# In-Service Testing Governance Arrangements

Prepared by IST3 Group

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| For Attention Of | **IMAG** | | | | |

**Overview or Purpose of Document:**

**This report has been produced for the Industry Metering Advisory Group (IMAG) to provide further information regarding the proposed In Service Testing (IST) regime. This report details the potential options for governance of an IST regime and also sets out the high level process and associated costs. This report should be read in conjunction with the IST1/2 report (reference 1) which provides details of the testing requirements.**

**The IMAG are invited to review and comment on this document. Comments received at the IMAG meeting may lead to revisions. The intention is to issue this document for industry consultation on the proposed regime and the various governance options.**

**The views received from the industry consultation will enable IMAG, and the IMAG Executive, to recommend a framework for IST to Ofgem and NMO.**

# 1 Executive Summary

The In Service Testing 3 Group (IST3 Group) was created to further consider the IST regime proposed by the IST1 and IST2 Groups. Specifically the IST3 Group was tasked to consider the governance arrangements and the costs of implementing the IST regime.

The IST3 Group noted that there were three potential options for implementing the IST regime:

- Option 1 – incorporating the arrangements in the current industry codes;
- Option 2 – incorporating the arrangements in a new standalone industry code; or
- Option 3 – the governance arrangements could sit outside the industry codes and would be directly managed and enforced by Ofgem and/or National Measurement Office[1] (NMO).

The advantages and disadvantages of each option were considered.

In addition, the high level process for administering and governing the IST regime was documented to enable costs to be estimated. With regards to costs the IST3 Group concluded the following:

- The costs of the IST regime are estimated to be £105k in 2010 rising to £655k in 2019. It is estimated that the total IST cost will peak at £858k in 2023 and thereafter a "steady state" will be reached of around £703k/yr.
- It is estimated that the current regimes, led by the UK Metering Forum (UKMF) for electricity and by individual Meter Asset Managers (MAMs[2]) in gas to currently cost £250k/yr. On an equivalent basis to IST this would cost £1,515k/yr; and
- The overall costs of the three implementation options do not differ significantly.

It should also be remembered that:

- Doing nothing is not an option. There is a legislative requirement for meters to be kept in proper order, etc.
- Maintaining the current **electricity** National Sample Survey is also not an option **for MID meters**. Electricity MID meters do not have a certification life and meters approved under UK national legislation cannot be placed on the market after 2016.
- An effective IST scheme should lead to increased consumer confidence (although clearly it is impossible to quantify this). Increased confidence should result in a reduction in the number of disputed meters (which the industry **directly**/indirectly pays for).
- The model assumes that all gas meters have a 20 year life and all electricity a 23 year. This results in the "steps" in the costs as tranches of meters are replaced. In practice this will not occur and MID meters can continue in-service for as long as they continue to meet the **accuracy and performance** requirements.

The Group were therefore keen to seek views from the IMAG and industry regarding the three options to enable a final recommendation to be made to Ofgem and/or NMO.

[1] Formerly the National Weights and Measures Laboratory (NWML)

[2] The term MAM is used throughout this document to include Meter Operators

## 2 Background

Prior to the introduction of the Measurement Instrument Directive (MID) in 2006, a process was established and operated to certify electricity meters used for supplier billing purposes. In addition to certification testing, the UKMF facilitates testing on a sample of meters to be removed from use near the end of their certification period. The UKMF collate the results of the tests and if necessary the certification period of the meter type is adjusted (increased or decreased) and published by Ofgem ("Schedule 4").

Note: On 1st April 2009 the statutory responsibility for the metrological performance of gas and electricity meters was transferred from Ofgem to NMO. Schedule 4 is now published on the NMO website at www.nmo.dius.gov.uk

Although there is no equivalent gas regime, currently MAMs undertake their own testing to ensure the accuracy of meters in their portfolios.

In October 2006 UK Regulations brought the MID into force to cover under 100kW meters. The MID is a European Union (EU) directive aimed at creating a single market for measuring instruments across the EU. The fundamental principle being that meters which receive a MID approval can be used in any other EU country irrespective of where in the EU that approval was granted.

The MID replaced the Ofgem certification testing for all new MID approved meter types from October 2006 (noting that certification would still be applied for old meter types until 2016). Under the MID a notified body approves new meters. There is a requirement within the MID for the manufacturer to indicate the 'durability' (period of time over which the metrological characteristics remain compliant) of its product. However this is considered neither reliable nor testable. Therefore suppliers and Ofgem/NMO raised concerns regarding the ability to ensure that MID approved meters remained accurate in the long term.

The IMAG (Groups IST1 and 2) was therefore tasked with developing a process for in service testing which would test the accuracy of a sample of MID approved meters in both electricity and gas to determine whether there were any issues with accuracy and long term performance.

The IMAG considered and endorsed the IST1/2 Report on 10 January 2008 (Reference 1). This report details the testing requirements which would be carried out by an approved test station. The IMAG then established IST3 to consider appropriate Governance arrangements required to implement the proposals.

## 3 Governance Options

The purpose of meter testing is to ensure that suppliers meet their legal obligations regarding the accuracy of their meters and, consequently, consumers have confidence in the accuracy of the measuring and billing for their energy supplies. The IST proposals describe a mechanism for testing and criteria for decision making on replacement of meters. The proposed scheme would achieve maximum effectiveness and optimum efficiency if all meters were captured under the arrangements so that duplication of administration is avoided. This drives a need to encourage all MAMs to participate. In addition, public confidence would be enhanced if a body independent of the MAMs could be made responsible for ensuring compliance. This in turn implies that the body may need to have powers to apply sanctions in the event of non-compliance.

The IST3 Group noted that there were three options for implementing an IST regime:

- Option 1 – the new IST regime could be incorporated within current industry codes i.e. the electricity requirements could be included in the Balancing and Settlement Code (BSC) and the gas arrangements could be included in the Meter Asset Managers Code of Practice (MAMCoP);
- Option 2 – a new industry code could be developed to incorporate the new IST regime; or
- Option 3 – the governance arrangements could sit outside the industry codes and would be directly managed and enforced by Ofgem and/or NMO.

A comparison of these options is included in section 8.

# 4 Summary of Solution

The IST3 Group agreed that although the detailed process could not be finalised until it was agreed which of the governance options would be taken forward; it was possible to document a generic high level process which would allow costs to be estimated. This high level process has been broken down into three main areas: governance; administration; and testing.

## *4.1 Governance*

A Governance Body would be required to oversee the IST process and to determine and enforce the actions to be taken as a result of the testing. As it may be required to take enforcement action for non-compliance; the granting of relevant powers to a governance body is a significant factor in determining how such a body should be brought into effect.

In addition, it is acknowledged that the IST requirements may develop over time. Therefore it is proposed that the Governance Body would also manage a clear and transparent change process. In order to carry out this role, the Governance Body would require significant competence in the areas of meter testing and the associated legislation. Although the requirement to amend the process is likely to be infrequent as it would be triggered by changes to legislation or significant issues identified in the operation of the scheme; it is considered at this stage that the regime should be reviewed after some experience has been gained.

The actual composition of the Governance Body would be dependent on the legal framework in place as follows:

- Should the electricity requirements be placed within the BSC then the Panel would be responsible for the governance aspects and a Panel Sub Committee with relevant expertise would be created to undertake the role.
- Should the gas requirements be placed within the MAMCoP then the Scheme Management Board would be responsible for the governance aspects;
- Should a new industry code be developed to document the process then a decision making body would be appointed. This could consist of representatives from Ofgem, NMO, Manufacturers, Suppliers, MAMs and/or Meter Asset Providers (MAPs); or
- Alternatively, Ofgem/NMO may determine that the governance arrangements sit outside the industry codes and are therefore directly managed and enforced by Ofgem and/or NMO.

## *4.2 Administration*

An Administration Agent would be required to administer the IST process. This role would include the collection of data in relation to meter populations; the determination of required samples; and the collation of test results. Although this role was described at a high level in the IST1/2 Report, a more detailed description has been produced and included in section 5.2 below.

