handling, recording results

[182] Rate is $87,371 pa. Plus on-costs and other costs gives $133,583 pa. total employment cost for an FTE

[183] Second set of responses to AER questions sent 11 April

> *The 5 yearly CT meter test program will recommence in 2014 and is formulated as an annual test program of 1/5 of the entire CT meter population to smooth workload against available expert test technicians.*

Impaq agrees that the NER requires 100% testing of CT connected meters every 5 years. Based on the number of CT AMI meters given in Table 38, this is 1,878 meters tested each year. The rate Powercor advised for each CT meter test is $325. Hence this results in a cost of $610,415 for each of 2014 and 2015.

Unmetered supply audits

The NEM metrology procedure requires unmetered supplies to be regularly audited. Citipower and Powercor have forecast unit costs of $150 per audit and quantities of 1,100 in 2012 followed by 300 for each of the remaining years.

Validation of metering installations

The NEM metrology procedure also requires that the metering data base (in the DNSPs systems) must be validated against the metering data in type 5 and type 6 meters[184]. In respect of the validation of meter installations, PAL states that the sample size is based on samples used in meter testing and validation must be conducted every twelve months. Hence the meters which are sampled for accuracy testing (as detailed above) can also be used for validation of the metering database. The interval data collected from these meters can be validated against what is stored in the MDMS. It is expected that this would be largely an automated process resulting in very few exceptions as AMI meters are remotely read over secure communications channels. The cost of this is included in the next category.

Other metering resources

Although not nominated by Citipower and Powercor it is assumed that this cost category would include a range of activities including metering strategy, review of metering technologies and products from metering vendors, meter data validation management and meter accuracy testing management. This task is estimated to require 1 FTE, assumed to be that of an engineer.

Summary of meter maintenance costs

Table 119 gives a summary of costs outlined above. It is assessed that an allocation of 1/3 to Citipower and 2/3 to Powercor is reflective of the cost drivers.

[184] Metrology procedure part A, section 3.9 page 43

Table 119 – Summary of meter maintenance costs

	2012	2013	2014	2015	Total
Meter testing	866	866	866	866	3,465
CT meter testing			610	610	1,221
Unmetered supply audits	165	45	45	45	300
Metering Engineer	150	150	150	150	600
Total	**1,181**	**1,061**	**1,672**	**1,672**	**5,585**
Citipower allocation	**394**	**354**	**557**	**557**	**1,862**
Powercor allocation	**787**	**707**	**1,114**	**1,114**	**3,724**

6.7.3 Customer Service

Table 120 shows the PAL cost forecast and the Impaq assessment.

Table 120 – Customer Service – PAL Forecast and Impaq Assessment

		2012	2013	2014	2015	Total/Average
PAL Forecast		6,192	5,083	1,274	1,315	13,864
Impaq FTE	Call Centre	0	0	0	0	0
	Customer Interaction	0	0	0	0	0
	Revenue Management – billing	0.2	0.1	0	0	0.1
	Revenue Management – revenue protection	1.7	1.2	0.1	0.1	0.7
Impaq view - Cost of focus groups etc		100	100	100	100	400
IMPAQ FTE		1.9	1.3	0.1	0.1	13.2
IMPAQ cost		**336**	**264**	**114**	**114**	**828**

PAL has stated that the activities in this cost category are:[185]

- call centre;
- customer interaction; and
- revenue management.

Further, PAL has indicated that, for all these activities, the cost is a function of the number of customers who have their meters replaced with an AMI meter.

[185] Powercor budget and charges application, pages 86 to 87.

Impaq questions some of the statistics quoted by PAL in respect of this category, as they are not supported by industry statistics or other sources, including that:

- 32%, or 1 in 3, meter exchanges generate a telephone call from the customer to the call centre;
- 12%, or 1 in 8, final meter reads will be erroneous; and
- 1.5% of meter installations require investigation for possible corrupt or fraudulent behaviour.

Call Centre

In respect of call centre costs these have been included in the meter installation capital costs – refer section 6.1.4

Customer Interaction

In respect of customer interaction, PAL has stated that this activity includes the cost of:[186]

- resolving exceptions where 5% of AMI meter exchanges generate exceptions;
- post and courier costs, stationery and printing for mail outs; and
- training, focus groups and surveys.

In relation to 'resolving exceptions' and 'post and courier costs, stationery and printing for mail outs', this has been included in the meter installation capital costs – refer section 6.1.4.

Impaq accepts the need for PAL to be engaging customers and understanding customer response in respect of AMI and related metering issues. It is noted that this does not replace the interaction with customers by Retailers on these matters. Impaq considers that training of call centre and customer service staff is important and that conducting a few customer focus groups would provide useful understanding of customer perspectives. Impaq believes that three or four customer focus groups plus annual training sessions for all customer service staff would be in order. Impaq considers that $100,000 per annum for this purpose would be sufficient.

Revenue Management

In respect of revenue management, PAL has stated that this activity includes the cost of:[187]

- billing which involves verifying final meter reads; and
- revenue protection which involves identifying whether meters have been corrupted.

[186] Ibid, page 86.
[187] Ibid, page 87.

PAL expects that 12% of final reads will lead to errors, which will take a weighted average of approximately 10 minutes to process. Impaq accepts that errors in final reads of non-AMI meters will require manual intervention to resolve. However, Impaq does not accept a 12% incidence of errors. Final meter readings are the responsibility of the installation contractor. The performance management clauses in its contracts with installers allow CHED to demand AMI meter installers perform meter reads to a much higher standard. Impaq considers that PAL has adequate contractual power to reduce this to 0.5%. At 0.5%, the error rate in 2012 would be 1439 meter readings, or about 6.5 per day, and in 2013 the error rate would be 940, or 4.3 per day. In 2014 and 2015 this issue will disappear as all meters will be remotely read daily. Impaq believes that this will require[188] 0.2 FTEs in 2012, 0.1 FTEs in 2013 and 0 FTEs in 2014 and 2015..

PAL expects that 1.5% of meters replaced during the roll out will need to be investigated to identify whether the meter has been corrupted. This figure is much higher than the meter fraud percentages of 0.1 to 0.5% being presented by other utilities at Revenue Protection sessions at Metering Conferences[189]. Impaq believes that a level of 0.5% is more appropriate. Each investigation will take 110 minutes including site visit and reporting. Impaq considers that 1.7 FTEs will be required in 2012[190], 1.2 FTEs in 2013 and 0.1 FTEs in 2014 and 2015.

6.7.4 Backhaul Communications

Table 121 shows the PAL cost forecast for Backhaul Communications.

Table 121 – Backhaul Communications Costs

	2012	2013	2014	2015	Total
Backhaul Communications	2,195	3,487	3,564	3,638	12,884

Based on the spreadsheet PAL has provided Impaq showing:

- the number of backhaul endpoints, including Mesh Radio Access Points, 3G point to point connections, PSTN phone lines and Satellite connections; and
- the per month rates for these connections;

Impaq considers these costs as prudent.

[188] Assuming it takes 10.5 minutes to fix each final read error. (this is the average of the times given in the PAL Budget and charges application section 7.5.3)

[189] For example, The Australasian Utilities Revenue Protection Association ran conferences periodically until its merger with UMA in 2007. Revenue loss has been reported of the order of $80M to $160M in 2001 http://www.highbeam.com/doc/1G1-77779280.html. Total of 216,316 GWh in 2001 (http://www.abs.gov.au/ausstats/abs@.nsf/productsbytopic/0C2AA58A90E887B3CA256E60007BAB57?OpenDocument) at average price of $0.12. Gives non-technical .losses of)0.25% to 0.5%. Further if non-technical losses were of the order of 1.5% then distribution loss factors would be higher than they are.

[190] Assumes 0.75% investigation level, and 1550 hours per FTE per annum.

Impaq does consider that the $19 per month rates for 3G connections is above what is available today, however given that this is a contract that PAL has with Telstra, in accordance with the CROIC, Impaq accepts this forecast.

6.7.5 Communication operations

Table 122 shows the PAL cost forecast and the Impaq assessment.

Table 122 – Communications Operations

	2012	2013	2014	2015	Total/Average
PAL Forecast	3,082	3,082	3,082	3,083	12,329
Total Cost – Impaq view	1,267	1,267	1,267	1,267	5,067

PAL has stated that:[191]

Communications operations involve four work streams:

- *AMI Technology, which provides management expertise with respect to the AMI project and is also responsible for fault detection, fault investigation, fault resolution and reporting;*
- *AMI Communications Control, which is responsible for operational aspects of the AMI network, including meter data delivery and prescribed market transactions;*
- *Technology Acceptance, which is responsible for quality testing, regression testing and functionality testing of new firmware and software released by SSN and other meter providers; and*
- *Home Area Network Support, which is responsible for assessing and testing HAN technology and its compatibility with the AMI meters and Powercor Australia network.*

AMI Network Operations and fault rectification

Impaq would expect there would be a communication network operation centre (NOC) to service both the Citipower and Powercor AMI communications networks. Services in relation to operation, fault detection, investigation and resolution would need to be provided 24/7. However given the high reliability of the SSN network it is expected that the operators for the electrical network would, with training, be able manage the operation of the AMI network for the afternoon and night shift and for weekends, with an experienced AMI operator/technician on standby. During day shift, only one AMI operator would be required for the NOC. This is assumed to be a technician level role and one that could be shared with other AMI network technicians that would undertake fault investigation and rectification.

There are to be 69 Access points for Citipower and 738 for Powercor; a total of 807. There are to be 2471 relays in the Powercor area. There are also likely to be about

[191] Ibid, page 84.

11,500 point to point meter reading communications links for Powercor (mainly 3G mobile and PSTN).

With a failure rate of access points and relays of 5%pa (<1% is considered more likely) with 3,278 devices this gives 1 failure per day. With a failure rate of 3G and PSTN connections of 2% pa this gives 1 failure per day. If it is also assumed that there is a failure rate of meters of 0.5% pa[192], this translates to 14 meters per day to be investigated for comms failure. There will also be other comms issues, such as dead spots, new obstacles etc which will require attention.

In relation to fault investigation and rectification it is considered that a total of 9 technicians across both networks would be adequate; 8 doing field work and one to operate the NOC.

For overall technology and network design and management it is assumed that a telecommunications engineer would be required.

The total FTEs required then are:

- Section Manager
- Engineer
- 9 technicians

Table 43 summarises the Impaq estimate of the communications network operating costs

Table 123 – Network operating costs

	2012	2013	2014	2015	total
Technicians cost	1,350	1,350	1,350	1,350	5,400
Engineer cost	160	160	160	160	640
Section Manager	200	200	200	200	800
Vehicle operating costs	90	90	90	90	360
Consumables and equipment costs	100	100	100	100	400
Total	**1,900**	**1,900**	**1,900**	**1,900**	**7,600**
Citipower allocation	**633**	**633**	**633**	**633**	**2,533**
Powercor allocation	**1,267**	**1,267**	**1,267**	**1,267**	**5,067**

In respect of AMI communications control, Impaq believes that the activities of 'data delivery' and 'prescribed market transactions' are already sufficiently included in Meter Data Services. Any costs related to resolving issues with the IT systems that manage these processes are covered under IT Opex.

[192] ENEL advise that failure rates are less than 0.3% pa

Technology Acceptance

In respect of technology acceptance, Impaq is of the view that 'quality testing, regression testing and functionality testing of new firmware and software released by SSN and other meter providers' is a capital expense related to the relevant IT, Communications or Meter upgrade project. This is included in the capital expenditure – refer section 6.1.2.

Home Area Network support

In respect of home area network support, Impaq believes that, while this technology appears to be slow to progress in Australia, providing information and control to the customer is necessary in order for customers to gain the full benefits of AMI. Impaq considers that the implementation of HAN should be encouraged however this should be the subject of a separate program of work developed in conjunction with DPI and costs recovered through a revised budget submission.

6.7.6 Project Management

Table 124 shows the PAL cost forecast and the Impaq assessment.

Table 124 – Project Management

($,000 – real 2011)	2012	2013	2014	2015	Total/Average
PAL Forecast	0.0	0.0	3,180	2,864	6,044
Equivalent FTE	0.0	0.0	17.1	15.4	8.1
IMPAQ FTE	0.0	0.0	4.7	3.0	1.5
IMPAQ cost	**0**	**0**	**690**	**484**	**1,174**

Taking account of the CHED margin on project management[193] the PAL forecast equates to 17 project manager FTEs in 2014 and 15 project manager FTEs in 2015. PAL has treated all project management costs before the completion of the rollout as capital.

PAL has stated that:

> *After the rollout finalises, the PMO will become part of the management of the new AMI Business unit, ensuring that the AMI Business unit runs smoothly and is able to deliver to the regulatory standards.*[194]
> *The key projects expected under program management once the rollout reaches its final stages relate to the following:*
> - *operational review: once the rollout finalises the Business is going to be left with a sophisticated AMI Business unit that is far more complex than the pre-existing metering Business. In order to manage the transition*

[193] PAL Budget and Charges application, page 35.
[194] Ibid, page 80.

from rollout to BAU, a comprehensive operational review is envisaged in order to help the Business transition in a cost effective manner. The operational review is expected to highlight key risk areas and areas with potential for process improvement.

- *review of the meter supply contracts: relates to the end of the third party purchasing contracts that were negotiated for the purposes of the AMI rollout. The Business is forecasting for legal and consulting services in relation to the closing of the current contract and agreements and the scoping of the new agreements that will be required for metering BAU activities.*

In respect of the operational review, Impaq supports the need to review the AMI business unit following the completion of the roll out. At the completion of the rollout is an opportune time to review the structure, responsibilities and business processes to ensure that the business unit is optimised for BAU operations instead of rollout. There is also opportunity to review how the data from AMI can be leveraged for more efficient operation of the network and the business as a whole. It would be expected that business processes would be re-engineered through identification of opportunities to simplify process maps and to review the cost, quality and time performance measures and metrics to ensure that such performance measures are optimally aligned with business strategies and objectives. Such a project is similar to other strategic reviews of business units and does not require a large resource base perform the work[195]. The Impaq is of the view that this would require no more than 1 project manager and 2 business analysts for both 2014 and 2015.

In respect of the 'closing of the current contract and agreements and the scoping of the new agreements that will be required for metering BAU activities' it is Impaq's view that these costs should be capitalised. However, it appears that PAL have chosen to expense these costs. All of the significant contracts have been let by CHED and apply for both Citipower and PAL. Consequently, the costs involved in closing the existing contracts and scoping the new contracts would be a shared cost.

Impaq is of the view that legal support of 0.5 FTEs as well as 1 FTE of experienced accounting support in 2014 would be sufficient for the closing of the existing contracts and supporting the scoping of the new contracts. In addition, a further 0.5 FTE with a technical background will be required to scope the new contracts. There is allowance in the Capital Expenditure for management of meter supply contracts. Refer section 4.1.2. (Meter installation contract costs are out of scope because these relate to new connection and meter changes which are recovered through

[195] For example it would be expected that there would be about 4 to 8 top level business processes which would translate to about 20 to 40 main processes. The maps of these processes could be reviewed through 15 to 30 workshops – hence about 30 to 90 days for each member of a team of 3. This would also include review the measures of performance for each process.

Alternative Control Services.) The cost of these resources would be incurred by CHED and would be shared one third to Citipower and two thirds to PAL.

6.7.7 Executive and corporate office services

Table 125 shows the PAL cost forecast and the Impaq assessment.

Table 125 – Executive and Corporate Services[196]

	2012	2013	2014	2015	Total/Average
PAL Forecast	424	436	638	609	2,107
Equivalent FTE	4.2	4.3	6.3	6.0	5.2
IMPAQ FTE	1.0	1.0	2.0	2.0	1.5
IMPAQ cost	**102**	**102**	**382**	**382**	**968**

The PAL forecast equates to 4 accounting FTEs in 2012 increasing to 6 accounting FTEs in 2015.

PAL has stated that:[197]

> *Executive and corporate office services are mainly regulatory costs associated with the preparation of budget and charge applications and financial accounting costs. Also included are costs associated with the preparations for the 2016-20 Victorian Electricity Distribution Price Review (Victorian EDPR 2016-2020) which will incorporate metering (only the incremental costs associated with metering at the Victorian EDPR 2016-2020 have been included in this Application). As is to be expected, costs increase in 2014-15 as preparations commence for the Victorian EDPR 2016-2020.*

This cost category includes two activities:

- accounting services; and
- support for the 2016 – 20 EDPR (which will be required in 2014 and 2015).

In respect of accounting services, Impaq does not believe that the 'preparation of budget and charge applications and financial accounting' would require 4 incremental FTEs to PAL's accounting activities for the rest of its business.

The preparation of the budget and charges application is an annual activity that should require no more than 3 FTEs for 2 months, or 0.5FTEs for the year. The preparation of monthly reports, given the new automated systems that have been installed, should be sufficiently met with 1 FTE for 3 days per month, or 0.18 FTEs for the year.

[196] It is noted that the Impaq assessment of costs for this category is the same for Citipower and PAL. This is because the activities involved are largely not variable with numbers of customers

[197] Ibid, page 88.

In respect of other financial transactions that are related to 'in scope' activities, the amount of human intervention should not be significant. Predominantly, these activities will be related to the payment of a small number of contractors. This activity should be sufficiently met by 1 FTE for 5 days per month, or 0.3 FTEs for the year.

Impaq is of the view that this activity would be sufficiently met by 1 accounting FTE.

Impaq accepts the need for additional resources to support the 2016-20 EDPR in respect of metering and metering services. Impaq believes that 1 additional FTE would sufficiently meet this requirement.

6.8IT Opex

Table 126 summarises the IT Opex provided in the Budget Template.

Table 126 – Summary of IT Opex

	2012	2013	2014	2015	Total
Workforce Scheduling & Mobility	1,275	1,275	1,297	1,297	5,145
Connection Point Management	34	34	34	34	138
Network Management	1,071	1,174	1,195	1,222	4,661
Meter Data Management	4,743	4,803	4,868	4,934	19,347
Performance & Regulatory Reporting	54	54	54	54	216
Logistics Management	8	8	8	8	32
IT Infrastructure (incl middleware, B2B and B2M)	2,180	2,137	2,254	2,254	8,824
Totals	**9,365**	**9,485**	**9,710**	**9,803**	**38,363**

6.8.1 Workforce scheduling and mobility

In response to a question about why this is such a large cost item, PAL has provided the following information regarding workforce scheduling and mobility[198]:

> *Workforce scheduling and mobility is still required after the completion for the rollout by 2013. The workforce scheduling and mobility includes:*
>
> - *support and maintenance for service suite, device scanning software and meter data analytics;*
> - *telecommunications costs for fault devices; and*
> - *FTE support for these systems.*

[198] Second set of responses from PAL to questions raised by the AER on 11 April, 2011

It is Impaq's view that after the rollout is finished there is no requirement for the a mobility solution dedicated to AMI. Should PAL wish to use this system for scheduling and mobility for other parts of the business then this should not be a cost to AMI. Further meter installations in 2014 and 2015 are recovered under Alternative Control Services and hence should not be a cost to AMI.

6.8.2 Meter Data Management System

Section 6.7.8 of the Budget and Charges Application provides information on the Itron Enterprise Edition (IEE) MDMS which PAL and Citipower have implemented. From this description it would appear that the costs are for IEE only. However in response to a question about why this is such a large cost item, PAL has provided the following information regarding MDMS cost[199]:

> *The MDMS allocation is made up of the following items:*
>
> - *maintenance and support for MTS, DAA, IEE & USB;*
> - *24hr*7 external support and internal FTE's support;*
> - *hosting for 100,000 CEDA customers information portal; and*
> - *HAN & demand side management.*

This is scant information to support a $19m Opex cost over the 2012 to 2015 period. Nevertheless in relation to this information:

- In respect of the Market Transaction System (MTS), it is noted that this would have required a major upgrade to handle the volumes required for AMI. However, this should not lead to high operating costs. For example, if Utilisoft Gatekeeper and FlowTalk were used for the MTS it is Impaq's view that Opex, including license costs and software support would be about $250,000 per year[200]. Further a large proportion of the MTS Opex cost should be recovered through other channels. Apart from sending interval data to the market the gateway is used mainly for B2B transactions and the costs of these are recovered either through Alternative Control Services or Excluded Services. Hence in the absence of definitive data on the cost allocation for MTS Impaq is of the view that this is not a material cost for AMI.
- In relation to Utility Services Bus (USB) the cost of this should be borne across the whole PAL business as it services all the major applications that operate on it. The infrastructure cost of the USB is covered under IT infrastructure .
- The hosting of a customer information portal, although a project to be encouraged, is not within the scope of the CROIC.

[199] Ibid

[200] Based on discussions with Utilisoft in scoping out the gateway requirements for other market participants.

Hence, in Impaq's view, the Opex cost of the MDMS comes down to the Opex for IEE. In the absence of detailed information from PAL, Impaq has used information from other DNSPs which have implemented MDMS.

Table 127 shows Impaq's assessment of IT Opex.

Table 127 – Impaq Assessment of IT Opex cost

	2012	2013	2014	2015	Total
Workforce Scheduling & Mobility	1,275	1,275	0	0	2,550
Connection Point Management	34	34	34	34	138
Network Management	1,071	1,174	1,195	1,222	4,661
Meter Data Management	1,841	1,841	1,732	1,732	7,146
Performance & Regulatory Reporting	54	54	54	54	216
Logistics Management	8	8	8	8	32
IT Infrastructure (incl middleware, B2B and B2M)	2,180	2,137	2,254	2,254	8,824
Totals	**6,463**	**6,523**	**5,277**	**5,304**	**23,567**

6.9 Operating Cost Summary

Table 128 gives a summary of the proposed PAL Opex and the Impaq Assessment.

Table 128 – Summary of Operating Costs – proposed and Impaq view

	2012	2013	2014	2015	Total
Meter Data Services – Proposal	5,343	4,663	3,577	2,824	16,407
Meter Data Services – Impaq view	1,079	904	641	553	3,177
Meter Maintenance – Proposal	1,274	2,004	2,429	2,299	8,006
Meter Maintenance – Impaq view	787	707	1,114	1,114	3,724
Customer Service – Proposal	6,192	5,083	1,274	1,315	13,864
Customer Service – Impaq view	336	264	114	114	828
Backhaul Communications –Proposal	2,195	3,487	3,564	3,638	12,884
Backhaul Communications – Impaq View	2,195	3,487	3,564	3,638	12,884
Communications operations - Proposal	3,082	3,082	3,082	3,083	12,329
Communications operations – Impaq view	1,267	1,267	1,267	1,267	5,113
Project Management – Proposal	0	0	3,180	2,864	6,044
Project Management – Impaq view	0	0	690	484	1,174
Executive & corporate services – Proposal	424	436	638	609	2,107

	2012	2013	2014	2015	Total
Executive & corporate services – Impaq view	102	102	382	382	968
IT Opex –proposal	9,365	9,485	9,710	9,803	38,364
IT Opex – Impaq View	6,463	6,523	5,277	5,304	23,567
Total – Proposal	**27,875**	**28,240**	**27,454**	**26,435**	**110,004**
Total – Impaq view	**12,229**	**13,254**	**13,049**	**12,856**	**51,388**

7 SpAusNet

The SpAusNet AMI Subsequent period (2012 to 2015) Budget Application is summarised in Table 129. It is noted that all values in tables are $,000 real 2011 unless otherwise stated.

Table 129 – Summary of Opex and Capex[201]

	2012	2013	2014	2015	Total
Total Operating Expenditure	48,549	40,149	26,441	24,352	139,491
Total Capital Expenditure	171,025	49,081	7,367	3,999	231,472
Total Expenditure	**219,575**	**89,231**	**33,808**	**28,352**	**370,966**

Each of the items that make up the Capex and Opex costs are reviewed in order.

7.1 Capex – Meter Supply

Table 130 details the meter supply Capex

Table 130 – Meter Supply Capex[202]

	2012	2013	2014	2015	Total
Meters Contracted	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Other (3G meters)	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Total	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]

7.1.1 Meter Volumes

The meter volumes proposed by SpAusNet are given in Table 131 .

Table 131 – Meter Volumes[203]

Meter type	2012	2013	2014	2015
Single Phase single element	50,999	12,609	13,033	13,389
Single Phase two element	217,749	33,659		
Multiphase	33,662	7,410	1,616	1,648
Multiphase Direct connected with contactor	34,575	4,896	36	36
Multiphase Current Transformer connected	3,730	94	58	59
Total	**340,715**	**58,668**	**14,743**	**15,132**

[201] SpAusNet AMI subsequent budget and charges application – table E-1, page 12. A detailed breakdown is provided in the SpAusNet budget template spreadsheet (revision 1).
[202] Budget template, AMI Capex detail tab
[203] SpAusNet AMI subsequent budget and charges application – table 5.2 page 54

Historically the number of meters has been greater than the number of customers. The reason for this is that a proportion of customers have had more than one meter. SpAusNet has had a higher proportion of customers with more than one meter than the more Melbourne based DNSPs. The meter to customer ratio for SpAusNet has been 1.26[204] although SpAusNet have advised the AER that it is 1.18[205]. However this changes with the rollout of AMI. Customers with off peak water heating that previously had two meters will now only need one AMI meter. It is Impaq's view that the ratio will reduce to about 1.08. However in the SpAusNet application the ratio reduces to around 1.02[206]. This seems too low. The urban DNSPs are above this value and Powercor is considerably above this.

The meter volumes in Table 131 do not appear to take into account the effect of abolishments and meter changes (eg: when a customer moves from single phase to three phase supply) on the net number of new meters installed for new connections. In the past meters removed from premises were typically not worth re-using. Mostly the cost of having removed meters re-verified for accuracy was more than the written down value of the meter. Hence typically meters that were removed were scrapped. However with AMI this is no longer the case. AMI meters removed from these installations can be returned to the meter vendors for re-verification testing, at a cost of around $15 to $30 (which is a small proportion of the price to purchase a new meter) and then used on new connections. Table 132 shows the adjustment to meter quantities that results from this change and the cost of meter re-verification.

Table 132 – Adjustment to meter quantities

	2011	2012	2013	2014	2015
Customer Numbers[207]	633,847	646,034	657,240	667,352	677,204
Increase in customer numbers		12,187	11,206	10,112	9,852
Increase in meter numbers for BAU		13995	14363	14,743	15,132
Ratio of BAU meter purchases to increase in number of customers		115%	128%	146%	154%
Post rollout meter to customer ratio		1.08	1.08	1.08	1.08
Abolishments and meter changes		3,286	4,953	5,893	5,379
Rollout % complete (midway through the year)[208]		74%	100%	100%	100%
SpAusNet forecast meter quantities		340,715	58,668	14,743	15,132
Reduction in purchase quantity		4%	16%	26%	30%

[204] Based on the ratio of meters to NMIs for small customers in the MSATS database

[205] SpAusNet advised the AER by email that the meter to customer ratio was 1.18

[206] SpAusNet Budget and Charges application, table 3.1 page 25 shows that by the end of 2010 there were 637,318 meters (presumably the number of meters for rollout as at end 2010) and there were 624,000 customers which gives a meter to customer ratio of 1.02. This seems too low.

[207] from Victorian Final Distribution Determination for 2011 to 2015, table 4, page XVIII

[208] This figure allows assessment of what proportion of abolishments and meter changes are AMI meters and therefore can be reused.

	2011	2012	2013	2014	2015
Adjusted BAU meter quantities		13,379	12,102	10,921	10,640
Revised total meter purchase quantities		340,099	56,407	10,921	10,640
Number of re-verify meters		616	2,261	3,822	4,492
Cost of re-verifying meters($,000)		12	45	76	90

7.1.2 SP AusNet's proposed meter costs

The SpAusNet meter unit costs from their budget application[209] are shown in Table 133 and Table 134. SpAusNet's AMI program involves a mix of AMI meters with the larger proportion having WiMAX communications and a lesser proportion having 3G communications to fill in where WiMAX will not reach..

Table 133 – SpAusNet submission meter prices - WiMAX(AUD$)

Meter type	2012	2013	2014	2015
Single phase single element	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Single phase two element with contactor	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Multiphase	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Multiphase with contactor	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Multiphase CT connected	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]

Table 134 - SpAusNet submission meter prices – 3G (AUD$)

Meter type	2012	2013	2014	2015
Single phase single element	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Single phase two element with contactor	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Multiphase	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Multiphase with contactor	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Multiphase CT connected	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]

These meter prices are much higher than those of other DNSPs. For example the unit prices[210] for Powercor are shown in Table 135. At a US$ to AUD$ exchange rate of around parity the Powercor prices for single phase meters are about half the SpAusNet prices.

[209] SpAusNet Budget Application – Appendix A – Calculation Method spreadsheet, Meters tab
[210] Powercor AMI Budget and Charges Application 2012-15, table 15, page 52

Table 135 – Powercor Unit Meter Prices (US$, 2011)

Meter type	2012	2013	2014	2015
Single phase single element	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Single phase one element with contactor	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Single phase two element with contactor	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Multiphase	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Multiphase with contactor	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Multiphase CT connected	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]

The SpAusNet meter prices included in the AER's final determination for the initial budget of 2009 to 2011 were more in line with the Powercor meter prices. These meter unit prices are shown in Table 136. For example for SpAusNet a single phase single element meter was a total of US$[C-I-C] (including the communications module in the meter) and for Powercor a single phase single element meter (including the communications module) is US$[C-I-C].

Table 136 – SpAusNet Meter Unit Costs[211] - initial budget determination

Meter type	Meter Cost[212] (US$)	Comms Module Cost (US$)	Unit Cost (US$)
Single Phase single element	86.5	60	146.5
Single Phase two element	104.4	60	164.4
Multiphase	150.9	60	210.9
Multiphase Direct connected with contactor	160.7	60	220.7
Multiphase Current Transformer connected	260.0	60	320.0

The SpAusNet meter cost also includes the cost of the ZigBee Home Area Network (HAN) interface as described in the SpAusNet Initial Budget Application (amended)[213]:

[211] Costs taken from SpAusNet Revised Budget Application dated 28 February 2011, table 8.3, page 38 –budgeted unit costs per L&G meter per the Approved Budget

[212] The SpAusNet Landis and Gyr contract explicitly states that the prices are fixed for the term of the contract (and there are provisions to allow extensions)

[213] SpAusNet Initial Budget Application (amended with additional cost data), 27 February 2009, section 3.3, page 17

"The meters are required to meet the functionality and service level requirements set out in the relevant specifications referred to above as well as other NEM metrology requirements.

SP AusNet's meter requirements will be sourced through a competitive tender process. Meters will be WiMAX compatible in line with SP AusNet preferred communications solution, and will meet the specification requirements referred to above including those of:

- *Direct connected meters having a Home Area Network (HAN) interface which complies with the ZigBee Smart Energy Profile, and*
- *The meter having the capability to operate as the Energy Service Portal for a Utility Private HAN."*

In February 2011 SpAusNet submitted a revised budget application to the AER seeking adjustment to a range of costs including an increase in the budget for metering costs. The revised budget meter unit costs are shown in Table 137.

Table 137 – Revised Budget Application – meter unit costs[214]

Meter type	Meter Cost (US$)	Comms Module Cost (US$)	ZigBee Card	Subtotal Unit Cost (US$)	Subtotal (AUD$)	Antenna (AUD$)	Total AUD$
Single Phase single element	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Single Phase two element	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Multiphase	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Multiphase Direct connected with contactor	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Multiphase Current Transformer connected	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]

It is noted that all the components of the meter cost have increased substantially. The total costs are much larger than those in Table 136. For example for a single phase single element meter:

- the meter cost has increased from US$[C-I-C] to US$[C-I-C], plus there is an additional US$[C-I-C] for a ZigBee card (which was previously included); and
- the communications module has increased from US$[C-I-C] to US$[C-I-C].

The AER in its final determination on SpAusNet's revised budget application notes that SpAusNet was aware of these cost increases in September 2009 prior to the

[214] SpAusNet AMI Revised Budget Application table 8.4, page 39

AER's final determination in October 2009, yet did not advise the AER of the increases. Neither did SpAusNet review its decision for WiMAX (together with 3G) as its AMI solution despite very large cost increases.