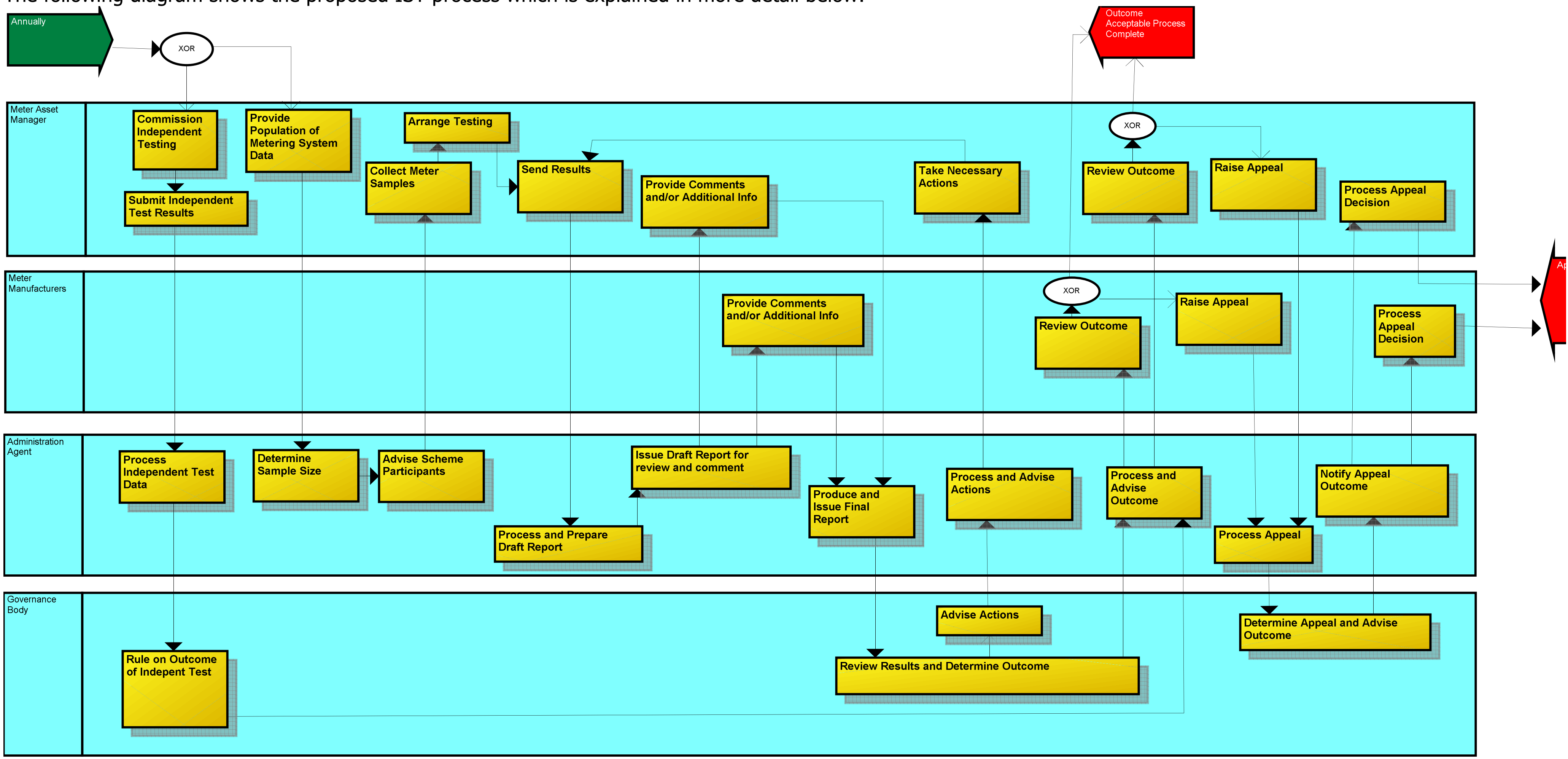
## *4.3 Testing*

Each MAM would be responsible for ensuring that testing is carried out on the requested number of meters to make up a national sample of data. Testing would be carried out by an approved test station, in accordance with the IST1/2 Report.

# 5 Detail of Solution Requirements

An overall process diagram is provided below followed by a description of the governance and administration aspects of the regime. The testing requirements are already documented in the IST1/2 report (reference 1) and are therefore not repeated in this document. A summary timetable for the activities detailed in this section is included in Section 5.4

The following diagram shows the proposed IST process which is explained in more detail below:



## 5.1 Governance

This role includes the following functions:

- REQ 1 – Approve Test Stations
- REQ 2 – Review Test Results and Determine Actions
- REQ 3 – Consider Appeals
- REQ 4 – Carry out Enforcement
- REQ 5 – Manage Change Process
- REQ 6 – Consider Results of Independent Tests

### 5.1.1 Approve Test Stations

The Governance Body would be required to set the criteria that test stations must meet. It is anticipated that this would be based on the current CoP 4 requirements regarding calibration. CoP 4 states:

> *'It is important that confidence must be established in the organisations which calibrate Meters and/or in the processes/equipment that are used to calibrate Meters. Three approaches can be used to establish traceability to national Standards of accuracy. The party performing the Calibration must either:*
>
> *i. Have third party accreditation for all Calibration equipment and procedures, the third party being a recognised certification body such as UKAS or a European/international equivalent. Alternatively, audited conformity with BS EN ISO/IEC 17025 for all equipment and procedures will be a presumption of competence; or*
>
> *ii. Have partial third party accreditation for use of certain Standards, e.g. through Ofgem/supporting agent and can demonstrate they have similar procedures for use of other Standards to follow the requirements detailed in Section 7 and audited by BSCCo; or*
>
> *iii. Directly comply with all the requirements detailed in Section 7 and audited by BSCCo.'*

Although the Governance Body would set the criteria, the Administration Agent would be responsible for ensuring that test stations meet these standards.

### 5.1.2 Review Test Results and Determine Actions

The Governance Body would receive a report detailing the results of the In Service Testing, together with any additional information provided by MAMs or manufacturers. The report would include details of those meter types that have failed to meet the required levels of accuracy; those that have met the required levels of accuracy; and those where issues have been highlighted. The Governance Body would determine the action to be taken as follows:

- Where a particular meter type fails to meet the required levels of accuracy, the Governance Body would confirm that these must be removed within 2 years;
- Where a particular meter type meets the required levels of accuracy, the Governance Body would confirm that no further action is required; and

- Where an issue has been highlighted with a particular meter type, the Governance Body would decide what action should be taken. This may require further testing to be carried out, or may require analysis to be conducted to assess the impact of removing meters from service. It should be noted that the Governance Body may consider the accuracy of the overall population for a particular MAM, therefore a determination may not impact the entire population of a particular meter type.

### 5.1.3 Consider Appeals

It is proposed that a meter manufacturer, MAP or MAM could raise an appeal against a determination. The appellant would be expected to provide evidence to demonstrate that the process carried out has failed in some way; or that new evidence is available to suggest that the sample of meters tested does not represent the accuracy of the overall population.

The Governance Body would initially consider the appeal and make a decision as to whether the information provided changes the initial determination. This consideration may include referral back to the Administration Agent to require further testing by MAMs.

Depending on the exact constitution of the Governance Body, there may be a process for the appellant escalating the appeal to Ofgem or NMO.

### 5.1.4 Carry out Enforcement Activities

Throughout the process of determining samples and testing meters, there are opportunities for parties to be non compliant with the requirements. For example a MAM may not provide the required data on the number of meters per type, or a MAM may not provide sufficient test data in relation to the sample size required.

Although the Administration Agent would be responsible for monitoring these activities and would initiate discussions with specific MAMs to try to resolve any issues, should these persist then the Administration Agent would refer the MAM to the Governance Body. The Governance Body may also deal with Payment Default issues should a party fail to pay into the relevant cost recovery regime.

In addition the Governance Body would also need to ensure that actions are taken by MAMs to remove particular meters following a determination that the meter type fails to meet the required levels of accuracy.

The specific enforcement powers used by the Governance Body would be dependent on the legal framework in place and would need to be detailed further.

Depending on the exact constitution of the Governance Body, there may be a process for escalating issues to Ofgem or NMO.

### 5.1.5 Manage Change Process

It is recognised that the testing requirements contained within the In Service Testing Report may be subject to change. It is therefore proposed that a clear and transparent change process is maintained which would allow industry members to suggest improvements to the testing model and the processes that sit around it. This process should include industry consultation to ensure all types of participant have an opportunity to comment on the proposal. The Governance Body would then be responsible for agreeing such a change, or recommending to Ofgem/NMO that the change be made.

### 5.1.6 Consider Results of Independent Tests

The In Service Testing Report states that:

*'Should a MOP/MAM wish to utilise an alternative method for maintaining accuracy, the onus will be on that MOP/MAM to demonstrate to the Governance Board that it is equivalent to or better than the approach described in this document.'*

The Governance Body may therefore be required to consider the results of these independent tests. Consideration would also need to be given to the actions required if the results of the independent tests are inconsistent with the results of the national testing regime for a particular meter type.

## *5.2 Administration*

This role includes the following functions:

- REQ1 – Maintain Store of Metering System Data
- REQ 2 – Determine and Allocate Samples
- REQ 3 – Monitor Progress
- REQ 4 – Collate and Analyse Results
- REQ 5 – Facilitate Governance Body Discussions
- REQ 6 – Publish Results
- REQ 7 – Ad Hoc Administration
- REQ 8 – Non Functional Requirements

### 5.2.1 Maintain Store of Metering System Data

In order to derive sample meters for testing, MAMs would be required to provide data annually to the Administration Agent stating how many of each type of MID Approved Meter they have in their portfolio. Each MAM would be required to provide the following information:

- Manufacturer;
- Type or model;
- Year of manufacture;
- Meter Attributes e.g. capacity/rating, number of registers, diaphragm material, integral temperature conversion;
- Number of the EC type examination certificate or the EC design examination certificate
- Current Number of Meters in Portfolio.

A snapshot of this information taken from the first week in January should be submitted to the Administration Agent by 31 January each year. The Administration Agent would collate the data from each MAM and store it on a central database. Although only data for the current year would be used to determine samples, historic data should be stored for a minimum of 20 years.

Should a MAM fail to provide this data within the required timescales, the Administration Agent would try to resolve the issue and if necessary escalate the MAM to the Governance Body. The

Administration Agent would also highlight to the Governance Body if any meters are reported to be in service which have previously not met the accuracy requirements and should therefore have been removed from service.

### 5.2.2 Determine and Allocate Samples

The Administration Agent would determine which meter types should be tested in a year e.g. gas meters require testing every 3 years and electricity meters require testing after 8 years and then every 5 subsequent years.

The Administration Agent would determine the size of the sample that requires testing based on the total population of a particular meter type in accordance with the table below:

| Population by type and year | Sample size |
|---|---|
| 1,201 to 3,200 | 50 |
| 3,201 to 10,000 | 75 |
| 10,001 to 35,000 | 100 |
| 35,001 to 150,000 | 150 |
| >150,000 | 200 |

The Administration Agent would send a request to each relevant MAM by the end of February, requiring a certain number of meters to be tested. The number of meters to be tested by each individual MAM would be determined on a pro rata basis with a de minimis threshold to avoid an individual MAM from being required to test only a small number of meters.

### 5.2.3 Monitor Progress

MAMs would be given 3 months to undergo testing of meters with results provided to the Administration Agent by 31 May. During this time the Administration Agent would monitor progress to ensure that allocated work is progressing in a timely manner. The Administration Agent would also seek confirmation that the test stations being utilised meet the criteria set by the Governance Body.

### 5.2.4 Collate and Analyse Results

**Accuracy Test Results**

The Administration Agent would receive numerical test results from each relevant MAM in relation to each meter type. See Attachments 1 and 2 for the required format of the results submission. Test results for each meter type would be assessed in accordance with the In Service Testing report to determine the overall accuracy of the meter type. A draft report should be produced including details of:

- Meter types which did not meet the required levels of accuracy and should therefore be removed from service within 2 years;
- Meter types which met the required levels of accuracy;
- Meter types where there were issues which should be considered further; and
- The accuracy of the overall population of meters for individual MAMs.