7.1.3 Impaq Assessment of WiMAX meter costs

As indicated above, Impaq considers that the SP AusNet meter costs in their submission to be above that which is the commercial standard for AMI meters (including communications). Further it is Impaq's view that SP AusNet did not competitively tender for AMI meters and communications as it excluded Mesh Radio technologies which have been successfully implemented by all the other Victorian DNSPs.

Because of the above Impaq has used the Powercor unit meter costs[215] in its assessment. These meter unit costs (in US$) are similar to those approved by the AER in its final decision in 2009. It is noted that these meter unit costs do not include an external antenna. The other DNSPs have external antennae for 5% to 10% of meter installations. Because of this Impaq has included the cost of an external antenna for meters at a cost of [C-I-C] as shown in Table 137[216].

The Impaq assessment of meter unit costs is different to that approved in the AER's revised budget determination. This is due to new information being available and the US$ exchange rate now being more favourable than that which applied at the beginning of the 2009 to 2011 period.

7.1.4 Impaq assessment of 3G meter costs

In SP AusNet's submission it states that a secondary communications network is required to cover about 10% of the customer base[217]. This secondary network is to utilise the Telstra 3G (Next G) network. Powercor in their application has also indicated that they will be requiring 3G communications for a small proportion of meters (of the order of 1% to 2%). The meter costs proposed by SP AusNet are shown in Table 138 which is a reproduction of Table 134.

Table 138 – 3G meter unit costs[218]

[215] The Powercor meter unit costs include an AMI communications module which also has ZigBee HAN interface.

[216] SpAusNet's revised budget application, page 39, states that the cost of the antenna was previously included in the communications Capex cost

[217] SP AusNet budget and charges application, section 5.3.3, page 57

[218] SpAusNet Budget Application – Appendix A – Calculation Method spreadsheet, Meters tab – these prices are marked as Non Contract costs – "best estimate based on quotes"

Meter type	2012	2013	2014	2015
Single phase single element	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Single phase two element with contactor	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Multiphase	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Multiphase with contactor	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Multiphase CT connected	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]

SP AusNet has stated that these prices are "best estimates based on quotes". [C-I-C]. For example it would be expected that the cost of a multiphase CT connected meter would be much more than for a single phase single element meter. See Table 135.

Impaq has made its own assessment of the costs of 3G AMI meters as shown in Table 139.

Table 139 – Next G Meter cost

Meter type	Base interval meter (US$)	Next G Comms card (US$)	ZigBee (US$)	Total (US$)
Single phase, single element	82	160	12	254
Single phase, two element with contactor	116	160	12	288
Multi phase	164	160	12	336
Multi phase, with contactor	175	160	12	347
Multi phase current transformer connected	227	160	0[219]	387

The base interval meter costs reflect the costs of other DNSPs for a meter that will support the Victorian Functionality specification, excluding the communications. The Next G communications card cost is the cost of single band 850MHz 3G modem which is suitable of use in AMI meters[220]. The Telstra Next G network uses the 850MHz band. There are 3G modems which are quad band at about US$250 in reasonable volume, however the extra 3 bands are redundant if Telstra Next G is used. The cost of the ZigBee module is also included[221].

7.1.5 Impaq assessment on meter supply Capex

Impaq has assessed the meter supply cost based on:

[219] ZigBee HAN interface is not required for CT connected meters in the VIC Functionality Specification
[220] Pricing from meter vendors
[221] SP AusNet cost from Table 137

- the adjusted meter quantities as given in Table 132;
- 90% of meters with WiMAX - unit costs as given in Table 135 (plus antenna cost);
- 10% of meters with Next G communications – unit costs as given in Table 139;
- US$ to AUD$ exchanges rate of 1.05 as discussed in section 3.4.1.

The resulting total meter supply cost is as shown in Table 140.

Table 140 – Impaq calculation of meter supply cost

	2012	2013	2014	2015	Total
Single Phase single element	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Single Phase two element	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Multiphase	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Multiphase Direct connected with contactor	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Multiphase Current Transformer connected	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Total	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]

Table 141 compares these calculated meter supply costs against the meter supply costs in the SpAusNet submission.

Table 141 – SpAusNet submission compared with Impaq Assessment

	2012	2013	2014	2015	Total
SpAusNet application	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Impaq Assessment	67,193	11,045	1,918	1,883	82,038

7.2Capex – Meter Installation cost.

SpAusNet have indicated in their Budget Template that all meter installation costs are contracted. The costs per year are summarised in Table 142. The meter volumes per year are also given and the average unit installation cost is calculated.

Table 142 – Meter installation costs by year

	2012	2013	2014	2015	Total
SpAusNet Budget Template ($)	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Meter Volumes	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Unit installation costs ($)	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]

It would have been expected that installation costs for 2014 and 2015 would be zero as these are new connection installation costs which are Alternative Control Services. The unit installation costs in 2012 and 2013 appear high. Since this cost is shown as a contract cost on the SpAusNet Budget Template, SpAusNet was asked on 11 April 2011 for evidence of contracts to support the higher installation cost. The response to this request from SpAusNet was that "contracts were previously provided to the AER" and the detail of the installation cost was shown in what is reproduced in Table 143

Table 143 – SpAusNet table supplied in response to questions

Cost category	Description	Avg cost per meter	Approximate cost
[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]

Cost category	Description	Avg cost per meter	Approximate cost
[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]

It is noted that SP AusNet did provide copies of their contracts with installation providers [C-I-C] and [C-I-C]; however the pricing in the schedules was blanked out. Hence there is no evidence that the prices in Table 143 are the same as the prices in contracts SpAusNet has with its installation providers. Further Impaq considers that, for several of the items in Table 143, either the incidence rate is much higher than other DNSPs or the unit costs are much higher. Two examples of other DNSPs incidence and pricing are:

- Meter board replacement – 3% at a unit cost of $[C-I-C] (compared to SpAusNet's 3.8% at $[C-I-C])
- Asbestos meter board (upgrade) - 0.9% at a unit cost of $[C-I-C] (compared to SpAusNet's 3.8% at $[C-I-C])

Hence, it is Impaq's view that average installation costs of around $[C-I-C] per meter (refer Table 142) is not commercially prudent, as there are lower cost alternatives. It is our view that the installation cost should be adjusted in line with those at PAL plus the allowance for an antenna at all sites. PAL is a comparable benchmark to SpAusNet in that they are both Distributors with metro and rural areas. Both have similar numbers of customers and hence economies of scale should be similar for both. The PAL unit prices (including more difficult sites) for contracted installation of AMI meters are[222]:

- 2012 - [C-I-C]
- 2013 - [C-I-C]

Adding an allowance of [C-I-C] for an antenna, which is the weighted average cost in Table 143, gives

- 2012 - [C-I-C]
- 2013 - [C-I-C]

[222] Refer Powercor budget and charges application pages 55 to 57

7.2.1 Impaq Assessment of meter installation costs

Based on the foregoing and using the Powercor weighted average installation cost shown above Impaq has made an assessment of metering installation costs as shown in Table 144. This installation cost excludes the costs for installation of new connection meters (including meter changes) as the cost for these activities is recovered through Alternative Control Service charges.

Table 144 – Impaq Assessment of meter installation costs

	2,012	2,013	2,014	2,015	Total
SpAusNet proposal	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Meter volumes (meters)	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Less New connection meters (meters)	13,995	14,363	14,743	15,132	58,233
Net AMI rollout meters (meters)	326,720	44,305	-	-	371,025
Unit installation cost ($)	67.55	63.91			
Impaq assessment of Cost	**22,070**	**2,832**			**24,901**

7.3Capex - Information Technology

The IT Capex[223] proposed by SP AusNet is shown in Table 145.

Table 145 – Budget Template IT Capex

	2012	2013	2014	2015	Total
SpAusNet Budget Template	10,761	6,914	0	0	17,675

It appears that most of the 2012 & 2013 Capex is on Network Management systems, Meter Data Management Systems and Systems integration. Impaq would have expected that all the IT systems would have been bedded down by the end of 2011 given that these systems are required to provide interval data from all meters to the market by 1 Jan 2012. However given the immaturity of the NMS and MDMS systems it is understandable that more Capex might be required. Accordingly Impaq considers the proposed Capex to be prudent.

7.4Capex - Communications

Table 146 details the communications Capex proposed by SP AusNet, including both the supply of the equipment and the installation cost.

SpAusNet's WiMAX AMI communications solution uses a slice of the 2.3GHz spectrum owned by Unwired for the eastern edge of Melbourne and spectrum owned by NBN Co (previously owned by Austar until Feb 2011) for the rest of the

[223] From SpAusNet budget template, IT Capex Detail tab.

SpAusNet territory. It is noted that these spectrum licences expire in July 2015[224] and SpAusNet's contract information supplied to the AER does not provide certainty that SpAusNet will have access to this spectrum beyond that date.

Table 146 – Capex for communications

	2012	2013	2014	2015	Total
Backhaul Communications	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Communications infrastructure	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Installation of communications infrastructure	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Total	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]

It is Impaq's view that this cost is excessive and not prudent. There are alternative technologies, for example Mesh Radio, which has a much lower cost structure for communications. Powercor services rural areas like SP AusNet does, yet the cost of communications infrastructure is a fraction of what SpAusNet is proposing. Powercor will require less than 1000 access points with a cost of about [C-I-C] each[225] and less than 3000 relays at a cost of about [C-I-C]each[226]. Allowing for an installation cost of about [C-I-C]each (which is typical of what contractors charge for this) the total installed capital cost is about $13.5M (this is not just for the 2012 to 2015 period, but covering the whole of the rollout).

Furthermore it would appear that the SP AusNet WiMAX network is to be used for other purposes. It has been reported in Australian Electrical World[227] (and other sources) that SP AusNet has an agreement with Unwired (now VividWireless)

> *"The Australian newspaper reports under the agreement signed on Thursday, once the power company builds its network using Unwired's 2.3 GHz spectrum it will share the infrastructure with Unwired.*
>
> *David Spence CEO of Unwired said 'SP AusNet will build a network based on the WiMAX standard and deploy it and connect up the [electricity] meters and when we come to deploy our network - our WiMAX network in Melbourne - we will share the networks and share the spectrum,' The [electricity] meters themselves don't actually take up a lot of traffic on the network," Spence said. "it's sort of a trickle of data compared to video streaming to a mobile device.*

[224] BKAL Pty Ltd has the Radiocommunications Act 1992 Spectrum Licence 8100157 for the 2.3GHz band which expires on 24 July 2015. Copy of licence details available on ACMA website http://web.acma.gov.au/pls/radcom/register_search.main_page then enter the licence number.

[225] Powercor budget application table 21, page 62

[226] Ibid

[227] Refer http://www.electricalworld.com.au/onestory.php?idNum=1224

David Spence the first CEO of Vivid (previously in Unwired) also reported to IT News on Oct 23, 2009

> *"Under the agreement signed yesterday, once the power company (SP AusNet) builds its network using Unwired's 2.3 GHz spectrum it will share the infrastructure with Unwired. Unwired will then use the assets to augment the rollout of its Vividwireless network in Melbourne.*

The Seven Network, owners of Unwired (now VividWireless) in a press release[228] on 22 October 2009 said:

> *"This agreement demonstrates the broad range of applications supported by 4G wireless services. The network is purpose-built to deliver traditional online services and support connectivity for millions of devices, such as these smart meters", said Unwired CEO, Mr David Spence.*
>
> *Under the agreement, SP AusNet will gain access to part of Unwired's 2.3GHz spectrum in Melbourne to operate a WiMAX network. As part of the deployment SP AusNet will build a number of base station sites in Unwired's coverage area. This network would be utilised in any future 4G broadband network to be deployed in Melbourne.*

From the above it is clear that the traffic levels on this network are to be much more driven by internet service provision than for communication with electricity meters. In the CROIC one of the activities listed as outside scope[229] is:

> *"using AMI Technology to provide communications services beyond those in the most up to date Specifications."*

It is Impaq's view that Victorian Electricity Customers should not be bearing all the cost to provide infrastructure which also provides services that are outside of scope. In relation to what proportion of this infrastructure should be allocated to the provision of AMI services, Impaq considers that $15m over the four years would be appropriate as this approximates to the communications capital costs associated with alternative AMI technologies as outlined earlier in this section. Refer Table 147.

Table 147 – Communications Capex summary

	2012	2013	2014	2015	Total
SpAusNet application	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Impaq Assessment	8,215	5,743	1,117	-	15,075

[228] refer http://www.sevencorporate.com.au/default.aspx?page=mediareleases&year=2009&month=10 –"Wireless Electricity Meters charge up Victoria" The pdf is at http://www.sevencorporate.com.au/_uploads/Files/Wireless%20Electricity%20Meters%20charge%20up%20Victoria.pdf

[229] Cost Recovery Order in Council, 25 November 2008, clause S2.8 (iv)

7.5Capex Summary

Table 148 summarises the SpAusNet Capex proposal and the Impaq assessments of prudent Capex.

Table 148 – Capex Summary

	2012	2013	2014	2015	Total
Meter Supply - proposal	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Meter Supply - Impaq view	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Meter Installation - proposal	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Metering installation - Impaq view	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
IT Capex - Proposal	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
IT Capex - Impaq view	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Comms Capex - Proposal	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Comms Capex - Impaq view	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Total - proposal	**171,025**	**49,081**	**7,367**	**3,999**	**231,472**
Total - Impaq view	**108,239**	**26,534**	**3,035**	**1,883**	**139,690**

7.6Operating Expenditure

Table 149 shows the summary of all the categories of Operating Expenditure proposed by SpAusNet.

Table 149 – Summary of Operating Expenditure Forecast[230]

	2012	2013	2014	2015	Total
Meter Reading	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Meter Data Management	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Meter maintenance	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Customer Service	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Communication infrastructure maintenance	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Project Management	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
AMIPO and AMI ISC costs	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Audit and quality assurance	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
AMI budget and charges applications	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]

[230] From SpAusNet budget template, tab - AMI O&M Detail

	2012	2013	2014	2015	Total
Equity raising costs	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Management fees or overhead	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Extra Accommodation Cost	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
IT Opex	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Total – Proposal	**48,550**	**40,149**	**26,441**	**24,351**	**139,491**

The cost of many of these items is heavily affected by human resources costs. Where human resource costs are involved the Impaq view has been established based on the assumptions in section 3.4.2.

Each of these categories of Opex is considered in turn in the following sections.

7.7Meter reading

Table 150 shows the proposed costs of manual meter reading. At the end of the rollout SpAusNet are proposing that there would still be a small number of meters which will need to be manually read.

Table 150 – Meter reading costs

($,000 real 2011)	2012	2013	2014	2015	Total/Average
SP AusNet Forecast	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Average cost per read ($)	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]

Impaq's analysis of the SpAusNet meter reading forecast shows that the average cost per read ranges from [C-I-C] in 2012 to [C-I-C] in 2015. Impaq accepts that as the AMI roll out proceeds, the remaining manually read meters will have a higher proportion of more difficult and thus more expensive sites to read. From June 2014, the remaining meters will be the most remote sites that will remain with manually read interval meters. These costs per read compare favourably with the Alternative Control Service price for a special meter read.

Impaq considers that SP AusNet's meter reading forecast is prudent.

7.8Meter data management

Table 151 shows the SP AusNet cost forecast for meter data management and the Impaq assessment of these costs.

Table 151 – Meter Data Management

	2012	2013	2014	2015	Total/Average

SP AusNet Forecast		[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Office Mgr FTE		[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Staff FTE		[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Impaq FTE	Office Manager	1.0	1.0	1.0	1.0	1.0
	Maintain accreditation	0.25	0.25	0.25	0.25	0.25
	Estimation, validation, exceptions mgt	3.0	3.0	2.0	2.0	2.5
	Other activities	0	0	0	0	0
Impaq FTEs		4.25	4.25	3.25	3.25	3.75
Impaq cost		**396**	**396**	**309**	**309**	**1,410**

Assuming that this cost category would require an office manager and a number of staff, the SP AusNet cost forecast equates to one office manager and [C-I-C] staff in 2012 reducing to one office manager and [C-I-C] staff in 2015.