Details taken from the draft report should be communicated to relevant affected parties, for example affected MAMs and manufacturers. At this the stage manufacturers would have access to the sample test results for their meter types.

MAMs and manufacturers would be given a month to consider the draft findings and provide any information which they feel could be relevant. For example the impact on individual MAMs having to replace a number of meters, or evidence that a particular batch of meters has failed testing, whereas the rest of the population is within acceptable levels.

The Administration Agent would then produce a final report for the Governance Body, including any additional information provided by MAMs or manufacturers.

**Excluded Meters**

The Administration Agent should also receive details of meters that were excluded from the sample as they are unsuitable for accuracy testing e.g. if the meter had a faulty display. Details of Excluded Meters should be provided by the relevant MAMs and recorded by the Administration Agent. Where statutory register displays or meter construction appear to be deteriorating in an unacceptable manner, additional samples may be required or remedial action may need to be taken. Therefore the Administration Agent should provide an annual report on Excluded Meters to the Governance Body for consideration.

### 5.2.5 Facilitate Governance Body Discussions

The Administration Agent would provide a report to the Governance Body by the 30 October. The report should include the information set out in 5.2.4 above. The Governance Body would meet to discuss the results in November and may ask for further analysis: for example additional samples may need to be tested for certain meters; or the Governance Body may require additional analysis of the impact of removing certain meters from service. The Administration Agent would conduct any further work and provide results to the Governance Body as soon as practicable.

### 5.2.6 Publish Results

Following consideration by the Governance Body, the Administration Agent would arrange for details of the decisions to be published. Details of meter types which have failed to meet the required levels of accuracy and are therefore required to be removed from service would be published on a website. In addition, details of meter types that met the required levels of accuracy would also be published. If further analysis is being undertaken for certain meter types then the website would highlight these meter types and include a statement that MAMs/MAPs should contact the Administration Agent to confirm the status of any such meters they have in their portfolio.

### 5.2.7 Ad Hoc Administration

Depending on the exact form of governance, the Administration Agent may need to provide administrative support to the Governance Body. For example the Administration Agent may be required to assist in the change management process, or may be responsible for the recovery of costs.

### 5.2.8 Non Functional Requirements

The Administration Agent would be required to meet the following requirements:

- Data Retention – All data submitted by MAMs should be held for a minimum of 20 years;

- Auditability – All formal communication with MAMs and the Governance Body should be maintained for audit purposes; and

- Confidentiality – All data provided by MAMs, and discussions conducted with the Governance Body should be treated as confidential. Information should only be disclosed in accordance with 5.2.6 above or where specified by the Governance Body.

## *5.3 Testing*

The IST1/2 Report specifies the testing requirements; therefore these have not been included in this document.

## *5.4 Summary of Timetable*

| **Activity** | **Date** |
|---|---|
| Snapshot of portfolio data taken by MAMs | Start of January |
| Details of Metering Systems sent to Administration Agent | By 31 January |
| Request for sample testing data sent to MAMs | By 28 February |
| Meter testing carried out | 1 March – 31 May |
| Analysis of test results undertaken | 1 June – 31 August |
| Draft Report issued to MAMs | By 31 August |
| Additional evidence provided by MAMs | By 30 September |
| Final Report issued to Governance Body | By 30 October |
| Governance Body meeting | During November |
| Decisions published[3] | End November |

# 6 Costs of Proposed Process

The IST3 Group considered the cost of implementing the IST regime. The costs may be split into:

- Set up costs (i.e. the one off cost of implementing the governance and administration arrangements);

- Annual operational cost; and

- Testing costs.

The Group agreed that the testing costs would be much greater than the set up and administration costs although the testing costs would be spread over participating MAMs.

[3] If further analysis is being undertaken for certain meter types then the website would highlight these meter types and include a statement that MAMs/MAPs should contact the Administration Agent to confirm the status of any such meters they have in their portfolio

Note: All costs in this report are the IST3 Group's best estimate based on the high level requirements set out in Section 5 above. A number of assumptions have been made and these are detailed in the document.

## 6.1 Set Up Costs

The IST3 Group considered the costs of the three possible governance arrangements to be:

| Description of Cost | Governance | | |
|---|---|---|---|
| | **MAMCOP & BSC** | **Standalone** | **NMO/Ofgem** |
| Procurement of Admin agent | £10k<br>£10k | £10k | £10k |
| Legal cost | £20k<br>£20k | £75k | £40k |
| Change cost (i.e. consultation) | £15k<br>£15k | £60k | £15k |
| **TOTAL** | **£90k** | **£145k** | **£65k** |
| Comments | Separate arrangements for gas and electricity.<br>Governance by BSC CoP4 and MAMCOP.<br>Cost recovery:<br>BSC invoiced monthly by ELEXON to BSC parties.<br>MAMCOP borne by Ofgem and recovered by licence fees. | Brand new code to cover the governance of gas and electricity.<br>Cost recovery borne by parties to the agreement. | Governance of gas and electricity following consultation with industry.<br>Cost recovery borne NMO/Ofgem and recovered by licence fees. |

## 6.2 Annual Operational Cost

The annual cost of the administration arrangements were estimated to be:

| Description of Cost | Governance | | |
|---|---|---|---|
| | **MAMCOP & BSC** | **Standalone** | **NMO/Ofgem** |
| Admin agent (to include salary, accommodation, overheads, etc) | £90k MAMCOP<br>£50k BSC | £100k | £100k |
| Meeting costs with relevant parties (cost of providing a room and lunch based on four meetings per year) | £4k<br>£4k | £4k | £4k |
| **TOTAL** | **£148k** | **£104k** | **£104k** |
| Comments | Admin agent based on:<br>MAMCOP 1.0 FTE<br>BSC 0.5 FTE | Admin agent based on:<br>1.0 FTE | Admin agent based on:<br>1.0 FTE |

Note:

- These are the assumed "steady state" costs. The early years' costs may be less than these figures but will increase as the population (and therefore testing requirements) of MID meters increases.
- These figures do not include the cost of regulatory input from NMO and Ofgem.
- These costs are based on the assumption that a third party would be procured to undertake the Administration Agent role. It was noted that the costs may be lower if BSCCo (for the BSC) or Ofgem/NMO carried out the administrative activities in house.

## 6.3 Testing Costs

### 6.3.1 Gas Meters

#### *6.3.1.1 Assumptions*

The following assumptions have been made:

- UK population of around 20m domestic type gas meters (i.e. a badged capacity of 6$m^3$/h or below).
- Meters have a 20 year asset life.
- MID came fully into force in October 2006 so the first "full" year of MID approvals is 2007. Gas meters are first sampled after 3 years so this will take place in 2010.

In January 2008 NMO contacted MAMs and MOPs to obtain estimates of the numbers of MID meters they had purchased and were expecting to purchase in the coming year. The figures were:

| MID Gas Meters | 2007 - 08 | 2008 - 09 |
|---|---|---|
| | 170,000 | 200,000 |

Assuming the 2007 population is comprised of four meter types, then the number of samples required for testing in 2010 may be:

| Meter Type | % of MID Population | Population | No Required for sampling |
|---|---|---|---|
| A | 55.9 | 95,000 | 150 |
| B | 23.5 | 40,000 | 150 |
| C | 14.7 | 25,000 | 100 |
| D | 5.9 | 10,000 | 75 |
| **TOTAL** | **100** | **170,000** | **475** |

#### 6.3.1.2 *Cost of Sampling*

The cost of meter testing would be a commercial arrangement between the MAM and the meter test station. For the purpose of this model the IST3 Group assumed the average cost of a gas meter test to be £85 which comprises:

- Meter removal (i.e. taking it "off the wall"), transport to test station and return to MAM (£70). In contrast the cost of taking a meter from "churn" is nil; and
- Testing of meter (£15).

The cost of testing all of the meters sampled in 2010 (i.e. meters installed in 2007) is therefore £40,375. For a population of 170,000 the IST cost is £0.24 per meter.

Assuming these meters continue to meet the statutory requirements then they may be returned to use and continue in service until the next sampling period which is after 6 years (i.e. 2013).

#### 6.3.1.3 *Population Increase*

As manufacturers develop new products the number of meter types will increase. Assuming the 2008 population is comprised of six meter types then the number of samples required in 2011 may be:

| Meter Type | % of MID Population | Population | No Required for Sampling |
|---|---|---|---|
| A | 37.5 | 75,000 | 150 |
| B | 32.5 | 65,000 | 150 |
| C | 15.0 | 30,000 | 100 |
| D | 7.5 | 15,000 | 100 |
| E | 5.0 | 10,000 | 75 |
| F | 2.5 | 5,000 | 75 |
| **TOTAL** | **100** | **200,000** | **650** |

At £85 per test, the cost of testing all of the meters sampled in 2011 (i.e. meters installed in 2008) is £55,250. For a population of 200,000 the IST cost is £0.28 per meter.

This illustrates that the IST costs increase as the number of different meter types increases. If the 2008 population comprised of just four meter types with a total of 400 samples required then the IST cost would be £0.17 per meter.

#### 6.3.1.4 *Smart Meters*

Mandating smart meters for domestic consumers may result in a sudden increase in the number of installed MID gas meters and the number of meter types available. If smart meters are rolled out over a 10 year period then it will be necessary to install around 2m smart meters each year.

Assuming the roll out begins in 2011 and is comprised of ten meter types then the number of samples required for testing in 2014 may be:

| Meter Type | % of MID Population | Population | No Required for Sampling |
|---|---|---|---|
| A | 25 | 500,000 | 200 |
| B | 20 | 400,000 | 200 |
| C | 15 | 300,000 | 200 |
| D | 15 | 300,000 | 200 |
| E | 10 | 200,000 | 200 |
| F | 5 | 100,000 | 150 |
| G | 4 | 80,000 | 150 |
| H | 3 | 60,000 | 150 |
| I | 2 | 40,000 | 150 |
| J | 1 | 20,000 | 100 |
| **TOTAL** | **100** | **2,000,000** | **1,700** |

At £85 per test, the cost of testing all of the meters sampled in 2014 (i.e. meters installed in 2011) is £144,500. For a population of 2m the IST cost is £0.07 per meter.

This illustrates that the IST costs per meter decrease as the population of MID meters increases (the maximum sample size being 200).

#### 6.3.1.5 *Cumulative Effect*

As the sampling is repeated at 3 year intervals there would be a cumulative effect of the number of meters to be sampled as shown in Appendix 4. For example, in 2013 the sampling will include:

- The first (i.e. 3 year) sampling of meters installed in 2010; and
- The second (i.e. 6 year) sampling of meters installed in 2007, etc.

However as the population of MID gas meters increases over time it may be assumed that there would be an element of "churn" as meters would be returned when properties are demolished, etc.

Although the number of meters the MAM is requested to test is allocated in proportion to the population they have, one of the benefits of a national scheme is that meters to be sampled may be taken from any participating MAM.

The IST3 Group therefore assumed that, for any particular meter type, the number of meters available from churn would increase over the meters life. The assumptions are given below:

| Year | Taken off the wall (%) | Available from churn (%) | Total (%) |
|---|---|---|---|
| 3 | 100 | 0 | 100 |
| 6 | 90 | 10 | 100 |
| 9 | 75 | 25 | 100 |
| 12 | 50 | 50 | 100 |
| 15 | 25 | 75 | 100 |
| 18 | 0 | 100 | 100 |

The IST3 Group assumed the average cost of a gas meter test to be £15 when the meters are taken from churn.

This reduces the cost of meter testing as shown in the following examples:

- Year 6: 90% of the meters required for sampling are taken off the wall (at £85 per meter test) and 10% are available from churn (at £15 per meter test).
- Year 15: 25% of the meters required for sampling are taken off the wall (at £85 per meter test) and 75% are available from churn (at £15 per meter test).

In contrast, a MAM implementing their own scheme is unlikely to have sufficient samples available from churn even towards the end of a meters life. All of the meters required for sampling would therefore need to be taken off the wall (at £85 per meter test)

#### 6.3.1.6 *Lifetime Costs*

The cost of IST may be illustrated as a cost per meter model expressed over the period the meter remains in service (assumed 20 years).

Using the above example of Meter A installed in 2007 (150 samples required), the cost of testing this meter is:

| **Year** | | | | | | | |
|---|---|---|---|---|---|---|---|
| 2025 | | | | | | | £2,250 |
| 2022 | | | | | | £4,875 | |
| 2019 | | | | | £7,500 | | |
| 2016 | | | | £10,125 | | | |
| 2013 | | | £11,700 | | | | |
| 2010 | | £12,750 | | | | | |
| 2007 | Install | | | | | | |
| | 0 | 1st | 2nd | 3rd | 4th | 5th | 6th |
| | **Sample Number** | | | | | | |

The testing cost for Meter A is £49,200 over the life of the meter. For example, with a population of 95,000 the lifetime cost is £0.52 per meter to ensure that, statistically, the population remains accurate for 20 years in-service, this equates to £0.03 per meter type per year.

### 6.3.1.7 *Capped Costs:*

Although sample size is related to population, it is limited to a maximum of 200 (applicable to populations greater than 150,000). It follows that the IST cost for populations greater than 150,000 would not exceed:

| Year | | | | | | | |
|---|---|---|---|---|---|---|---|
| 2025 | | | | | | | £3,000 |
| 2022 | | | | | | £6,500 | |
| 2019 | | | | | £10,000 | | |
| 2016 | | | | £13,500 | | | |
| 2013 | | | £15,600 | | | | |
| 2010 | | £17,000 | | | | | |
| 2007 | Install | | | | | | |
| | 0 | 1st | 2nd | 3rd | 4th | 5th | 6th |
| | **Sample Number** | | | | | | |

The testing cost for any meter type is therefore "capped" at £65,600. With a population of 150,000 the cost is £0.44 per meter (this equates to £0.02 per meter type per year) to ensure that, statistically, the population remains accurate for 20 years in-service. However for a population of 500,000 this cost reduces to £0.13 per meter which equates to £0.01 per meter type per year.

### 6.3.1.8 *Cost Projection:*

The cost of IST may be represented as either an annual cost or as a lifetime cost for a specific meter type. These may be combined to produce a model projecting the future cost of IST.

The annual costs for gas meter IST in 2010 and 2011 are detailed above and summarised in Table 1 below:

*Table 1*

| Installation Year | MID Population | Sampling Year | Annual IST Cost | Cost per Meter |
|---|---|---|---|---|
| 2007 | 170,000 | 2010 | £40,375 | £0.24 |
| 2008 | 200,000 | 2011 | £55,250 | £0.28 |

These costs are relatively high compared to the number of MID gas meters installed. However smart metering would mean that 2m meters may be installed every year from 2011 to 2014. Assuming the roll out is comprised of ten meter types then the population of each meter type would be around 200,000.

The lifetime IST cost for any meter type is "capped" at £65,600 for populations greater than 150,000. It therefore follows that the cost of sampling this meter throughout its life is also "capped", and for ten meter types installed in 2011 the maximum IST costs are shown in Table 2 below:

*Table 2*

| **Year** | | | | | | | |
|---|---|---|---|---|---|---|---|
| 2029 | | | | | | | £30,000 |
| 2026 | | | | | | £65,000 | |
| 2023 | | | | | £100,000 | | |
| 2020 | | | | £135,000 | | | |
| 2017 | | | £156,000 | | | | |
| 2014 | | £170,000 | | | | | |
| 2011 | Install | | | | | | |
| | 0 | 1st | 2nd | 3rd | 4th | 5th | 6th |
| | **Sample Number** | | | | | | |

These maximum IST costs are based on 10 meter types, each with a population greater than 150,000 (i.e. a total of 2,000 samples). It should be noted that IST costs will be reduced if the meter populations are such so that fewer samples are required (e.g. 1,700 samples are illustrated on page 17).

Appendix 4 illustrates the cumulative effect of sampling being repeated at 3 year intervals and this may also be shown in tabular form as in Table 3 below:

*Table 3*

| **Testing Year** | **Installation Year** | | | |
|---|---|---|---|---|
| | **1st Sample** | **2nd Sample** | **3rd Sample** | **4th Sample** |
| 2010 | 2007 | | | |
| 2011 | 2008 | | | |
| 2012 | 2009 | | | |
| 2013 | 2010 | 2007 | | |
| 2014 | 2011 | 2008 | | |
| 2015 | 2012 | 2009 | | |
| 2016 | 2013 | 2010 | 2007 | |
| 2017 | 2014 | 2011 | 2008 | |
| 2018 | 2015 | 2012 | 2009 | |
| 2019 | 2016 | 2013 | 2010 | 2007 |

The model projecting the future cost of IST is developed by combining Tables 1, 2 and 3 to give the maximum IST costs for ten meter types installed in 2007 onwards as shown in Table 4 below:

*Table 4*

| Testing Year | Testing Costs | | | | |
|---|---|---|---|---|---|
| | 1st Sample | 2nd Sample | 3rd Sample | 4th Sample | Total |
| 2010 | £40,375 | | | | £40,375 |
| 2011 | £55,250 | | | | £55,250 |
| 2012 | £85,000 | | | | £85,000 |
| 2013 | £85,000 | £40,375 | | | £125,375 |
| 2014 | £170,000 | £55,250 | | | £225,250 |
| 2015 | £170,000 | £85,000 | | | £255,000 |
| 2016 | £170,000 | £85,000 | £40,375 | | £295,375 |
| 2017 | £170,000 | £156,000 | £55,250 | | £381,250 |
| 2018 | £170,000 | £156,000 | £85,000 | | £411,000 |
| 2019 | £170,000 | £156,000 | £85,000 | £40,375 | £451,375 |

It is assumed:

- The population of MID meters installed in 2007 and 2008 are so small that all samples would need to be taken off the wall (i.e. there will be no churn throughout the life of this meter). The testing cost of the meters installed in these years would therefore remain constant.
- In 2009 and 2010 manufacturers would be trialling new designs of smart meters prior to roll out commencing in 2011. The IST costs for meters installed in these years are therefore based on the assumption of ten meter types with 250,000 meters installed each year (i.e. each meter type has a population of 25,000 units with 100 units required for sampling). Again the population is such that all samples would need to be taken off the wall.

### 6.3.1.9 *Cost for a Single MAM:*

As explained previously, the benefits of a national scheme are that:

- Meters to be sampled may be taken from any participating MAM resulting in reduced testing costs because of the availability of meters from churn.
- Reduced administration costs resulting from the economies of scale.

For an individual MAM with a population of 2m gas meters it would be necessary to install 200,000 meters each year during the 10 year roll out of smart meters. If these consist of four meter types, each with a population of 50,000, then a total of 600 meters will need to be sampled every year (i.e. four lots of 150 meters). If the roll out commences in 2011 then, at £85 per test, the testing cost in 2014 will be £51,000.

As the roll out continues the testing cost will increase because of the cumulative effect of sampling at 3 year intervals. The following table shows a comparison between the testing costs of this single MAM and the national scheme shown in Table 4:

| Testing Year | Testing Costs | |
|---|---|---|
| | National Scheme | Single MAM |
| 2014 | £225,250 | £51,000 |
| 2015 | £255,000 | £51,000 |
| 2016 | £295,375 | £51,000 |
| 2017 | £381,250 | £102,000 |
| 2018 | £411,000 | £102,000 |
| 2019 | £451,375 | £102,000 |
| **AVERAGE** | £336,542 | £76,500 |

For a single MAM with 2m gas meters (i.e. 10% of the total UK population) the average cost of an individual testing scheme will be £76,500 (i.e. 23% of the cost of the national scheme).

Note these figures do not include the administration cost which will also be borne by the individual MAM.