SP AusNet has stated that:[231]

> *Meter data services comprise meter data processing and management and the transfer of processed meter data to retailers and market systems. The following activities are included in this program:*
>
> *(a) Data processing and management:*
>
> - *Secure and maintain accreditation to read and process meter data for the relevant metering installation type;*
> - *Estimation, validation and substitution of metering data in accordance with the metrology procedures for the relevant metering installation type;*
> - *Exceptions management;*
> - *Management of business rules applying to data management and exceptions;*
> - *Data storage management to regulatory requirements;*
> - *Hardware licensing and consumables;*
> - *Software licensing and support; and*
> - *Maintenance and support costs.*
>
> *(b) Data transfer*
>
> - *Management of transfer of AMI reading data to required service levels; and*
> - *Management of AMI functionality in areas of control, security and messaging to required service levels not included in other activities above.*

[231] SP AusNet 2011 – "Advanced metering infrastructure – AMI Subsequent Budget and Charges application", pages 76 to 78.

In respect of 'data storage management', 'hardware licensing and consumables', 'software licensing and consumables' and 'maintenance and support costs', it is Impaq's view that these are covered in IT Opex costs, section 7.18.

Secure and maintain accreditation

'Securing accreditation to read and process meter data for the relevant metering installation type' is an activity that forms part of the AMI program for SP AusNet. It is an integral part of the implementation of the AMI IT, communications and metering systems and processes to ensure that they comply with the requirements of the National Market and that accreditation is obtained. For example, when SP AusNet went to tender for meters, a requirement would have been that the meters comply with all relevant rules and regulations. The cost of securing accreditation is implicit in the Capex for AMI and Impaq expects that this is already done.

Impaq accepts that maintaining this accreditation is a valid operating activity that would be incorporated into the businesses' existing compliance and regulatory processes. A large part of this activity would be accessing, receiving and reviewing monthly reports on the performance of the AMI system, which would be automatically generated. Enquiries would be initiated if any unacceptable result is identified. This should take no more than 1 FTE for 2 days per month.

Further, on an annual basis, a more detailed analysis of systems, processes and performance would be conducted to ensure regulatory and market compliance. This should require no more than 1 FTE for 20 days.

Overall, Impaq believes that this activity should be sufficiently met with 1 FTE for about 44 days, or 0.25 FTE over the year.

Estimation, validation, substitution, exceptions and business rules management

Impaq, through the AER, asked SpAusNet to explain the high cost of Meter Data Management considering that it was expected that this would be an automated process. The SpAusNet response[232] is:

> *"As noted in section 5.2.2 of the Budget and Charges application, although the functions associated with meter data services were designed to be fully automated, some manual intervention or workarounds are anticipated to be required to ensure business process are executed to the required levels of service performance and timeframes.*
> *After 'bedding down' the systems in 2011 SP AusNet anticipates that the level of read exceptions in 2012 and beyond should reduce to the expected level of* [C-I-C] *with resources required to support any manual intervention also reducing to the expected base level.*

Table 152 – *SpAusNet response - Breakdown of forecast meter cost (real 2011 $)*

	2015

[232] SpAusNet reply to AER questions of 11 April, 2011

	2015	
	[C-I-C]	[C-I-C]
	[C-I-C]	[C-I-C]
	[C-I-C]	[C-I-C]
	[C-I-C]	[C-I-C]
	[C-I-C]	[C-I-C]
	[C-I-C]	[C-I-C]
	[C-I-C]	[C-I-C]
	[C-I-C]	[C-I-C]

That SpAusNet expects to have a [C-I-C] exception level on meter reads after systems are bedded down is a concern. In the Functionality Specification the performance levels required[233] for daily reading[234] are 99% by 4 hours after midnight and 99.9% within 24 hours. Hence it is required that there be 99.9% of data delivered to the NMS from meters that will be correct data. This performance level would not be met with a [C-I-C] exception level.

Given the performance level requirements the vast majority, if not all, of the processing of the data, including validation, estimation and substitution should be automated. The NEM procedures for validation and substitution provide rules for undertaking this activity which should be implemented as automatic functions in the MDMS. 99.9% of data will be correct and complete when delivered to the NMS from meters and based on SP AusNet having 730,000 meters, this equates to an error rate of 35,040 data points per day. The vast majority of these errors will be addressed using standard and automated algorithms. Impaq assumes that at least 99% of the data points will be corrected by the MDMS, leaving 350 data points, or 7.3 meters, that may involve manual intervention per day.

Impaq accepts that prior to the completion of the AMI rollout, additional data management issues will arise due to the remaining non-AMI meters still in operation. Impaq is of the view that a staff of 3.0 FTEs in 2012 reducing to 2 FTEs in 2015 would be sufficient to meet these requirements.

Other Activities

[233] AMI minimum functionality specification (Victoria) – Sept 2008 Release 1.1, clause 4.1

[234] Daily reading is required from 1 Jan 2012 as per the Minimum Service Levels specification Sept 2008 Release 1.1 clause 4.3

Impaq believes that there are no other activities that require manual intervention or additional costs that are within scope. The cost of activities that relate to B2B requests are recovered through Alternative Control Service charges.

7.9 Meter maintenance

Table 153 shows the SP AusNet cost forecast for meter maintenance and the Impaq assessment of these costs.

Table 153 – Meter maintenance cost

	2012	2013	2014	2015	Total/Average
SP AusNet Forecast	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Impaq cost	**538**	**538**	**689**	**689**	**2,454**

SP AusNet has stated that maintenance and operating expenditure includes:[235]

> *Periodic meter testing based on meter family samples in accordance with relevant standards and asset management programs;*

This is little detail to support the proposed expenditure. Because of this Impaq has built up costs for the meter maintenance activities that it considers a DNSP would need to undertake and for which the costs are not recovered from other sources. Metering activities in relation to new connections and changes of metering are recovered as Alternative Control Services. Metering Provision for customers consuming >160MWh pa is a contestable activity and the costs recovered from the responsible person that nominates a Metering Provider.

Based on the requirements of the NER chapter 7 and the Metrology Procedure, there are four main activities required in relation to AMI metering and other metering for customers with consumption <160MWh pa:

- Testing of meters in service;[236]
- 100% testing of CT connected meters every 5 years (and the CTs);[237]
- Audits of unmetered supplies; and[238]
- Meter data validation.[239]

Testing of meters in service

The NER[240] requires that meters be accuracy tested in accordance with the requirements of AS1284.13. In AS1284.13:2002 it requires that all new meter types

[235] Budget and Charge Application 2012 to 2015, page 68.
[236] Metrology procedure schedule 2, section 5.2. NER S7.3.1(c)
[237] Metrology procedure schedule 2, section 5.15 and NER S7.3.2
[238] Metrology procedure section 10
[239] Metrology procedure section 3.9
[240] National Electricity Rules, Chapter 7

installed be tested within 3 years for in service accuracy. It further requires[241] that meter families are grouped according to:

a) Manufacturer; and

b) Design or pattern or type.

The population of each meter family is grouped into five year blocks based on the age of the meters. This means that, according to this classification of meter families, all of the AMI meters of the same type and vendor would constitute one family and thus only require one sample of testing. Notwithstanding, Impaq believes that, given the very large number of new meters that have been installed in a very short period of time, it would be prudent to have more metering families.

Impaq's assessment of the required meter testing program is summarised in Table 154. The meter numbers are the total meter numbers to be rolled out. The meter types are those nominated by SpAusNet.

The number of meter families has been assumed based on the need to have at least two families and also to keep the number of meters in each family less than 35,000 to limit the number that would need to be replaced if there was a failure of a family of meters.

Table 154 – Meter testing numbers and costs

	Meter numbers [242]	No of families	Meter per family	Sample Size	Meters to be tested	Testing cost ($)	Annual test Cost($)
Single Phase single element	354,330	12	29,528	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Single Phase two element with contactor	172,094	8	21,512	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
3 Phase Direct Connect	77,645	4	19,411	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
3 Phase direct connect with contactor	43,119	2	21,560	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
3 Phase CT connect	3,767	2	1,884	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Total	650,955	28	23,248		8440		341,007

The sample sizes[243] are taken from AS1284.13:2002. Based on this the number of meters to be tested is determined. AS1284.13 requires new meter types to be tested within 3 years of being placed into service[244]. It would appear that such

[241] AS1284.13 Clause 8.2

[242] SpAusNet budget and charges submission Table 3.1, page 25 – meter quantities at end of 2011

[243] Sample sizes are in AS1284.13:2002 table 1 – sampling by attributes

[244] AS1284.13, clause 6.2.2

testing can then be spread uniformly throughout the 2012 to 2015 period. The SpAusNet alternative control service price for testing meter accuracy is [C-I-C] for single phase and [C-I-C] for three phase[245]. This then determines the total cost of in situ testing of meters for each year of the 4 year period.

NER compliance current transformer meter accuracy testing

Chapter 7 of the NER requires 100% of CT connected meters to be accuracy tested at least every five years. It would therefore be expected that such testing for AMI rollout meters would commence in 2014. It assumed there would be an annual test program of 1/5 of the entire CT meter population to smooth workload against available test technicians.

Based on the number of CT AMI meters given in Table 38, this is 753 meters tested each year. The rate SpAusNet advised for each three phase meter test is [C-I-C] (as detailed above). Hence this results in a cost of [C-I-C] for each of 2014 and 2015.

Unmetered supply audits

The NEM metrology procedure requires unmetered supplies to be regularly audited. Based on other DNSPs charges a unit costs of $150 per audit is assumed and quantities of 315 per annum is assumed based on the metrology procedure[246].

Validation of metering installations

The NEM metrology procedure also requires that the metering data base (in the DNSPs systems) must be validated against the metering data in type 5 and type 6 meters[247]. Sample testing is required every 12 months. The sampling for this is the same as that for accuracy testing. Hence the meters which are sampled for accuracy testing (as detailed above) can also be used for validation of the metering database. The interval data collected from these meters can be validated against what is stored in the MDMS. It is expected that this would be largely an automated process resulting in very few exceptions as AMI meters are remotely read over secure communications channels. The cost of this is included in the next category.

Other metering resources

Allowance is made for a range of other activities including metering strategy, review of metering technologies and products from metering vendors, meter data validation management and meter accuracy testing management. This task is estimated to require 1 FTE, assumed to be that of an engineer.

Summary of meter maintenance costs

Table 155 gives a summary of costs outlined above.

[245] SpAusNet Alternative Control Services price list for 2011

[246] Metrology procedure table 14.1

[247] Metrology procedure part A, section 3.9 page 43

Table 155 – Summary of meter maintenance costs

	2012	2013	2014	2015	Total
Meter testing	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
CT meter testing	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Unmetered supply audits	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Metering Engineer	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Total	**538**	**538**	**689**	**689**	**2,454**

7.10 Customer service

Table 156 shows the SP AusNet cost forecast for customer service and the Impaq assessment of these costs.

Table 156 – Customer Service Costs

		2012	2013	2014	2015	Total/Average
SP AusNet Forecast		[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Impaq view	Customer communications & stakeholder strategy	1.0	1.0	0	1.5	1.5
	Training planning	0.25	0.25	0	0.6	0.6
	Training costs ($000's)	10	10	10	80	80
	IVR upgrading	0	0	0	0.3	0.3
	IVR costs ($000's)	0	0	0	100	100
IMPAQ cost		**999**	**103**	**103**	**10**	**1,215**

SP AusNet has stated that:[248]

> *SP AusNet's approach to Customer Services activities relating to the AMI program is focussed on:*
>
> - *The development of a Customer Communications and Service Strategy to educate and inform customers about AMI;*
> - *Development of complementary plans to provide detail on delivery, technology, training and resourcing with all stakeholders;*

[248] SpAusNet budget and charges submission, page 30.

- *Development and planning of resourcing and training requirements for Customer Services teams and call centre functions to deal with customer queries, complaints and claims; and*
- *Upgrading of the relevant Customer Service technology (e.g. Interactive Voice Recording) to ensure effective and efficient management and handling of customer calls.*

In respect of the 'development of a Customer Communications and Service Strategy' and the development of stakeholder management plans, Impaq accepts that this is a necessary part of the rollout. However, it would be expected that this is virtually completed given the large number of meters which are to be rolled out by the end of 2011. Impaq accepts, however, that SP AusNet has to date focused on installing AMI meters in the more 'straight forward' sites. Where customers have refused to allow an AMI meter to be installed, these sites have been skipped. Consequently, it is expected that the number and complexity of customer issues will increase over the period. For this reason, significant reviews of the Customer and Stakeholder plans may be required, resulting in the need for additional resources in 2012. Impaq is of the view that this would be sufficiently met with 4 FTEs in 2012, 1 FTE in 2013 and 2014.

The development of training plans for call centre and customer service staff is also a necessary activity which it would be expected would have been completed before 2012 as the rollout will by then be in the third year for SP AusNet. Impaq believes that the activity for this period should be the ongoing management and refinement of the plan and that 2 FTEs in 2012, 0.25 FTE in 2013 and 2014 would be sufficient. Additional costs would also be incurred for the development of training material and manuals. Impaq estimates a cost of $50,000 in 2012 and $10,000 for 2013 to 2015.

The upgrading of the customer service technology would require 1 FTE in 2012 as well as additional costs of $100,000 in 2012.

7.11 Communication infrastructure maintenance

Table 157 shows the SP AusNet cost forecast for communications infrastructure maintenance and the Impaq assessment of these costs.

Table 157 – Communications infrastructure maintenance cost

	2012	2013	2014	2015	Total/Average
SP AusNet Forecast	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Impaq Estimate	**600**	**600**	**600**	**600**	**2,400**

SpAusNet has provided no detail to support this item of Opex. The communications infrastructure for WiMAX consists of base stations which, according to the Budget application, totals to 37[249]. These base stations will be quite new throughout the

[249] Budget and Charges Application Table 4.3 page 42

2012 to 2015 period and given that they are all electronic, Impaq expects that very little hardware maintenance will be required. [C-I-C]

[C-I-C]

7.12 Project management

Table 158 shows the SP AusNet cost forecast for Project Management and the Impaq assessment of these costs.

Table 158 – Project Management

		2012	2013	2014	2015	Total/Average
SP AusNet Forecast		[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Equivalent FTE		[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Impaq view	PMO mgr	1.0	1.0	1.0	0	0.75
	Project Director	1.0	1.0	1.0	0	0.75
	Administration and coordination	4.0	3.0	2.0	0	2.25
	Finance and reporting	3.0	2.0	1.0	0	1.50
	Change mgt	2.0	1.0	0	0	0.75
	Additional costs	200	100	0	0	300
Impaq FTE		11.0	9.0	5.0	0	6.25
IMPAQ cost		**1,582**	**1,257**	**679**	**0**	**3,518**

SP AusNet's forecast for project management is equivalent to [C-I-C} PMO manager FTEs in 2012 reducing to nearly [C-I-C] PMO manager FTEs in 2014.

SP AusNet has stated that:[250]

> *Program Management and Training covers a range of activities required to implement the AMI Program. The areas within the AMI Program include Solution, Deployment and Operation streams for Metering and Communications Infrastructure.*
> *Activities include:*
> - *Project administration;*
> - *Project coordination (Issues and Risks);*
> - *Financial management and Reporting Requirements; and*
> - *Resourcing, training and Change Management.*

Impaq believes that these costs should be treated as capital costs against the AMI roll out. However, Impaq notes that SP AusNet has no forecast for Project Management in Capex and appears to treat these as an operating expense.

Impaq believes that an experienced PMO manager FTE is required to run the PMO and manage the support services for the period 2012 to 2014. Additionally, although SP AusNet has included these costs as overheads (see 7.17), it is more appropriate to explicitly include the Project Director in this category.

In respect of project administration and project coordination, Impaq believes the areas that need to be covered are:

- Meters and installation;
- Communications;
- IT; and
- Process changes.

When the rollout is at its peak, a project coordinator would be required for each of these functions. In the latter years of the rollout, when most of the development and planning is complete, these could be combined into two areas. Impaq believes that 4 project coordinator FTEs in 2012 reducing to 2 project coordinator FTEs in 2014 would be sufficient for this activity.

In respect of financial management and reporting, Impaq is of the view that, during the peak of rollout, financial management and reporting is a continuous process of reviewing budgets, reporting expenditure, preparing information for the payment of contractor invoices, etc. This would require 3 accountant FTEs in 2012 reducing to 1 accountant FTE in 2014.

Impaq believe that the activity of resourcing, training and change management would require 2 change manager FTEs in 2012 and 1 change manager FTE in 2013.

[250] Ibid, page 30.