### 6.3.2 Electricity Meters

#### *6.3.2.1 Assumptions*

The following assumptions have been made:

- UK population of around 27m domestic type electricity meters (i.e. a whole current, single phase meters).
- Meters have a 23 year asset life.
- MID came fully into force in October 2006 so the first "full" year of MID approvals is 2007. Electricity meters are first sampled after 8 years so this will take place in 2015.

In January 2008 NMO contacted MAMs and MOPs to obtain estimates of the numbers of MID meters they had purchased and were expecting to purchase in the coming year. The figures were:

| MID Electricity Meters | 2007 - 08 | 2008 - 09 |
|---|---|---|
| | 10,000 | 25,000 |

Note the adoption of MID appears to be much slower for electricity meters than for gas – presumably because the concept of "certification life" does not apply to MID electricity meters.

Assuming the 2007 population is comprised of four meter types, then the number of samples required in 2015 may be:

| Meter Type | % of MID Population | Population | No Required for sampling |
|---|---|---|---|
| A | 40 | 4,000 | 75 |
| B | 30 | 3,000 | 50 |
| C | 15 | 1,500 | 50 |
| D | 15 | 1,500 | 50 |
| **TOTAL** | **100** | **10,000** | **225** |

#### *6.3.2.2 Cost of Sampling*

The cost of meter testing would be a commercial arrangement between the MAM and the meter test station.

For the purpose of this model the IST3 Group assumed the average cost of an electricity meter test to be £50 which comprises:

- Meter removal (i.e. taking it "off the wall"), transport to test station and return to MAM (£35). In contrast the cost taking a meter from "churn" is nil; and
- Testing of meter (£15).

The cost of testing all of the meters sampled in 2015 (i.e. meters installed in 2007) is therefore £11,250. For a population of 10,000 the IST cost is £1.13 per meter.

Assuming these meters continue to meet the statutory requirements then they may be returned to circuit and continue in service until the next sampling period which is after 13 years (i.e. 2020)

#### *6.3.2.3 Population Increase*

As manufacturers develop new products the number of meter types will increase. Assuming the 2008 population is comprised of five meter types, then the number of samples required in 2016 may be:

| Meter Type | % of MID Population | Population | No Required for sampling |
|---|---|---|---|
| A | 28.0 | 7,000 | 75 |
| B | 24.0 | 6,000 | 75 |
| C | 20.0 | 5,000 | 75 |
| D | 16.0 | 4,000 | 75 |
| E | 12.0 | 3,000 | 50 |
| **TOTAL** | **100** | **25,000** | **350** |

At £50 per test, the cost of testing all of the meters sampled in 2016 (i.e. meters installed in 2008) is £17,500. For a population of 25,000 the IST cost is £0.70 per meter.

This illustrates that the cost of IST per meter is inversely proportional to the population. It is therefore uneconomical from an IST perspective to have small meter populations.

#### 6.3.2.4 *Smart Meters*

Mandating smart meters for domestic consumers may result in a sudden increase in the number of installed MID electricity meters and the number of meter types available. If smart meters are rolled out over a 10 year period then it would be necessary to install around 2.7m smart meters each year.

Assuming the roll out begins in 2011 and is comprised of ten meter types, then the number of samples required for testing in 2019 may be:

| Meter Type | % of MID Population | Population | No Required for sampling |
|---|---|---|---|
| A | 18.5 | 500,000 | 200 |
| B | 14.8 | 400,000 | 200 |
| C | 13.9 | 375,000 | 200 |
| D | 13.0 | 350,000 | 200 |
| E | 10.7 | 290,000 | 200 |
| F | 9.6 | 260,000 | 200 |
| G | 7.2 | 195,000 | 200 |
| H | 5.9 | 160,000 | 200 |
| I | 3.6 | 95,000 | 150 |
| J | 2.8 | 75,000 | 150 |
| **TOTAL** | **100** | **2,700,000** | **1,900** |

At £50 per test, the cost of testing all of the meters sampled in 2019 (i.e. meters installed in 2011) is £95,000. For a population of 2.7m the IST cost is £0.04 per meter.

This illustrates that the IST costs per meter decrease as the population of MID meters increases (the maximum sample size being 200).

#### 6.3.2.5 *Cumulative Effect*

Electricity meters are first sampled after 8 years and then at 5 year intervals which results in a cumulative effect of the number of meters to be sampled as shown in Appendix 5. For example, in 2020 the sampling will include:

- The first (i.e. 8 year) sampling of meters installed in 2012; and
- The second (i.e. 13 year) sampling of meters installed in 2007, etc.

Note the longer sampling periods for electricity meters which means that less testing is required for electricity meters than gas – even though the population and asset life is greater for electricity meters.

However as the population of MID electricity meters increases over time it may be assumed that there would be an element of "churn" as meters would be returned when properties are demolished, etc.

Although the number of meters the MAM is requested to test is allocated in proportion to the population they have, one of the benefits of a national scheme is that meters to be sampled may be taken from any participating MAM.

The IST3 Group therefore assumed that, for any particular meter type, the number of meters available from churn would increase over the meters life. The assumptions are given below:

| Year | Taken off the wall (%) | Available from churn (%) | Total (%) |
|---|---|---|---|
| 8 | 100 | 0 | 100 |
| 13 | 50 | 50 | 100 |
| 18 | 0 | 100 | 100 |
| 23 | 0 | 100 | 100 |

The IST3 Group assumed the average cost of an electricity meter test to be £15 when the meters are taken from churn.

This reduces the cost of meter testing as shown in the following examples:

- Year 13: 50% of the meters required for sampling are taken off the wall (at £50 per meter test) and 50% are available from churn (at £15 per meter test); and
- Year 18: 100% of the meters required for sampling are available from churn (at £15 per meter test).

In contrast, a MAM implementing their own scheme is unlikely to have sufficient samples available from churn even towards the end of a meters life. All of the meters required for sampling would therefore need to be taken off the wall (at £50 per meter test).

#### 6.3.2.6 *Lifetime Costs*

The cost of IST may be illustrated as a cost per meter model expressed over the period the meter remains in service (assumed 23 years).

Using the above example of Meter A installed in 2007 (75 samples required), the cost of testing this meter is:

| Year | | | | | |
|---|---|---|---|---|---|
| 2030 | | | | | £1,125 |
| 2025 | | | | £1,125 | |
| 2020 | | | £2,438 | | |
| 2015 | | £3,750 | | | |
| 2007 | Install | | | | |
| | 0 | 1st | 2nd | 3rd | 4th |
| | | | **Sample Number** | | |

The total cost of IST for Meter A is £8,438 over the life of the meter. For example, with a population of 4,000 the lifetime cost is £2.11 per meter to ensure that, statistically, the population remains accurate for 23 years in-service.

#### 6.3.2.7 *Capped Costs*

Although sample size is related to population it is limited to a maximum of 200 (applicable to populations greater than 150,000). It follows that the IST cost for populations greater than 150,000 would not exceed:

| **Year** | | | | | |
|---|---|---|---|---|---|
| 2030 | | | | | £3,000 |
| 2025 | | | | £3,000 | |
| 2020 | | | £6,500 | | |
| 2015 | | £10,000 | | | |
| 2007 | Install | | | | |
| | 0 | 1st | 2nd | 3rd | 4th |
| | | | **Sample Number** | | |

The total IST cost for any meter type is therefore "capped" at £22,500. With a population of 150,000 the cost is £0.15 per meter to ensure that, statistically, the population remains accurate for 23 years in-service. However for a population of 500,000 this cost reduces to £0.05 per meter.

#### 6.3.2.8 *Super Populations*

The number of electricity meters required for sampling is further reduced by having "super populations" in which up to five years of manufacture of meters of the same type may be combined together. The results obtained from tests on samples from the first year's population may then be applied to subsequent years without further testing. This is shown in Appendix 6.

If the roll out of smart meters begins in 2011 and is comprised of ten meter types then a super population means that meters of a particular type installed in 2012 – 2015 can be considered to be part of the 2011 population. Assuming an installation of 2.7m meters per year then the number of samples required for testing in 2019 may be:

| **Meter Type** | **Annual installation** | **Super Population** | **No Required for sampling** |
|---|---|---|---|
| A | 500,000 | 2,500,000 | 200 |
| B | 400,000 | 2,000,000 | 200 |
| C | 375,000 | 1,875,000 | 200 |
| D | 350,000 | 1,750,000 | 200 |
| E | 290,000 | 1,450,000 | 200 |
| F | 260,000 | 1,300,000 | 200 |
| G | 195,000 | 975,000 | 200 |
| H | 160,000 | 800,000 | 200 |
| I | 95,000 | 475,000 | 200 |
| J | 75,000 | 375,000 | 200 |
| **TOTAL** | **2,700,000** | **13,500,000** | **2,000** |

Note that although the number of meters required for sampling in 2019 has increased from 1,900 (in the example given above) to 2,000 - no further sampling of these super populations is required until 2024.

At £50 per test, the cost of testing all of the meters sampled in 2019 (i.e. meters installed 2011 - 2015) is £100,000. For a population of 13.5m the IST cost is less than £0.01 per meter.

The disadvantage of super populations is that up to five years meter population may be "condemned" from the results of sampling only 200 units (e.g. using the above example of Meter A, the use of super populations could indicate that a population of 2.5m units needs to be removed following the testing of only 200 meters).

As the cost of electricity IST is significantly lower than gas, MAMs may decide that the use of super populations is too risky.

### 6.3.2.9 *Cost Projection:*

The cost of IST may be represented as either an annual cost or as a lifetime cost for a specific meter type. These may be combined to produce a model projecting the future cost of IST.

The annual costs for electricity meter IST in 2015 and 2016 are detailed above and summarised in Table 5 below:

*Table 5*

| Installation Year | MID Population | Sampling Year | Annual IST Cost | Cost per Meter |
|---|---|---|---|---|
| 2007 | 10,000 | 2015 | £11,250 | £1.13 |
| 2008 | 25,000 | 2016 | £17,500 | £0.70 |

These costs are relatively high compared to the number of MID electricity meters installed. However smart metering will mean that 2.7m meters will be installed every year from 2011 to 2014. Assuming the roll out is comprised of ten meter types then the population of each meter type will be around 270,000.

The lifetime IST cost for any meter type is "capped" at £22,500 for populations greater than 150,000. It follows that the cost of sampling this meter throughout its life is also "capped", and for ten meter types installed in 2011 the maximum IST costs are shown in Table 6 below:

*Table 6*

| **Year** | | | | | |
|---|---|---|---|---|---|
| 2034 | | | | | £30,000 |
| 2029 | | | | £30,000 | |
| 2024 | | | £65,000 | | |
| 2019 | | £100,000 | | | |
| 2011 | Install | | | | |
| | 0 | 1st | 2nd | 3rd | 4th |
| | | | **Sample Number** | | |

These maximum IST costs are based on 10 meter types, each with a population greater than 150,000 (i.e. a total of 2,000 samples). It should be noted that IST costs will be reduced if the meter populations are such so that fewer samples are required (e.g. 1,900 samples are illustrated on page 24).

Appendix 5 illustrates the cumulative effect of sampling being repeated after 8 years and then at 5 year intervals and this may also be shown in Table 7 below:

*Table 7*

| **Testing Year** | **Installation Year** | | |
|---|---|---|---|
| | **1st Sample** | **2nd Sample** | **3rd Sample** |
| 2015 | 2007 | | |
| 2016 | 2008 | | |
| 2017 | 2009 | | |
| 2018 | 2010 | | |
| 2019 | 2011 | | |
| 2020 | 2012 | 2007 | |
| 2021 | 2013 | 2008 | |
| 2022 | 2014 | 2009 | |
| 2023 | 2015 | 2010 | |
| 2024 | 2016 | 2011 | |
| 2025 | 2017 | 2012 | 2007 |

The model projecting the future cost of IST is developed by combining Tables 5, 6 and 7 to give the maximum IST costs for ten meter types installed in 2007 onwards as shown in Table 8:

*Table 8*

| **Testing Year** | **Testing Cost** | | | |
|---|---|---|---|---|
| | **1st Sample** | **2nd Sample** | **3rd Sample** | **Total** |
| 2015 | £11,250 | | | £11,250 |
| 2016 | £17,500 | | | £17,500 |
| 2017 | £37,500 | | | £37,500 |
| 2018 | £37,500 | | | £37,500 |
| 2019 | £100,000 | | | £100,000 |
| 2020 | £100,000 | £11,250 | | £111,250 |
| 2021 | £100,000 | £17,500 | | £117,250 |
| 2022 | £100,000 | £37,500 | | £137,500 |
| 2023 | £100,000 | £37,500 | | £137,500 |
| 2024 | £100,000 | £65,000 | | £165,000 |
| 2025 | £100,000 | £65,000 | £11,250 | £176,250 |

It is assumed:

- The population of MID meters installed in 2007 and 2008 are so small that all samples would need to be taken off the wall (i.e. there will be no churn throughout the life of this meter). The testing cost of the meters installed in these years would therefore remain constant; and

- In 2009 and 2010 manufacturers would be trialling new designs of smart meters prior to roll out commencing in 2011. The IST costs for meters installed in these years are therefore based on the assumption of ten meter types with 100,000 meters installed each year (i.e. each meter type has a population of 10,000 units with 75 units required for sampling). Again the population is such that all samples would need to be taken off the wall.

#### *6.3.2.10 Cost for a Single MAM:*

As explained previously, the benefits of a national scheme are that:

- Meters to be sampled may be taken from any participating MAM resulting in reduced testing costs because of the availability of meters from churn.
- Reduced administration costs resulting from the economies of scale.

For an individual MAM with a population of 2.7m electricity meters it would be necessary to install 270,000 meters each year during the 10 year roll out of smart meters. If these consist of four meter types, each with a population of 67,500, then a total of 600 meters will need to be sampled every year (i.e. four lots of 150 meters). If the roll out commences in 2011 then, at £50 per test, the testing cost in 2019 will be £30,000.

As the roll out continues the testing cost will increase because of the cumulative effect of sampling at 8 years then at 5 year intervals. The following table shows a comparison between the testing costs of this single MAM and the national scheme shown in Table 8:

| **Testing Year** | **Testing Costs** | |
|---|---|---|
| | **National Scheme** | **Single MAM** |
| 2019 | £100,000 | £30,000 |
| 2020 | £111,250 | £30,000 |
| 2021 | £117,250 | £30,000 |
| 2022 | £137,500 | £30,000 |
| 2023 | £137,500 | £30,000 |
| 2024 | £165,000 | £60,000 |
| 2025 | £176,250 | £60,000 |
| **AVERAGE** | £134,964 | £38,571 |

For a single MAM with 2.7m electricity meters (i.e. 10% of the total UK population) the average cost of an individual testing scheme will be £38,571 (i.e. 29% of the cost of the national scheme).

Note these figures do not include the administration cost which will also be borne by the individual MAM.

## 6.4 *Conclusions*

The total cost of implementing the IST system for gas and electricity meters comprises of:

- The setup costs for the governance arrangement in 6.1 (the cheapest option i.e. governance by NMO/Ofgem is shown). This figure is shown amortised over five years.
- The annual operational costs in 6.2 (the cheapest options i.e. admin by a standalone scheme or NMO/Ofgem is shown).
- The gas meter costs in section 6.3.1 (Table 4).
- The electricity meter costs in section 6.3.2 (Table 8).

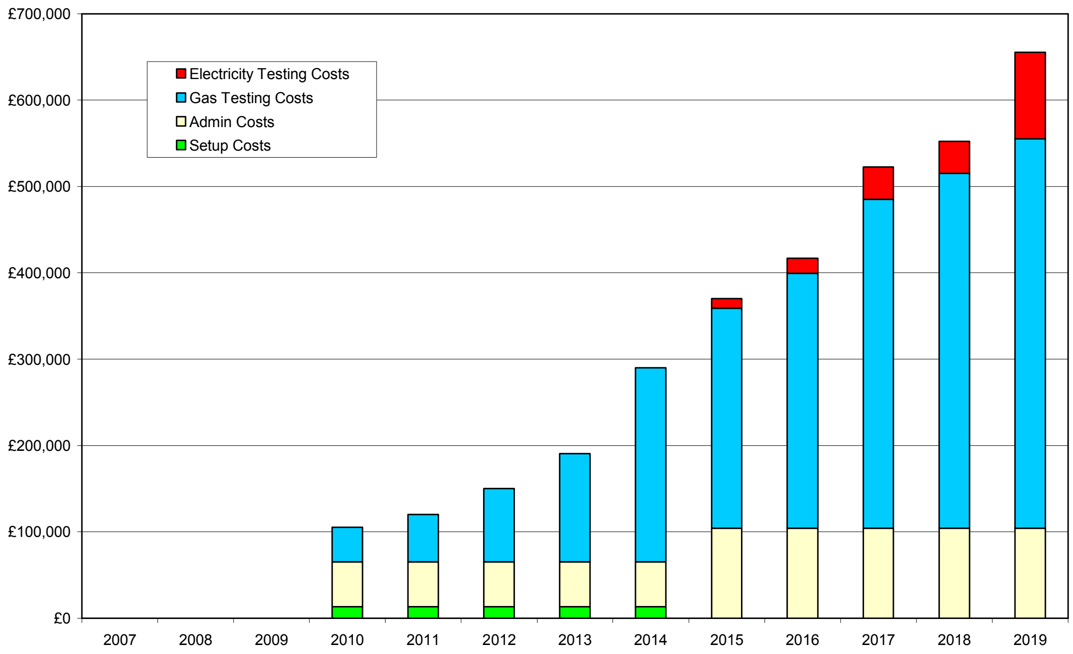
These are summarised below:

| Testing Year | Paid By Industry | | Paid By MAM | | Total |
|---|---|---|---|---|---|
| | Setup Costs | Admin Costs | Gas Costs | Electricity Costs | |
| 2010 | £13,000 | £52,000 | £40,375 | - | £105,375 |
| 2011 | £13,000 | £52,000 | £55,250 | - | £120,250 |
| 2012 | £13,000 | £52,000 | £85,000 | - | £150,000 |
| 2013 | £13,000 | £52,000 | £125,375 | - | £190,375 |
| 2014 | £13,000 | £52,000 | £225,250 | - | £290,250 |
| 2015 | - | £104,000 | £255,000 | £11,250 | £370,250 |
| 2016 | - | £104,000 | £295,375 | £17,500 | £416,875 |
| 2017 | - | £104,000 | £381,250 | £37,500 | £522,750 |
| 2018 | - | £104,000 | £411,000 | £37,500 | £552,500 |
| 2019 | - | £104,000 | £451,375 | £100,000 | £655,375 |

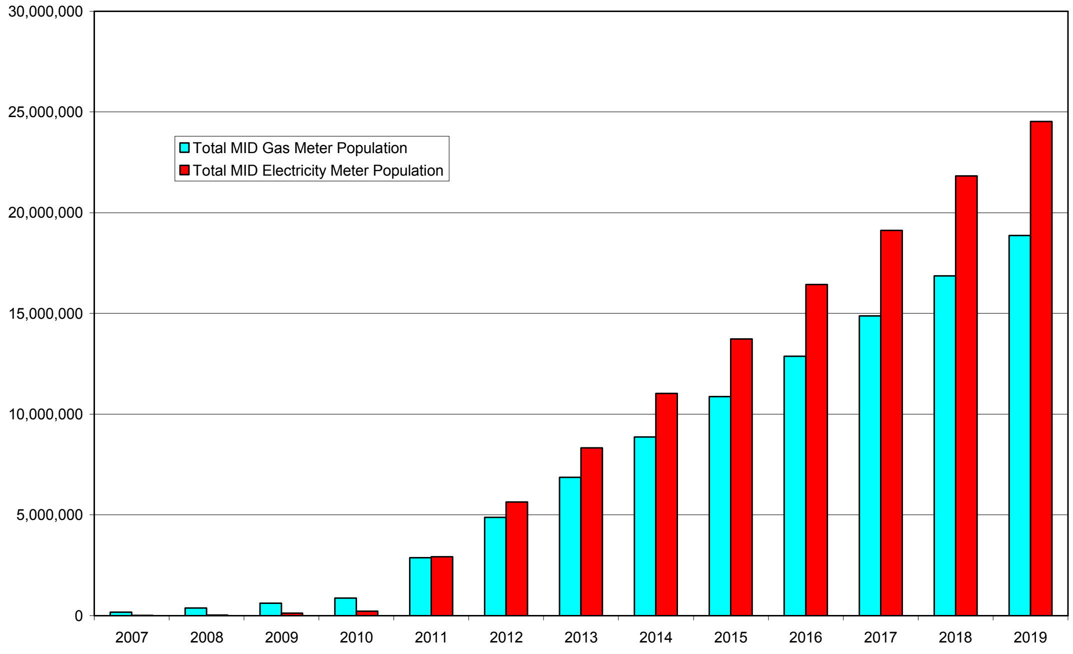
Note:

- These figures do not include any RPI increase;
- IST testing of electricity meters does not start until 2015 and for this reason the administration costs are shown halved from 2010 to 2014 although in practice half of the set up costs should be recovered from the electricity sector; and
- These figures do not include "super populations" which would further reduce the cost of electricity meter testing. However there is a significant risk in using super populations as detailed above.