Additionally, Impaq accepts that the PMO will incur additional costs for training, conference facilities, etc. Impaq believes that $200,000 in 2012 and $100,000 will be sufficient to cover this.

7.13 AMIPO and AMI ISC costs

Table 159 shows the SP AusNet cost forecast for AMIPO and AMI ISC.

Table 159 – AMIPO and ISC costs

	2012	2013	2014	2015	Total
SP AusNet Forecast	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]

Impaq believes the SP AusNet forecast of costs for its involvement in the AMIPO and the AMI ISC is reasonable.

7.14 Audit and quality assurance

Table 160 shows the SP AusNet cost forecast for Audit and Quality Assurance.

Table 160 – Audit and Quality Assurance

	2012	2013	2014	2015	Total
SP AusNet Forecast	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]

Impaq believes the SP AusNet forecast of costs for audit and quality assurance is reasonable.

7.15 AMI budget and charges applications

Table 161 shows the SP AusNet cost forecast for Budget and Charges Applications.

Table 161 – AMI budget and charges applications

	2012	2013	2014	2015	Total/Average
SP AusNet Forecast	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]

Impaq believes the SP AusNet forecast of costs for AMI budget and charges applications is reasonable.

7.16 Equity raising costs

Table 162 shows the SP AusNet cost forecast for Equity Raising Costs.

Table 162 – Equity raising costs

	2012	2013	2014	2015	Total/Average
SP AusNet Forecast	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]

It is beyond the scope of the work for which Impaq has been engaged to provide any view on equity raising costs.

7.17 Management fees or overhead

Table 163 shows the SP AusNet cost forecast for Management fees and overheads.

Table 163 – Management fees or overheads

	2012	2013	2014	2015	Total/Average
SP AusNet Forecast	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Impaq costs	**516**	**350**	**271**	**270**	**1,407**

SP AusNet has provided information on overhead resources allocated to the project as shown in Table 164. These represent an allocation of the charges from SPI Management Services, details of which are provided in SP AusNet's submission.[251]

Impaq has reviewed this table of overhead resources and believes that a number of the roles identified are:

- already accounted for in previous cost forecasts in this report; or
- related to unregulated revenue and are thus out of scope; or
- the time spent by resources over the survey period is not reflective of the time that will be spent during the period 2012 to 2015.

In relation to the latter point, high levels of involvement of SPI Management in the early stages of a large project such as AMI are prudent. However by 2012 the rollout will be in its 4th year and the rollout should be "business as usual" at that point. Hence although the allocations in this table are appropriate on a backward looking basis (looking back over 2009 and 2010) they are not appropriate on a forward looking basis for the 2012 to 2015 years.

Table 164 - SPI Management Services Overheads

Position Title		Proposal	Impaq View	Comment
	[C-I-C]	[C-I-C]	0.0%	Already allowed for
	[C-I-C]	[C-I-C]	1.5%	
	[C-I-C]	[C-I-C]	9.0%	
	[C-I-C]	[C-I-C]	7.0%	
	[C-I-C]	[C-I-C]	0.0%	Already allowed for
	[C-I-C]	[C-I-C]	0.0%	Already allowed for
	[C-I-C]	[C-I-C]	2.0%	
	[C-I-C]	[C-I-C]	5.0%	Not reflective of period
	[C-I-C]	[C-I-C]	3.7%	
	[C-I-C]	[C-I-C]	0.0%	Already allowed for
	[C-I-C]	[C-I-C]	0.0%	Not reflective of period
	[C-I-C]	[C-I-C]	0.0%	Already allowed for

[251] Ibid, pages 50 to 52.

Position Title		Proposal	Impaq View	Comment
	[C-I-C]	[C-I-C]	0.5%	
	[C-I-C]	[C-I-C]	0.0%	Unregulated - Out of Scope
	[C-I-C]	[C-I-C]	5.0%	
	[C-I-C]	[C-I-C]	2.0%	
	[C-I-C]	[C-I-C]	0.0%	Already allowed for
	[C-I-C]	[C-I-C]	3.0%	
	[C-I-C]	[C-I-C]	5.0%	
	[C-I-C]	[C-I-C]	0.0%	Already allowed for
	[C-I-C]	[C-I-C]	36.3%	
	[C-I-C]	[C-I-C]	1.0%	
	[C-I-C]	[C-I-C]	4.5%	
	[C-I-C]	[C-I-C]	0.0%	Already allowed for
	[C-I-C]	[C-I-C]	4.4%	
	[C-I-C]	[C-I-C]	8.4%	
	[C-I-C]	[C-I-C]	0.6%	
	[C-I-C]	[C-I-C]	2.0%	
	[C-I-C]	[C-I-C]	15.0%	
	[C-I-C]	[C-I-C]	25.0%	Not reflective of period
	[C-I-C]	[C-I-C]	0.0%	Already allowed for
	[C-I-C]	[C-I-C]	8.0%	
	[C-I-C]	[C-I-C]	18.8%	
	[C-I-C]	[C-I-C]	2.0%	
	[C-I-C]	[C-I-C]	1.7	

As the employment costs of each of these roles has not been provided, Impaq has pro-rated the SP AusNet forecast by the number of FTEs to determine the Impaq assessment of cost.

7.17.1 Extra Accommodation Cost

Table 165 shows the SP AusNet cost forecast for Extra Accommodation.

Table 165 – Extra accommodation cost

($,000 – real 2011)	2012	2013	2014	2015	Total/Average
SP AusNet Forecast	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]

Impaq believes that the SP AusNet forecast is reasonable for accommodating the resource requirements of the roll out.

7.18 IT Opex

The SpAusNet IT Opex component of their Budget Application is summarised in Table 166.

Table 166 – Proposed IT Opex[252]

	2012	2013	2014	2015	Total
Functional Technology Response	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
IT Infrastructure (incl middleware, B2B & B2M)	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Total IT Operating Expenditure	**14,745**	**13,035**	**13,519**	**13,552**	**54,851**

Table 167 is taken from the SpAusNet Budget Template[253]

Table 167 – Budget template IT Opex

	2012	2013	2014	2015	Total
Network Management	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Meter Data Management	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
IT Infrastructure (incl middleware, B2B and B2M)	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Total	14,745	13,035	13,519	13,552	54,851

Impaq, through the AER, asked SP AusNet to explain why the IT Opex cost is so high and to provide more detail. The response from SpAusNet[254] was:

> *"The budged (Sic) software support costs are associated with running the communications network as a whole. Accordingly a direct comparison between the AMI IT Capex – Network Management capital spend and the ongoing software support cost is misleading.*
> *We have undertaken an analysis of all Capex that the IT Opex is required to support (below) and have calculated an Opex to Capex ratio of 5.6%.*
> *Accordingly, we consider our ongoing maintenance costs to be reasonable given the scale of the project.*

[252] SpAusNet budget application table 6.2 page 69
[253] Budget template spreadsheet, tab "AMI IT O&M detail"
[254] SpAusNet response to AER questions of 11 April 2011

Table 168 - Communications infrastructure related Capex compared to Opex

Item	Total Capital spend (2009 – 2015)
1. Metering & communications equipment purchase - d) Backhaul communications	[C-I-C]
1. Metering & communications equipment purchase - e) Communication Infrastructure	[C-I-C]
2. AMI Installation Services - d) Backhaul communications	[C-I-C]
2. AMI Installation Services - e) Communication Infrastructure	[C-I-C]
IT Capital Spend	[C-I-C]
Total Capex relating to IT infrastructure	[C-I-C]
IT total Opex cost for 2015	[C-I-C]
IT Opex as a percentage of total Capex to support	[C-I-C]

There are some differences in the data provided by SpAusNet in this response to that provided in other information. The response indicates an IT Capital Spend of $171M, whereas the budget templates give a total over the 2009 to 2015 period of $96M.

Further, the table includes communications infrastructure costs but the question to SpAusNet was in relation to IT Opex costs. The Opex costs of communications infrastructure is separately covered in section 7.11.

SP AusNet's proposed IT Opex is much higher than for any of the other DNSPs. The Network Management System costs are multiples of that for other DNSPs. In the absence of detailed information from SP AusNet, Impaq is not able to evaluate the prudency of SpAusNet's IT Opex proposal. Instead Impaq considers that the nearest benchmark is that of Powercor. Powercor like SpAusNet is a distributor with a large rural area and some metro areas. Powercor is a little larger than SpAusNet in terms of customer numbers, but not so much different that economies of scale will be greatly different. Hence the cost drivers for Powercor should be similar to that for SpAusNet. Impaq's assessment is therefore derived from comparison with that of Powercor as shown in Table 169.

Table 169 – Impaq assessment of IT Opex.

	2012	2013	2014	2015	Total
SpAusNet proposal	14,745	13,035	13,519	13,552	54,851
Impaq Assessment	6,463	6,523	5,276	5,304	23,566

7.19 Operating Expenditure summary

Table 170 shows the summary of all the categories of Operational Expenditure.

Table 170 – Summary of Operational Opex – proposal and Impaq view

	2012	2013	2014	2015	Total
Meter Reading - Proposal	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Meter Reading – Impaq view	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Meter Data Management - Proposal	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Meter Data Management – Impaq view	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Meter maintenance Proposal	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Meter Maintenance – Impaq view	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Customer Service - Proposal	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Customer Service – Impaq view	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Communication infrastructure maintenance - Proposal	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Communication infrastructure maintenance – Impaq view	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Project Management – Proposal	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Project Management – Impaq view	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
AMIPO and AMI ISC costs - Proposal	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
AMIPO and AMI ISC costs Impaq view	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Audit and quality assurance - Proposal	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Audit and quality assurance – Impaq view	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
AMI budget and charges applications - Proposal	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
AMI budget and charges applications – Impaq view	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Equity raising costs - Proposal	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Equity raising costs – Impaq view	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Management fees or overhead - Proposal	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Management fees or overhead – Impaq view	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Extra Accommodation Cost - Proposal	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Extra Accommodation Cost – Impaq view	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
IT Opex - proposal	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]

	2012	2013	2014	2015	Total
IT Opex – Impaq view	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Total – Proposal	**48,550**	**40,149**	**26,441**	**24,351**	**139,491**
Total – Impaq view	**15,343**	**13,326**	**9,467**	**8,695**	**46,831**

8 United Energy

Table 171 shows a summary of the United Energy Distribution (UED) budget submission for Capital Expenditure for AMI for 2012 to 2015 which is taken from spreadsheets provided by UED to the AER. Table 172 is taken from the UED budget submission document and also shows a summary of Capex. The differences between the two tables are small and are in the areas of MRO Meter Supply and BAU Metering. Impaq has based its review on the data in the former of these tables. It is noted that all values in tables are $,000 real 2011 unless otherwise stated.

Table 171 – UED Spreadsheets - Capex Summary[255]

	2012	2013	2014	2015	Total
MRO Meter supply	57,506	5,775			63,282
MRO Installation	21,652	3,278			24,930
BAU metering	6,965	5,366	5,571	5,571	23,474
Comms	5,915	3,712	701	906	11,234
IT Capex	10,848	2,260	3,814	3,391	20,313
MRO back office	1,700	500	0	0	2,200
Total UED Capex	**104,586**	**20,891**	**10,086**	**9,868**	**145,431**

Table 172 – UED Budget Submission – Capex Summary[256]

($M real 2011)	2012	2013	2014	2015	Total
Meters (Mass Rollout)	58.2	5.9	-	-	64.1
Installation (Mass Rollout)	21.7	3.3	-	-	25.0
New Connections, Adds and Alts	7.6	5.7	5.9	5.8	25.0
AMI Technology and Communications	5.9	3.7	0.7	0.9	11.2
IT Infrastructure and Systems	10.8	2.3	3.8	3.4	20.3
Projects (AMI Phase 6)	-	-	-	-	
MRO Back Office	1.7	0.5	-	-	2.2
Total Capex	**105.9**	**21.4**	**10.4**	**10.1**	**147.8**

[255] UED Cap Recon 20 Apr Spreadsheet summary tab.

[256] UED AMI Budget and Charges Application Table 3, page 22. It is noted that the UED Opex costs were provided in $M whereas elsewhere in this report costs for categories of expenditure are in $,000.

Table 173 shows the UED operating expenditure forecast. The Budget templates categories and values do not match up with those in the UED Budget submission. Impaq has based its review on the categories and values in the Budget submission document.

Table 173 – UED Budget Submission - Operating Expenditure Summary[257]

($M real 2011)	2012	2013	2014	2015	Total
Asset Strategy and Planning	1.7	1.7	1.8	1.8	7.0
Asset Operations	1.1	1.1	1.5	1.6	5.3
Customer Contact and Back Office	3.8	2.7	2.6	2.7	11.8
AMI Network Operations	1.0	1.0	1.1	1.1	4.2
Meter Data Collection	1.1	0.2	0.0	-	1.3
AMI Transitional Business Activities	2.0	0.5	-	-	2.5
AMI Back haul Communications	0.5	0.5	0.5	0.5	2.0
Management	0.7	0.8	0.8	0.8	3.1
Finance and HR	0.7	0.6	0.6	0.6	2.5
Service Delivery and Contract Management	1.0	1.0	0.9	0.9	3.8
Stakeholder Relations	0.2	0.2	0.2	0.2	0.8
Premises	0.5	0.5	0.5	0.5	2.0
AMI IT	14.0	12.8	11.5	11.5	49.8
Total Opex	**28.3**	**23.6**	**22.0**	**22.2**	**96.1**

Each of the cost items in the above table are reviewed in order in the following sections.

8.1 Capital Expenditure Meters (Mass Rollout)

8.1.1 Meter Volumes

Table 174 shows the mass rollout meter volumes by meter type for UED. It is noted that UED expects to complete rollout by the end of 2013 and hence there are not rollout volumes for 2014 and 2015.

[257] UED AMI Budget and Charges Application Table 3, page 22

Table 174 – UED meter rollout volumes by meter type[258]

Meter Types	2012	2013
Single Phase Single element	104,038	22,128
Single phase two element (off peak)	113,218	5,959
Three phase direct connect	41,913	3,796
Three phase, two element, direct connect	12,498	658
Three phase CT connect	2,718	143
Total	**274,385**	**32,684**

8.1.2 Meter Unit Prices

Table 175 shows the unit prices for meters that are to apply from Jan 2012. It is noted that these prices include the cost of the meter and the cost of the Silver Springs Networks Network Interface Card (NIC).

Table 175 – Meter Prices[259]

Meter type	Price US$ Real 2010
Single Phase, single element	[C-I-C]
Single Phase, two elements with 31.5A load control	[C-I-C]
3 Phase with no load control	[C-I-C]
3 Phase two elements with 31.5A load control	[C-I-C]
3 Phase two elements with 31.5A and 2A load control	[C-I-C]
3 Phase CT connect	[C-I-C]
3 Phase CT & VT connect	[C-I-C]
LAN Antenna	[C-I-C]

Apart from the two element meters (single and three phase) the unit prices are quite similar to that given in the Citipower and Powercor budget submissions[260] and the meter costs used in the National Smart Metering Cost benefit analysis of 2008. It would appear that the meter purchasing has been competitively tendered with the exception of the two element meters. The PRI (Secure Meters) contract does not include two element metering. The unit price for two element meters appears high. Normally two element meters are between US$25 to US$30 more than their single

[258] Taken from UED budget and charges application, appendix A, JAM substantiation document, Table 5-2, page 52

[259] From UED Cap Recon 20 Apr spreadsheet, Tab for "Meter_Comms Unit rates AMI". Meter prices include a Silver Spring Networks NIC card.

[260] Powercor Budget and Charges application, table 15, page 49

element counterparts[261]. The incremental cost reflects the additional metering element and the inclusion of a 31.5A controlled load contactor. However in the UED pricing the difference between them is US[C-I-C] to US[C-I-C]. Since there is no evidence of a contract for 2 element metering Impaq's assessment of metering costs has included an adjustment to the price of 2 element meters.

The UED submission has assumed a US$ exchange rate of [C-I-C] throughout 2012 to 2015. Impaq considers that a more appropriate exchange rate is 1.05, refer section 3.4.1. Once the AERs determination is finalised UED would be in a position to place orders for its rollout metering requirements for 2012 & 2013 and hedge this at 1.05.