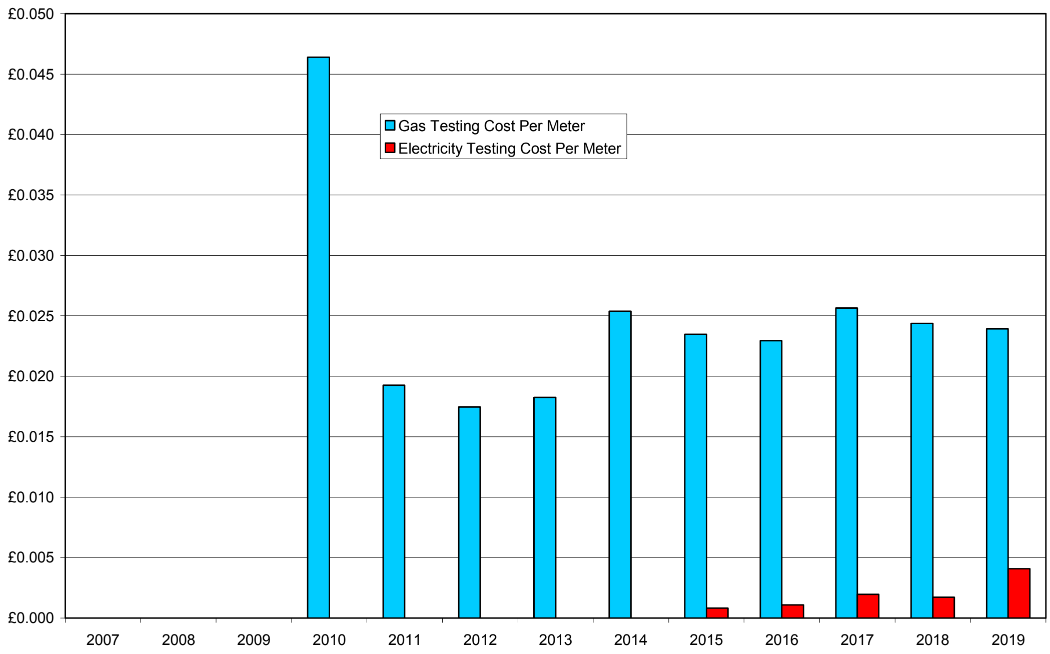
**Graph 1: Predicted total cost of IST:**




**Graph 2: Predicted number of installed MID gas and electricity meters:**



**Graph 3: Predicted cost of IST per meter:**




# 7 Long Term Costs

The above graphs illustrate the gradual increase in IST costs resulting from the rollout of MID smart meters. It is extremely difficult to predict the long term costs of IST although, using the same assumptions and costs, the model may be extended as follows:

## *7.1 Theoretical*

In this model the smart meter rollout is completed in 2020 although:

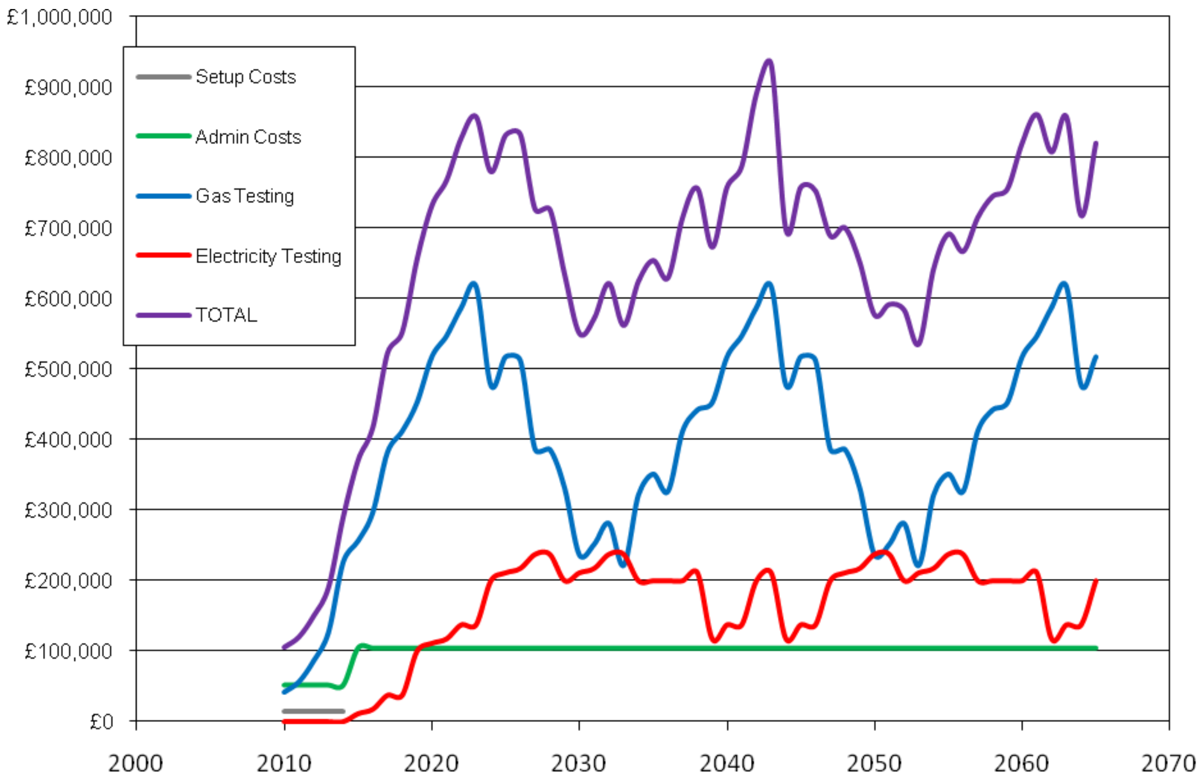
- All gas meters have 20 year asset lives and meters installed in 2007 will continue in service until 2027.
- In the year 2027, the gas meters installed in 2007 have reached the end of their asset live and are replaced.
- Consequently no gas meters are installed between 2021 and 2026 (although IST testing costs are incurred in this period).
- In the year 2028, all gas meters installed in 2008 are replaced, etc.

Similarly for electricity meters:

- All electricity meters have a 23 year asset lives and meters installed in 2007 will continue in service until 2030.
- In the year 2030, the electricity meters installed in 2007 have reached the end of their asset live and are replaced.
- Consequently no electricity meters are installed between 2021 and 2029 (although IST testing costs are incurred in this period).
- In the year 2031, all electricity meters installed in 2008 are replaced, etc.

As a result of these assumptions, following the initial "ramp up", the testing cost for both gas and electricity meters is "cyclic" as shown below:

**Graph 4: Theoretical long term costs of IST:**




## *7.2 Predicted*

MID gas and electricity meters can continue in service for as long as they continue to meet the requirements. In practice some meter types will fail before the anticipated 20/23 year life while other types will continue in service for longer periods. It is also highly unlikely that there will be no gas meters installed 2021 to 2026 and no electricity meters installed 2021 to 2029. The addition of these factors will "blur" the cyclic nature of the theoretical testing costs shown in Graph 4 and it is likely that a "steady state" will eventually be reached.

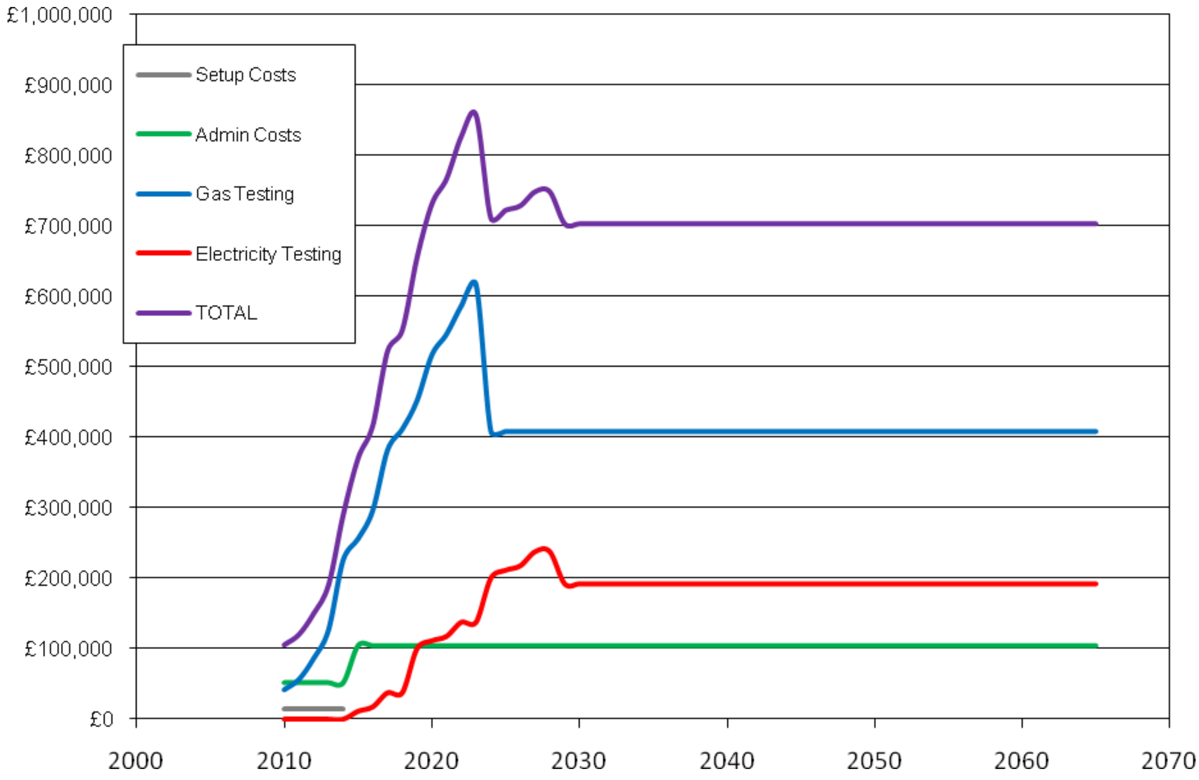
The "steady state" will occur after the completion of the smart meter rollout in 2020 and it may be estimated by averaging the theoretical costs given above.