8.1.3 Adjusted meter (mass rollout) Capex cost

Impaq's view is that the cost of two element metering should be set at $30 above that of single element meters. Further the exchange rate should be set to 1.05. The Impaq assessment of meter supply costs is shown in Table 176.

Table 176 – MRO Meter Supply

	2012	2013	2014	2015	Total
UED Proposal	57,506	5,775			63,282
Impaq view	44,347	4,566			48,913

8.2 Capital Expenditure – Installation (Mass Rollout)

The unit costs for contract meter MRO installation are shown in Table 177. The prices have been validated against UED's contract with Service Stream. UED has provided evidence that this contract was competitively tendered. In the table the columns headed Jan-13 and Aug-10 shows UED's view of the forecast incidence of the installation items listed.

Table 177 – cost items for MRO installations[262]

MASS ROLLOUT	Jan-13 %	Aug-10 %	$ Aug-10
Standard Install	[C-I-C	[C-I-C	[C-I-C]
Panel Rewire	[C-I-C	[C-I-C	[C-I-C]
Panel Replacement	[C-I-C	[C-I-C	[C-I-C]
Asbestos	[C-I-C	[C-I-C	[C-I-C]
NST Appointments	[C-I-C	[C-I-C	[C-I-C]
Revisit	[C-I-C	[C-I-C	[C-I-C]
Out of Sequence Revisit	[C-I-C	[C-I-C	[C-I-C]
Antenna extension cable	[C-I-C	[C-I-C	[C-I-C]

[261] This accords with a note on the UED "Meter Comms Unit Rates – AMI" sheet of the "Cap Recon 20 Apr" workbook.
[262] From Cap Recon 20 Apr spreadsheet – MRO installation unit rates tab.

MASS ROLLOUT	Jan-13 %	Aug-10 %	$ Aug-10
DPI/DB Letter	[C-I-C	[C-I-C	[C-I-C]
DPI Letter Printing	[C-I-C	[C-I-C	[C-I-C]
Meter Exchange Card	[C-I-C	[C-I-C	[C-I-C]
DB Intro Letter - Printing	[C-I-C	[C-I-C	[C-I-C]
DB Intro Letter Envelope - Printing	[C-I-C	[C-I-C	[C-I-C]
Meter Exchange Letter Envelope - Printing	[C-I-C	[C-I-C	[C-I-C]
No Access Letter	[C-I-C	[C-I-C	[C-I-C]
Multi-Site Panel Replacement	[C-I-C	[C-I-C	[C-I-C]

Impaq makes the following comments in respect of a number of these items.:

- The instances of panel replacements at 10.10% seems much higher than other DNSPs are experiencing. In response to questions about this UED have advised that in the rollout up to 2011 sites requiring panel replacement have been skipped. Impaq considers that although this may be an easier approach for UED it nevertheless adds cost to AMI program as it results in a revisit cost and an out of sequence visit cost, effectively adding another $[C-I-C] to the cost of these sites. Sites with off peak water heating can reasonably be skipped due to the TOU moratorium and the lack of 2 element metering, however it does not seem prudent to skip panel replacement sites. Accordingly Impaq has adjusted the panel replacement rate to 5%.
- In respect of the incidence of "No Access", the AMI ISC Dashboard[263] for February 2011 shows that the cumulative proportion of no access is 4.67% and for refused access is 1.63%. The total of these is 6.3%. Hence it is considered reasonable to use 6.3% as the percentages of no access letters required.
- NST testing is not a requirement of the AMI program. There is no obligation in the Distribution Code or the Service Installation rules. Although it is advantageous to undertake such testing while on site doing a meter replacement, it is nevertheless a cost to be recovered under DUOS. Hence Impaq's assessment is that this activity is outside of scope.

In addition to the above installation items, UED has included costs for Truck support as shown in Table 178.

[263] The monthly reports to the AMI Industry Steering Committee (ISC) include a summary of the status of the AMI rollout and associated issues and metrics. This is termed a the AMI Dashboard.

Table 178 – Truck support costs[264]

Truck Support	Incidence	Unit Cost
Customer Isolation	2.10%	$[C-I-C]
Customer Defect	0.82%	$[C-I-C]
POA Defect	0.31%	$[C-I-C]
Network Asset Rectification or NST Failure	0.04%	$[C-I-C]

It is noted that these truck support costs are well above the Alternative Control Service charge of $[C-I-C] for a Truck for 30 minutes. It is Impaq's view that a 30 minute truck visit would be adequate for almost all instances of the above categories. Impaq has therefore substituted ACS truck visit costs.

8.2.1 Adjusted MRO installation Capex cost

With the adjustments detailed above the resultant cost is $19.0m as shown in Table 179.

Table 179 – MRO Installation

	2012	2013	2014	2015	Total
UED Proposal	21,652	3,278			24,930
Impaq view	16,412	2,618			19,030

8.3Capital Expenditure – New Connections (Adds & Alts)

Impaq has broken this category into two parts – the cost of the BAU meters and the installation cost of BAU meters.

8.3.1 BAU meter supply

The BAU metering quantities are given in Table 180 below.

Table 180 – UED BAU meter volumes[265]

New Connections/ Adds /Alts	2012	2013	2014	2015	Total
AMI meters (not part of mass roll-out program)					
Single Phase (1 Ph 1 element)	13,008	11,255	10,000	10,000	44,263
Single Phase off peak	-	112	200	200	512
Three Phase Direct connected (3 Ph)	3,300	3,195	3,120	3,120	12,735
Three Phase CT connected (CT)	-	119	204	204	527
Non-AMI Meters					

[264] From the UED Cap Recon workbook, "MRO Installation rates" tab

[265] Refer UED Budget application - Appendix A – JAM substantiation document, Table 5-4. The quantities here also agree with those in the UED Cap Recon Apr 20 spreadsheet UED - BAU Vols tab.

New Connections/ Adds /Alts	2012	2013	2014	2015	Total
Accumulation meters	550	230	-	-	780
Manually Read Interval Meters	300	126	-	-	426
Total	**17,158**	**15,037**	**13,524**	**13,524**	**59,243**

The volumes of meters projected are somewhat different to the growth in the forecast customer numbers for UED[266]. Historically a proportion of customers have had two meters; typically for customers that have off peak electric water heating. From data from AEMO MSATS system[267] the meter to customer ratio in UED has been about 1.21. However after the rollout of AMI the meter to customer ratio for UED will come down[268] to about 1.03 because a high proportion of those customers that previously had two meters will now only have one meter.

Table 181 gives a comparison of growth of customer numbers against the proposed BAU meter volumes.

Table 181 – Comparison of meter numbers to growth of customer numbers

	2011	2012	2013	2014	2015
UED Customer Numbers	627,203	633,295	638,757	643,600	648,220
Increase in customer numbers		6,092	5,462	4,843	4,620
BAU Meter numbers proposed		17,158	15,037	13,524	13,524
Ratio of proposed meter numbers to increase in customer numbers		282%	275%	279%	293%

The ratio of meters proposed to increase in customer numbers is of the order of 280% which is far too high for an expected meter to customer ratio of 1.03. The difference between the increase in meter numbers and the increase in customer numbers is due to abolishments and meter changes (eg: single phase to three phase). In these situations meters retrieved from abolishments can be re-used for new customer connections after the meters are re-verified. Prior to their being an AMI rollout most meters retrieved from abolishments or meter changes were not worth having recertified and then reused on another customers premise and were therefore scrapped. Hence additional new meters were purchased to meet the requirements for all new connections. However after the AMI rollout all installed meters are new meters and those removed from abolishments and meter changes are worth re-certifying and reusing.

Hence Impaq's assessment is that the number of new AMI meters that need to be procured is about 1.03 times the increase in customer numbers. The difference between that and the meter numbers forecast by UED will be meters requiring re-

[266] Victorian Final Distribution Decision 2011 to 2015, table 5, page XVIII

[267] AEMO MSATS ratio of small customer meters to NMIs for UED was 1.21 in 2008

[268] It is noted that the UED meter numbers for 2011 totals to 630,818 when the forecast customer numbers are 627,203 (which is a ratio of 1.006) – refer JAM substantiation document table 5-2, page 52

certification. The cost to recertify meters does not appear to be in the contracts that UED has with its meter vendors and hence Impaq has used a typical value of $20 per meter, which is approximately what other DNSPs are being charged.

The meter unit costs provided by UED for BAU metering is the same as for the rollout.

The UED forecast of BAU meter cost and the Impaq assessment is shown in Table 182 below. The difference is due to:

- an exchange rate of 1.05 instead of [C-I-C];
- reduction in meter numbers in line with growth in customer numbers and additional costs for re-verification of meters removed for abolishments or meter changes;
- the price difference between single element and two element metering adjusted to US$30; and
- inclusion of external antennas for 5% of meters not 100% of meters[269]

Table 182 – BAU meter supply costs

	2012	2013	2014	2015	Total
UED Proposal	3,615	2,690	2,894	2,894	12,093
Impaq view	1,199	980	1,009	975	4,163

8.3.2 Installation cost of BAU meters

Table 183 shows the UED forecast of the installation cost of BAU meters and the Impaq assessment. These costs are Alternative Control Services and hence the cost is recovered directly from the customer requiring these services. It is Impaq's view that this item is out of scope.

Table 183 – BAU meter installation costs

	2012	2013	2014	2015	Total
UED Proposal	3,350	2,676	2,677	2,677	11,380
Impaq view	0	0	0	0	0

8.4Communications Capex

The Communications Capex includes the purchase and installation costs of access points and relays, together with a provision for customer response trials costs.

Impaq has confirmed that purchase costs in US$ for Silver Spring access points and relays were the result of a competitively tendered procurement process, however

[269] Cap Recon workbook "MRO Installation Unit Rate" sheet which shows 5% of meters with external antennas. Furthermore UED has implemented a thin mesh over all their territory, but after rollout, the mesh will be quite a dense mesh hence requiring relative few meters with external antennas.

the exchange rate is assumed to be [C-I-C]. As discussed in section 3.4.1 it is Impaq's view is that an appropriate exchange rate is 1.05.

In relation to the customer response trials, these are within the CROIC scope for UED[270]. It is Impaq's view that it is encouraging to see UED being pro-active in considering ways to demonstrate the customer benefits of AMI, however Impaq considers that it would be beneficial for UED to undertake these trials with involvement from DPI. Table 184 shows the UED proposal for Comms and Trials Capex cost and the Impaq assessment of the costs for both.

Table 184 – Communications Capex

	2012	2013	2014	2015	Total
UED Comms Proposal	2,200	1,855	701	906	5,662
UED Customer trials proposal	3,715	1,858			5,573
UED proposal - Total	5,915	3,712	701	906	11,234
Impaq view	5,784	3,712	701	906	11,104

8.5IT Capex

Table 185 shows the UED proposed IT Capex. It would be expected that the IT systems build and testing for AMI would be complete since these systems are required before meter rollout can commence. Further, given that rollout is now in its third year it would be expected that IT systems would be bedded down and almost all bugs gone. It would however be expected that there would be new releases or major upgrades for some systems.

Table 185 – UED IT Capex[271]

	2012	2013	2014	2015	Total
Hardware - Life cycle replacement	61	618	3,270	2,846	6,795
Major Release	0	365	0	0	365
Legacy Archive & Decommission	0	174	0	0	174
Business Intelligence - Major upgrade	0	289	0	0	289
Integration (Webmethods) major upgrade	0	269	0	0	269
System improvement and defect release	545	545	545	545	2,179
Two element metering cost	1,852				1,852
Second meter provider	8,390				8,390
Total	**10,848**	**2,260**	**3,815**	**3,391**	**20,313**

[270] CROIC clauses S2.1 (b) (2) (iv) and (vi)
[271] From UED Cap Recon (Apr 20) spreadsheet, IT Capex tab

8.5.1 Hardware - Life cycle replacement

Impaq accepts that all these activities need to occur. However it noted that a large number of servers are scheduled to be replaced in the second half of 2015. Given the dual redundant systems architecture and the extensive use of blade servers it would appear that the replacement time for servers could be extended into 2016. Hence Impaq's assessment shifts the replacement of servers from 2015 to a later time. Impaq has priced the servers listed in the spreadsheet provided by UED[272] and considers that by deferring their replacement the reduction in cost is about $1.3M.

8.5.2 Two element metering

The UED proposal to implement 2 element metering at $1.85M is considered excessive. Two element metering with a controlled load contactor is no different in terms of settings, status and event information than a single element meter with a controlled load contactor. The operation of the contactor is exactly the same – the same time switch mode settings would apply and the same override settings would apply. The second element will generate two additional channels of active energy interval data – one for export and one for import. The Victorian functionality specification does not require total (element 1 + element 2) interval energy data streams, although this would be required if the national specification were followed. There is no requirement for reactive energy data channels either (in the Victorian Functionality specification). Furthermore there is no change required in the NIC card in the meter.

The Itron IEE MDMS can adequately handle the extra data streams. There will be additional data storage requirements for the interval data – about 20% increase, however in relation to the total AMI systems storage requirements this is quite small. Other systems such as connection point management may need an additional field or two to indicate the presence or otherwise of a two element meter at the customer premise. The Gateway systems are already capable of handling the additional data stream because it is already part of the MSATS meter data file format. Hence to do the system changes is in Impaq view quite minor - perhaps one FTE for a month or two. It is accepted that regression testing will be much more involved. However this change could be tested with other changes, such as software updates to the NMS or MDMS. The incremental component of testing required for adding a second element should be less than 3 months of an FTE. Allowing for contingencies Impaq has assessed the effort required as 1 FTE for 12 months, which at an IT contractor rate of $1000 per day plus $50,000 of support cost is $250,000.

8.5.3 A second meter supplier

The cost UED has proposed to implement a 2nd meter provider is excessive. The changes to implement a second meter supplier should not be major. The SSN NIC card will be the same. There will be changes required to support a different set of

[272] AMI IT Infrastructure roadmap 2012-2015_UED

meter configuration management settings, but these will not affect all systems. The interval energy data streams will be the same, the events recorded will be the same – indeed most things will be the same because all meters from whatever vendor need to comply with the VIC Functionality specification. There should be no change to the MDMS because the interval energy data is the same and the events are the same. There will be small changes to the NMS, however most likely these will already be done by SSN as part of supporting another meter vendor.

The proposed cost of $8.4M translates to about 34 FTEs for a year[273]. Impaq is of the view that 1 FTE for a year would be sufficient for the task of doing the changes. In relation testing this change could also be aggregated with other system changes for regression testing to optimise the cost. To allow for contingencies the Impaq assessment is 5 FTEs for a year.

8.5.4 Impaq Assessment

Table 186 shows the Impaq assessment of IT Capex.

Table 186 – IT Capex

	2012	2013	2014	2015	Total
Hardware - Life cycle replacement	61	618	3,270	1,546	5,495
Major Release	0	365	0	0	365
Legacy Archive & Decommission	0	174	0	0	174
Business Intelligence - Major upgrade	0	289	0	0	289
Integration (Webmethods) major upgrade	0	269	0	0	269
System improvement and defect release	545	545	545	545	2,179
Two element metering cost	250				250
Second meter provider	1,250				1,250
Total Impaq View	**2,106**	**2,260**	**3,815**	**2,091**	**10,272**

8.6MRO Back Office Capex

There is no discussion of this item in the UED submission or the JAM substantiation document. It would appear that the MRO back office Capex costs are to provide back office support for the meter change out process – changes to standing data in MSATS and the provision of final reads etc, Hence the Impaq's view is that this function is required. Impaq accepts UED's proposed cost given in Table 187.

[273] Assuming 200 working days, contractor rate of $1000/day and $50,000 additional costs (accommodation, computer, IT support etc)

Table 187 – MRO Back Office

	2012	2013	2014	2015	Total
UED Proposal	1,700	500	-	-	2,200

8.7 Summary of Capex adjustments

Table 188 shows the summary of the UED submission together with the Impaq assessment of costs.

Table 188 – Summary of UED proposal and Impaq view

	2012	2013	2014	2015	Total
MRO Meter supply Proposal	57,506	5,775			63,282
MRO Meter supply - view	44,347	4,566			48,913
MRO Installation - Proposal	21,652	3,278			24,930
MRO Installation Impaq view	16,412	2,618			19,030
BAU metering Proposal	6,965	5,366	5,571	5,571	23,474
BAU metering Impaq view	1,199	980	1,009	975	4,163
Comms- Proposal	5,915	3,712	701	906	11,234
Comms - Impaq view	5,784	3,712	701	906	11,104
IT Capex - Proposal	10,848	2,260	3,814	3,391	20,313
IT Capex - Impaq view	2,106	2,260	3,815	2,091	10,271
MRO back office - Proposal	1,700	500	0	0	2,200
MRO Back office - Impaq view	1,700	500	0	0	2,200
Total UED Proposal	**104,586**	**20,891**	**10,086**	**9,868**	**145,431**
Total Impaq view	**71,548**	**14,636**	**5,525**	**3,972**	**95,681**

8.8 Operational Opex

Table 189 shows a summary of the UED operating expenditure proposal by category.

Table 189 – Summary of UED Opex proposal[274]

($M real 2011)	2012	2013	2014	2015	Total
Asset Strategy and Planning	1.7	1.7	1.8	1.8	7.0
Asset Operations	1.1	1.1	1.5	1.6	5.3

[274] UED have provided Opex costs in their budget and charges submission in $M and hence Impaq's analysis of UED is recorded in $M. The UED Budget templates spreadsheet for Ops Opex had categories of costs which did not map against the cost categories in the budget and charges application. Further the total costs were different. Hence Impaq has used the UED Budget and Charges application as the reference document for Opex costs.

($M real 2011)	2012	2013	2014	2015	Total
Customer Contact and Back Office	3.8	2.7	2.6	2.7	11.8
AMI Network Operations	1.0	1.0	1.1	1.1	4.2
Meter Data Collection	1.1	0.2	0.0	-	1.3
AMI Transitional Business Activities	2.0	0.5	-	-	2.5
AMI Back haul Communications	0.5	0.5	0.5	0.5	2.0
Management	0.7	0.8	0.8	0.8	3.1
Finance and HR	0.7	0.6	0.6	0.6	2.5
Service Delivery and Contract Management	1.0	1.0	0.9	0.9	3.8
Stakeholder Relations	0.2	0.2	0.2	0.2	0.8
Premises	0.5	0.5	0.5	0.5	2.0
AMI IT	14.0	12.8	11.5	11.5	49.8
Total Opex	**28.3**	**23.6**	**22.0**	**22.2**	**96.1**

Almost all of the costs of the Opex items is driven by human resource costs. Where Impaq has made its own assessment of human resource costs it has used the assumptions given in section 3.4.2 These rates have been escalated from 2010 to the relevant year by using the 'Outsourced Labour Escalation Rates' and CPI provided by UED[275]. A [C-I-C] has then been applied.

8.9 Asset Strategy and Planning

Table 190 details UED's cost forecast[276] and Impaq's assessment.

Table 190- Asset Strategy and Planning costs

($m, real 2011)	2012	2013	2014	2015	Total/Average
UED forecast	1.7	1.7	1.8	1.8	7.0
Equivalent FTE	11.74	11.51	11.86	11.66	11.69
IMPAQ FTE	1.0	1.0	1.0	1.0	1.0
IMPAQ cost	**0.22**	**0.22**	**0.23**	**0.23**	**0.90**

The cost of this activity would be substantially labour, and the level of expenditure forecast represents approximately 11 tertiary qualified FTEs, likely to be telecommunications engineers.

UED has described the activities in this cost category in the following way.[277]

> *AMI technology remains a relatively new technology, but is rapidly maturing as AMI experience grows both locally and internationally. This activity helps ensure that experience drives the strategy for managing AMI*

[275] Reconciliation received by AER from UED 21 April 2011
[276] UED Budget Application – Table 3
[277] UED Budget Application – Appendix A page 103

> *communications and metering assets. In this way, the activity reduces the risks of technology obsolescence, and ensures that, as technology evolves, a roadmap from the existing to the future remains available.*

and[278]

> *Asset Strategy and planning – dynamic asset base that will require careful planning and strategy, in particular to deliver benefits and respond to the changing nature this exciting investment brings. Customers will demand more technology and the system needs constant planning to operate, deliver and improve.*

JAM provides the bulk, if not all, of these services to UED. Given that JAM provides AMI services to multiple clients, utilising common meter and communications vendors and technologies, many of these activities will be common and the costs will be shared.

This activity is fundamentally developing, maintaining and updating the expertise within the business on the latest advances and technology, as well as updating the roadmap and AMI strategy accordingly. While Impaq accepts the need to ensure that UED is abreast of the current developments and initiatives in respect of AMI, the technology that has been deployed in the form of meters, communications and IT systems is leading edge. Consequently, it is unlikely that there will be a need over the period for significant reviews of the current technology roadmaps or strategies.

It is Impaq's view that the provision of this service for UED will involve equivalent to 1.5 telecommunications engineers.

8.10 Asset Operations

Table 191 details UED's cost forecast and Impaq's assessment.

Table 191 – Asset Operations costs

($m, real 2011)	2012	2013	2014	2015	Total/Average
UED Forecast	1.1	1.1	1.5	1.6	5.3
Impaq Cost	**0.316**	**0.316**	**0.362**	**0.362**	**1.355**

UED's description of this activity is given below.[279]

> *While the AMI roll-out continues, UED ... (has) obligations to continue regular testing of the meters installed in the field, in accordance with AEMO approved asset management plans. This includes both AMI and non-AMI metering. From 2012, AMI meters will be included in the testing sample programs. The expenditure in this category is for the management and planning to support the field activity. This is performed by in-house JAM staff.*

[278] Letter from United Energy Distribution to AER 20 April 2011, "Questions relating to the costs given in the budget template sheets"

[279] UED Budget Application – Appendix A page 104

This is little detail to support the proposed expenditure. Because of this Impaq has built up costs for the meter maintenance activities that it considers a DNSP would need to undertake and for which the costs are not recovered from other sources. Metering activities in relation to new connections and changes of metering are recovered as Alternative Control Services. Metering Provision for customers consuming >160MWh pa is a contestable activity and the costs are recovered from the responsible person that nominates a Metering Provider.

Based on the requirements of the NER chapter 7 and the Metrology Procedure, there are four main activities required in relation to AMI metering and other metering for customers with consumption <160MWh pa:

- Testing of meters in service;[280]
- 100% testing of CT connected meters every 5 years (and the CTs);[281]
- Audits of unmetered supplies; and[282]
- Meter data validation.[283]

Testing of meters in service

The NER[284] requires that meters be accuracy tested in accordance with the requirements of AS1284.13. In AS1284.13:2002 it requires that all new meter types installed be tested within 3 years for in service accuracy. It further requires[285] that meter families are grouped according to:

a) Manufacturer; and

b) Design or pattern or type.

The population of each meter family is grouped into five year blocks based on the age of the meters. This means that, according to this classification of meter families, all of the AMI meters of the same type and vendor would constitute one family and thus only require one sample for testing. Notwithstanding, Impaq believes that, given the very large number of new meters that have been installed in a very short period of time, it would be prudent to have more metering families.

Impaq's assessment of the required meter testing program is summarised in Table 192 The meter numbers are the total meter numbers to be rolled out. The meter types are those nominated by UED.

The number of meter families has been assumed based on the need to have at least two families, considering that UED are planning on having a second meter vendor

[280] Metrology procedure schedule 2, section 5.2. NER S7.3.1(c)
[281] Metrology procedure schedule 2, section 5.15 and NER S7.3.2
[282] Metrology procedure section 10
[283] Metrology procedure section 3.9
[284] National Electricity Rules, Chapter 7
[285] AS1284.13 Clause 8.2

and also to keep the number of meters in each family less than 35,000 to limit the number that would need to be replaced if there was a failure of a family of meters.

Table 192 – Meter testing numbers and costs

	Meter numbers [286]	No of families	Meter per family	Sample Size	Meters to be tested	Testing cost ($)	Annual test Cost($)
Single Phase single element	424,146	14	30,296	315	4410	[C-I-C]	[C-I-C
Single Phase two element with contactor	119,177	6	19,863	315	1890	[C-I-C]	[C-I-C
3 Phase Direct Connect	71,478	4	17,870	315	1260	[C-I-C]	[C-I-C
3 Phase direct connect with contactor	13,156	2	6,578	200	400	[C-I-C]	[C-I-C
3 Phase CT connect	2,861	2	1,431	125	250	[C-I-C]	[C-I-C
Total	**630,818**	**28**	**22,529**		**8210**		**118,714**

The sample sizes[287] are taken from AS1284.13:2002. Based on this the number of meters to be tested is determined. AS1284.13 requires new meter types to be tested within 3 years of being placed into service[288]. It would appear that such testing can then be spread uniformly throughout the 2012 to 2015 period. The UED alternative control service price for testing meter accuracy is $[C-I-C] for single phase and $[C-I-C] for three phase[289]. This then determines the total cost of in situ testing of meters for each year of the 4 year period.

NER compliance current transformer meter accuracy testing

Chapter 7 of the NER requires 100% of CT connected meters to be accuracy tested at least every five years. It would therefore be expected that such testing for AMI rollout meters would commence in 2014. It assumed there would be an annual test program of 1/5 of the entire CT meter population to smooth workload against available test technicians.

Based on the number of CT AMI meters given in Table 192, this is 572 meters tested each year. The rate UED advised for each three phase meter test is $[C-I-C] (as detailed above). Hence this results in a cost of $46,000 for each of 2014 and 2015.

[286] JAM substantiation document table 5-2 page 52.

[287] Sample sizes are in AS1284.13:2002 table 1 – sampling by attributes

[288] AS1284.13, clause 6.2.2

[289] UED Alternative Control Services price list for 2011

Unmetered supply audits

The AEMO metrology procedure requires unmetered supplies to be regularly audited. Based on other DNSPs charges a unit cost of $150 per audit is assumed and quantities of 315 per annum is assumed based on the metrology procedure[290].

Validation of metering installations

The NEM metrology procedure also requires that the metering data base (in the DNSPs systems) must be validated against the metering data in type 5 and type 6 meters[291]. Sample testing is required every 12 months. The sampling for this is the same as that for accuracy testing. Hence the meters which are sampled for accuracy testing (as detailed above) can also be used for validation of the metering database. The interval data collected from these meters can be validated against what is stored in the MDMS. It is expected that this would be largely an automated process resulting in very few exceptions as AMI meters are remotely read over secure communications channels. The cost of this is included in the next category.

Other metering resources

Allowance is made for a range of other activities including metering strategy, review of metering technologies and products from metering vendors, meter data validation management and meter accuracy testing management. This task is estimated to require 1 FTE, assumed to be that of an engineer.

Summary of meter maintenance costs

Table 193 gives a summary of costs outlined above.

Table 193 – Summary of meter maintenance costs

	2012	2013	2014	2015	Total
Meter testing	119	119	119	119	475
CT meter testing			46	46	91
Unmetered supply audits	47	47	47	47	189
Metering Engineer	150	150	150	150	600
Total	**316**	**316**	**362**	**362**	**1,355**

8.11 Customer Contact & Back Office

Table 194 below summarises the UED cost forecast and the Impaq assessment.

[290] Metrology procedure table 14.1
[291] Metrology procedure part A, section 3.9 page 43

Table 194 – Customer Contact and Back Office

($m, real 2011)		2012	2013	2014	2015	Total/Average
UED Forecast		3.8	2.7	2.6	2.7	11.8
Equiv FTEs - Proposal	Office Manager	1	1	1	1	1
	Staff	39.2	26.9	25.2	25.8	29.27
FTE – Impaq view	Office Manager	1	1	1	1	1
	Staff	3	3	1.5	1.5	2.0
Costs - Impaq		**0.40**	**0.41**	**0.28**	**0.28**	**1.37**

The forecast provided by UED equates to an office manager and 39 staff in 2012, reducing to an office manager and 25 staff in 2015.
This category includes the following activities[292]:

- *managing service orders - servicing requests from retailers to perform work on AMI and non-AMI meters. It involves back office processing related to metering additions, alteration, supply abolishment, and meter reconfigurations;*
- *managing service desk - servicing customer and retailer enquiries related to work performed in the field, or to the provision of meter data;*
- *Managing faults and emergencies - dealing with faults and emergencies that directly relate to the Regulated Services; and*
- *Network metering connections - dealing with new connections, faults and emergencies that directly relate to the Regulated Services.*

Little information has been provided on the forecast quantities of these activities or the expected time taken to carry out these activities.

The management of B2B service orders is out of scope and, in most cases, costs are recovered through Alternative Control Services. The management of network revenue is also out of scope. The costs incurred in respect of new connections are recovered through Alternative Control Services.

Manage Meter Data

The performance level for remote reading of metering data in the Functionality specification[293] is for 99% in 4 hours after midnight and 99.9% in 24 hours. It is our understanding that UED is achieving this level of performance from its AMI system. Hence Impaq expects that in excess of 99.9% of data will be delivered complete to

[292] UED Budget Application – Appendix A page 102
[293] Minimum AMI functionality specification section 4.1

the NMS from meters. Based on UED having 675,000 meters, this equates to an error rate of 32,400 data points per day. The vast majority of these errors will be addressed using standard and automated algorithms that are detailed in the NEM procedures for validation and substitution. Impaq assumes that at least 99% of the data points will be corrected automatically by the MDMS, leaving 324 data points, or 6.75 meters, that may involve manual intervention per day.

Impaq accepts that prior to the completion of the AMI rollout, additional data management issues will arise due to the remaining non-AMI meters still in operation. Impaq is of the view that a staff of 2.0 FTEs in 2012 reducing to 1 FTE in 2015 would be sufficient to meet these requirements.

Service Desk

Impaq accepts that UED is required to provide data to retailers when appropriate and valid requests are made. All of the relevant metering data and metering installation data will be available to Retailers from MSATS. Other data that may be required through B2B service orders is covered by Alternative Control Services and is out of scope for AMI cost recovery. This leaves little else to be covered in this category. Impaq is of the view that a staff of 1 FTE in 2012 reducing to 0.5 FTE in 2015 will be sufficient for this activity.

Faults and Emergencies

The cost for managing faults and emergencies is addressed in Section 8.12 of this report.

8.12 AMI Network Operations

Table 195 shows UED's cost forecast for AMI Network Operations.

Table 195 – AMI Network Operations

($m, real 2011)	2012	2013	2014	2015	Total
UED Forecast	1.0	1.0	1.1	1.1	4.2

This activity involves operating the 24/7 AMI communications network, including monitoring, identifying, correcting and reporting on AMI network operational and performance issues. Also, this service provides AMI network status and compliance reporting.[294]

Impaq accepts UED's cost forecast as reasonable.

8.13 Meter Data Collection

Table 196 shows the UED cost forecast for Meter Data Collection. It is noted that this applies to the manual reading of legacy electricity meters until such time as AMI meters are rolled out to all customers.

[294] UED Budget Application – Appendix A page 104

Table 196 – Meter Data Collection Costs

($m, real 2011)	2012	2013	2014	2015	Total
UED Forecast	1.1	0.2	0	0	1.3
FTE's approx	10.5	1.9			

Impaq accepts UED's cost forecast as reasonable.

8.14 AMI Transitional Business Activities

Table 197 shows the UED cost forecast for AMI transitional business activities.

Table 197 – AMI transitional business activities

($m, real 2011)	2012	2013	2014	2015	Total
UED Forecast	2.0	0.5	0	0	2.5

UED's description of this activity is given below[295].

> *This activity receives and responds to customer claims and complaints regarding the AMI mass roll-out. It includes responding to roll-out-related complaints that have been escalated to EWOV.*
> *Experience to date has shown a complaint or claim lodged for almost 1% of sites that have received an AMI meter. These rates are forecast to rise in line with the progress of the mass roll-out throughout 2011 and 2012 as more complex sites receive AMI meters, and customers focus on tariff implications.*

Impaq accepts UED's cost forecast as prudent.

8.15 AMI Backhaul Communications

Table 198 shows the UED cost forecast for AMI Backhaul communications together with the Impaq assessment of those costs.

Table 198 – AMI backhaul communications costs

	2012	2013	2014	2015	Total
UED Forecast	502	515	521	526	2,064
Impaq cost	49	49	49	49	195

It is understood there is a total of 203 access points[296] in the UED area. There are about 650,000 meters by end of 2015. This gives about 3200 meters per access point on average. The amount of data per day per meter[297] is 1272 bytes of payload. Assume 18kB per meter to take into account communications overheads.

[295] UED Budget Application – Appendix A page 104
[296] in the UED-MRO Vols tab of the Recon Spreadsheet there are a total of about 203 access points
[297] Refer Industry Transaction Volume Analysis report present to ISC May 2008 – 1.3TB per annum. Assuming 2,800,000 meters this is 1,272 bytes per meter per day

For an access point this is 55Mb per day or 20GB pa. At a retail level Telstra charge $60/month for this amount of data and it is known that other DNSPs pay about $20/month. Assuming $20/month per access point Impaq considers that the prudent cost is $48,720 per annum.

8.16 Management

Table 199 shows the UED cost forecast for AMI Management.

Table 199 - Management

($m, real 2011)	2012	2013	2014	2015	Total
UED Forecast	0.7	0.8	0.8	0.8	3.1
Equiv. FTE's	3.8	4.2	4.1	4.0	3.8
FTE Impaq	1.0	1.0	1.0	1.0	1.0
Impaq Cost	**0.3**	**0.3**	**0.3**	**0.3**	**1.2**

UED has forecast costs that approximately equate to 4 FTEs to carry out management activities, including:

- *assisting in developing regulatory submissions;*
- *participating in industry working groups and forums;*
- *engaging with Government stakeholders; and*
- *supporting other regulatory and compliance activities.*

The volume of work in these activities is not influenced by the number of AMI meters in the field. Rather, these are activities that are a function of a distribution business. Additionally, these activities are already carried out for the other parts of the distribution business. These activities in respect of AMI will be incorporated into existing business processes. Impaq is of the view that one additional FTE would be sufficient to carry out these activities.

Additionally, under the CROIC, UED is required to have its AMI expenditure audited annually. Impaq estimates the cost of this audit to be $100,000 pa.

8.17 Finance & HR

Table 200 shows the UED cost forecast for Finance and HR related to AMI together with the Impaq assessment.

Table 200 – Finance and HR costs

($m, real 2011)	2012	2013	2014	2015	Total
UED Forecast	0.7	0.6	0.6	0.6	2.5
Equiv. FTE's	6.4	5.4	5.2	5.1	5.5
FTE Impaq	1.0	1.0	1.0	1.0	1.0
Impaq Cost	**0.1**	**0.1**	**0.1**	**0.1**	**0.5**

UED has forecast costs for Finance and HR which represent approximately 6 FTE in 2012 reducing to approximately 5 FTE's in 2015. UED states that this is for:[298]

- *ensuring consistency and maintenance of financial reference data and asset management data;*
- *managing and paying installation service and meter providers for both the AMI roll-out and as a result of retailer requests;*
- *preparing financial reporting for accounts payable and reconciling acceptance certificates in preparation of payment to installation service vendors;*
- *managing remittances and payments for the mass roll-out program and other vendor contracts; and*
- *providing monthly reporting on expenditure to UED including actual and forecasts for upcoming periods.*

Thus, this cost category consists of:

- management of the financial asset register;
- the payment of contractors; and
- monthly reporting.

The financial asset register is automatically updated as work is completed and charged for. Human intervention is only necessary to provide reporting and to investigate anomalies. The new automated systems and the UED financial systems should be sufficiently accurate that 1 FTE for 3 days per month, or 0.18 FTEs should be all that is necessary to meet this task

There are only a small number of contractors involved in the AMI program that would provide monthly invoices. Systems are in place to provide supporting information, such as meters delivered, installations completed to requirements, etc. This activity should be sufficiently met by 1 FTE for 10 days per month, or 0.6 FTEs for the year.

The preparation of monthly reports, given the new automated systems that have been installed, should be sufficiently met with 1 FTE for 3 days per month, or 0.18 FTEs for the year.

In total, Impaq believes that 1 FTE would be sufficient for this cost category.

8.18 Service Delivery & Contract Management

Table 201 shows the UED cost forecast for service delivery and contract management and the Impaq assessment of these costs.

Table 201 – Service Delivery and Contract Management Costs

($m, real 2011)	2012	2013	2014	2015	Total

[298] UED Budget Application – Appendix A page 105

UED Forecast	1.0	1.0	0.9	0.9	3.8
Impaq FTEs	2.5	2.5	2.5	2.5	2.5
Impaq other costs	0.05	0.05	0.05	0.05	0.20
Impaq total cost	**0.5**	**0.5**	**0.5**	**0.6**	**2.1**

UED has stated that this category includes the activities of[299]:

- *ensure compliance;*
- *contract management and procurement; and*
- *performance and reporting*

Ensure Compliance

Impaq believes that compliance would be a function that would be incorporated into the businesses' existing compliance and regulatory processes. A large part of this activity would be accessing, receiving and reviewing monthly reports on the performance of the AMI system, which would be automatically generated. Enquiries would be initiated if any unacceptable result is identified. This should take no more than 1 FTE for 2 days per month.

Further, on an annual basis, a more detailed analysis of systems, process and performance would be conducted to ensure regulatory and market compliance. This should require no more than 1 FTE for 20 days.

Overall, Impaq believes that this activity should be sufficiently met with 1 FTE for about 44 days, or 0.25 FTEs over the year.

Contract Management and Procurement

Given the extent to which the AMI program is being delivered by external providers, Impaq accepts that contract and procurement management is a necessary cost. Given the amount of work that is being carried out by contractors and the amount of materials being provided, this activity would require 2 FTE contract managers.

Contract management will also involve some legal support, however it would be incorporated into the businesses existing legal process. Also, this activity will involve the management of existing contracts and the development of new or extended contracts. Impaq believes that contract management would incrementally require no more than $50,000 per year of external legal support, 0.25 internal legal FTE's and 1 contract manager FTE.

Performance and Reporting

UED has stated that this activity '*involves a business intelligence dashboard that proactively manages key performance indicators (KPIs) to ensure compliance with CROIC Regulated Service obligations.*' The development of this 'intelligence dashboard' is an IT capital expense. Analysing the information provided by this

[299] UED Budget Application – Appendix A page 106

dashboard in respect of compliance or non-compliance has been addressed under 'Ensure Compliance' above.

8.19 Stakeholder Relations

Table 202 shows the UED cost forecast for Stakeholder Relations and the Impaq assessment of these costs.

Table 202 – Stakeholder relations

($m, real 2011)	2012	2013	2014	2015	Total
UED Forecast	0.2	0.2	0.2	0.2	0.8
Impaq costs	**0**	**0**	**0**	**0**	**0**

UED has provided forecast costs for Stakeholder management. Impaq notes that the stakeholder management activities of:

- *participating in industry working groups and forums; and*
- *engaging with Government stakeholders,*

is included in the cost forecast for management, which Impaq has accepted (see section 8.16 of this report). Impaq is of the view that the activities of stakeholder management are already included in the management category and that there should be no additional costs allowed.

8.20 Premises

Table 203 shows the UED cost forecast for Premises related to AMI.

Table 203 – Premises costs

($m, Real 2011)	2012	2013	2014	2015	Total
UED Forecast	0.5	0.5	0.5	0.5	2.0

Impaq accepts the UED forecast for premises.

8.21 IT Opex

There are two different breakups of the UED IT Opex cost provided by UED:

- The AMI Budget Template which has sub categories of:
  - Licence Maintenance;
  - Tier 2/3 Support; and
  - IT Infrastructure, Hardware and Platform support.
- The Cap Recon spreadsheet which has sub categories of:
  - Software Licence Maintenance;
  - Hardware Maintenance;
  - Operating Software Maintenance;

- Infrastructure support;
- Base IT allocation; and
- Metering IT Opex

The Cap Recon spreadsheet provides more detail and hence this review is based around the sub categories given in that spreadsheet. Table 204 gives a summary of the IT Opex categories.

Table 204 – Summary of categories of IT Opex[300]

	2012	2013	2014	2015	Total
Base IT allocation	2,442	1,221			3,663
Software licence maintenance	1,722	1,810	1,714	1,715	6,960
Hardware maintenance	850	850	850	850	3,400
Operating Software maintenance	736	736	736	736	2,942
Infrastructure support	4,092	4,092	4,092	4,092	16,367
Metering IT Opex	2,985	3,053	3,152	3,219	12,409
Subtotal Total	12,826	11,761	10,543	10,611	45,741
[C-I-C]	13,595	12,467	11,176	11,248	48,486
Real 2011$	13,975	12,815	11,487	11,562	49,839

8.21.1 Infrastructure support

One of the larger costs ($16.4m over the period) is for Data Centre services which is contracted with Logica. In the Logica contract[301] there is the detailed breakdown of the costs. There is also details of the applications and the operating system images to be run as a managed service[302].

For UED there are 11 racks for the production site and 12 racks for the Disaster Recovery (DR) (& development site). This is a very large amount of rack space. There are 42 rack units (RUs) per rack, hence this translates to 966 rack units. Considering that:

- servers can be as small as 1RU;
- with blade servers there can be even more than one server per RU; and

[300] from UED Cap Recon Apr 20 spreadsheet – IT Opex tab
[301] schedule 7.1
[302] schedule 2.1 “Facilities proposal framework”

- many applications now run on virtual servers

this is a lot of rack units. Impaq has met with UED to discuss this and other matters. UED have provided data centre layouts of racking for both the production site and the DR site. The layouts show that there is about 30% to 50% free space. It is understood that the other JEN and UED systems are not hosted in this data centre and are hosted in data centres that will be closing in the near future. Hence it may be prudent, from a whole of business perspective, for both JEN and UED to move their other systems to run from the data centres used for AMI. There is perhaps a case for having the additional rack space now so that when other systems are shifted in they are in contiguous racks rather than in other areas of the data centre. However it is noted that the AMI project is paying a premium, while the benefit is business wide. Hence it is Impaq's view that the data centre managed services and facilities fees should be reduced by 30% due to unused space in racks.

8.21.2 Metering IT Opex

The Metering IT Opex cost, as given in the Cap Recon spreadsheet, is $12,408,988 over the 2012 to 2015 period. The UED explanatory document with the Cap Recon details a total of 27 IT resources supporting AMI as per Table 205.

Table 205 – Metering IT Opex Resources

Function	Role
IT Governance	IT Service Delivery Manager
	IT Service Delivery Coordinator
IT Service Provider Management - AMI	Infrastructure Service Provider Manager
IT Application Support - AMI	Itron Team Leader
	Snr Itron Technical / Functional Analyst
	Technical / Functional Analyst
	Itron Technical Analyst
	SAP Team Leader
	SAP CPM Senior Functional Analyst
	SAP NRM Senior Functional Analysts
	SAP MAM Functional Analyst
	BASIS/Security Technical Analyst
	CPM Functional Analyst
	Senior ABAP Developer
	Senior Workflow Developer
	Workflow Admin
	ABAP Developer
	Senior Technical Analysts

Function	Role
	Webmethods Team Leader
	Webmethods Senior Technical Analysts
	Webmethods Technical Analysts
	AMI Reporting Team Lead
	AMI Reporting Senior Technical Analyst
	AMI Reporting Business Analyst
	AMI Reporting Technical Analyst
	Test Analysts
	Test Manager

In reviewing this list it is Impaq's view that this number of resources is excessive and can be reduced to 14 based on:

- The IT systems for AMI have now been operating on a BAU basis since mid-2010. The requirements for AMI have not changed and hence the systems should be reasonably stable by now.
- The application support can be shared with JEN as they are using the same applications.

The following are Impaq's comments in relation to each of the resource categories.

- Two resources in IT Governance appears excessive. To have an IT delivery manager and an IT delivery co-ordinator seems more than required.
- Two resources for workflow seems excessive. Workflow should be well bedded down by now. One full time resource is more than adequate.
- It is understood that the Itron Enterprise Edition MDMS may require some attention for some time. It would appear that Utilities in other countries are also experiencing this. However 4 full time resources for just UED, seems excessive. Impaq's view is that 2 resources are adequate.
- The number of resources for the SAP applications appears very high. There is a total of eight:
    - SAP Team leader
    - SAP CPM Senior Functional Analyst
    - SAP NRM Senior Functional Analyst
    - SAP MAM Functional Analyst
    - BASIS (SAP)/Security Technical Analyst
    - CPM Functional Analyst
    - Senior ABAP Developer
    - ABAP Developer

  This appears high for non-challenging applications, such as the connection point management system, that should be well bedded down. For example, there does not appear to be the need for two ABAP developers writing code in ABAP language for SAP applications. It is Impaq's view that this group of 8 should be reduced to 4.

- It is assumed that Webmethods is used for the integration layer (utility bus) and hence the three Webmethods resources are to support this . The middleware or integration layer must be all done for the AMI systems to have been handed over from the project team to the business for BAU operation. Hence 3 resources is excessive. Changes to BAU operations and business processes, together with new software releases should be able to be managed by 1 resource.

8.21.3 Base IT allocation

In the reconciliation spreadsheet the "Base IT allocation" is a constant per month cost of $157,594 until June 2013. After this it ceases. Hence this would appear to be the IT Opex cost for the legacy metering systems and CIS system required for manually read meters. Impaq considers this to be reasonable.

8.21.4 Impaq assessment of IT Opex

Table 206 shows the Impaq assessment of IT Opex.

Table 206 – Impaq Assessment of IT Opex

	2012	2013	2014	2015	Total
Base IT allocation	2,442	1,221			3,663
Software licence maintenance	1,722	1,810	1,714	1,715	6,960
Hardware maintenance	850	850	850	850	3,400
Operating Software maintenance	736	736	736	736	2,942
Infrastructure support	3,787	3,787	3,787	3,787	15,148
Metering IT Opex	1,548	1,583	1,634	1,669	6,434
Total	11,084	9,986	8,721	8,756	38,547
[C-I-C]	11,749	10,586	9,244	9,282	40,860
Real 2011$	12,077	10,881	9,502	9,541	42,000

8.22 Operating Expenditure Summary

Table 207 – Summary of Operational Opex – UED application and Impaq Assessment

($m, Real 2011)	2012	2013	2014	2015	Total
Asset Strategy and Planning - Proposal	1.7	1.7	1.7	1.8	7.0
Asset Strategy and Planning – Impaq view	0.22	0.22	0.23	0.23	0.90
Asset Operations – Proposal	1.1	1.1	1.5	1.6	5.3
Asset Operation – Impaq view	0.32	0.32	0.36	0.36	1.35
Customer Contact & Back Office - Proposal	3.8	2.7	2.6	2.7	11.8
Customer Contact & Back Office – Impaq view	0.40	0.41	0.28	0.28	1.37
AMI Network Operations - Proposal	1.0	1.0	1.1	1.1	4.2
AMI Network Operations – Impaq view	1.0	1.0	1.1	1.1	4.2

($m, Real 2011)	2012	2013	2014	2015	Total
Meter Data Collection - Proposal	1.1	0.2	0	0	1.3
Meter Data Collection – Impaq view	1.1	0.2	0	0	1.3
AMI Transitional Business Activities - Proposal	2.0	0.5	0	0	2.5
AMI Transitional Business Activities – Impaq view	2.0	0.5	0	0	2.5
Backhaul Communications - Proposal	0.50	0.51	0.53	0.53	2.0
Backhaul Communications – Impaq View	0.05	0.05	0.05	0.05	0.2
Management – proposal	0.7	0.8	0.8	0.8	3.1
Management – Impaq view	0.3	0.3	0.3	0.3	1.2
Finance & HR - Proposal	0.7	0.6	0.6	0.6	2.5
Finance & HR – Impaq view	0.1	0.1	0.1	0.1	0.5
Service Delivery & Contract Management - Proposal	1.0	1.0	0.9	0.9	3.8
Service Delivery & Contract Management – Impaq view	0.5	0.5	0.5	0.6	2.1
Stakeholder Relations - Proposal	0.2	0.2	0.2	0.2	0.8
Stakeholder Relations- Impaq view	0.0	0.0	0.0	0.0	0.0
Premises - Proposal	0.5	0.5	0.5	0.5	2.0
Premises – Impaq view	0.5	0.5	0.5	0.5	2.0
AMI IT– Proposal	14	12	11	12	50
AMI IT– Impaq view	12	11	10	9	42
Total – Proposal	**28**	**23**	**21**	**23**	**96**
Total – Impaq view	**18**	**15**	**13**	**13**	**60**