- Gas testing costs - Average of one full cycle (2024 to 2043) = £ £407,688
- Electricity testing costs - Average of one full cycle (2029 to 2051) = £ £191,957

Plus annual cost of the administration arrangements = £104,000

- Total "steady state" IST Cost = £703,644

**Graph 5: Predicted long term costs of IST:**




# 8 Current Costs

The Group considered the costs of the current testing lead by the UKMF for electricity meters (the "National Sample Survey") and individual MAMs for gas meters.

## *8.1 Electricity*

The current electricity meter testing is operated by a number of MAMs jointly under the leadership of the UKMF. The testing is performed near the end of the meter type's certified life. It is assumed all meters used for test are recovered from churn.

| | |
|---|---|
| 10 meter types, with sample size of 150 meters at a test cost £15 each | £22.5k |
| UKMF management and admin | £7.5k |
| SGS costs | £10k |
| Ofgem/NMO (assumed nil to be comparable with MID regime) | Nil |
| TOTAL | £40k |

## *8.2 Gas*

The current gas meter testing is operated by a number of MAMs independently. The testing is performed at regular intervals throughout the meter life. It is assumed all meters used for test are recovered from churn for MAM1 and 50% for MAM 2, 3 & 4.  Testing by further MAMs has been ignored.

| | |
|---|---|
| MAM 1 – 4,000 meters/yr, at a test cost £15 each | £60k |
| MAM 2, 3 & 4 – 1,500 meters/yr, at a test cost of £85 (removed) | £127.5k |
| MAM 2, 3 & 4 – 1,500 meters/yr, at a test cost of £15 (churn) | £22.5k |
| Ofgem/NMO (assumed nil to be comparable with MID regime) | Nil |
| TOTAL | £210k |

## 8.3 *Commentary*

The total current costs to industry are therefore estimated to be £250k.

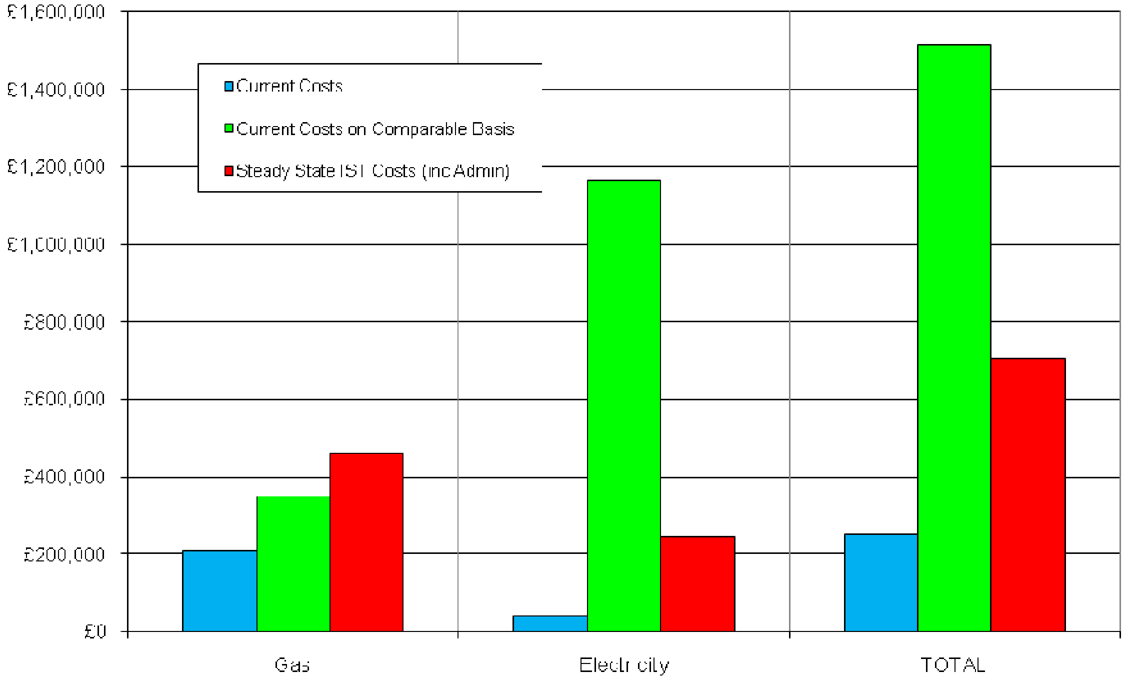
The current arrangements and the proposed IST arrangements differ in several significant respects from the current processes:

- All electricity meters are assumed to be from churn, IST proposals recognise this will not be possible. This would add 1,500 meters at additional cost of £35, added cost of £52.5k
- Electricity arrangements use super populations, this reduces numbers of meters tested. The IST analysis in this report does not assume super populations are used. This would increase the numbers of meters tested by five times. Adding 5 times to the costs (£22.5k +£52.5k), £375k
- The electricity meters are currently only tested at the end of their life, whereas the IST arrangements assume three tests. This would add three times the electricity costs, 3 times £375k, £1,125k
- All gas meters are assumed to be from churn, IST proposals recognise this will not be possible. This would add 4,000 meters at additional cost of £35, added cost of £140k

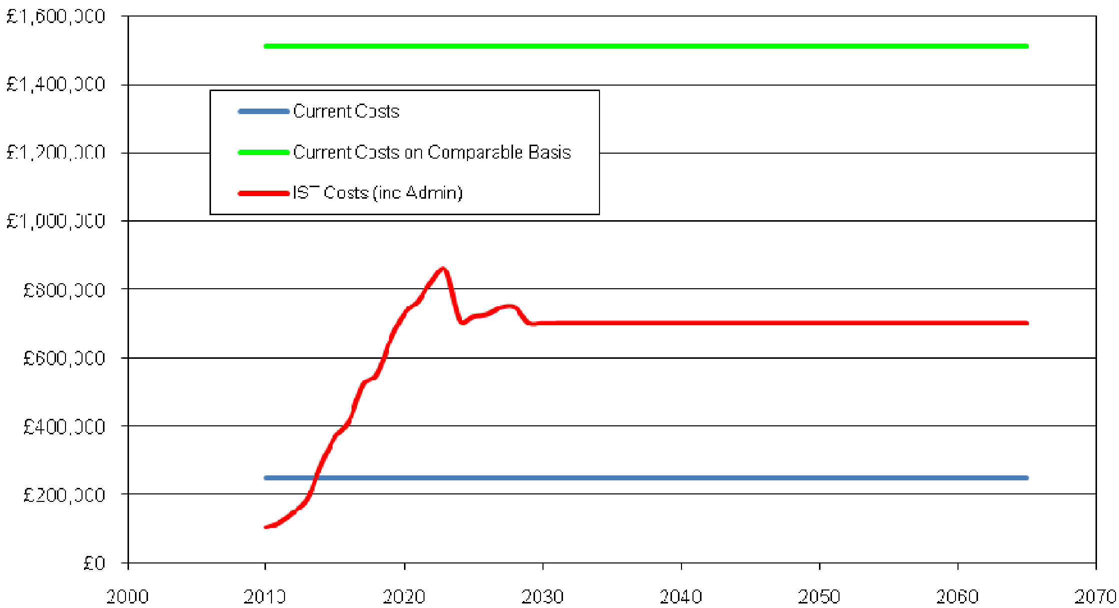
So the current arrangements on a comparable basis to the IST arrangements would be £250k, plus £1,125k, plus £140k. A total, on a comparable basis of £1,515k.

One of the "areas for future work" identified in the IST Report was to extend the IST arrangements to include meters approved under UK national legislation (i.e. to merge the current testing schemes into IST). Although this will require further work by IST/IMAG it will mean that it is not necessary to run the existing schemes in parallel with IST. This will lead to obvious cost benefits as there will be only one set of governance/admin costs for all gas and electricity meters used in the UK.

**Graph 6: Comparison of IST cost with current costs:**




**Graph 7: Comparison of IST cost with current costs:**



## *8.4 Conclusions*

It is apparent that the cost of IST is significantly greater than the current regimes used for gas and electricity meters although a direct comparison cannot be made for the reasons outlined above.

The IST report was developed by industry "experts" although it remains, as yet, untested. When practical experience of IST has been gained it may be possible to refine the IST system to reduce testing costs by:

- Increasing the testing periods. If, for example, the testing period for gas meters was increased from 3 years to 5 years then the "capped" cost for testing any particular meter type would reduce significantly.
- Applying the concept of super populations in which up to five years manufacture of meters may be combined together. Super populations are equally applicable to gas meters and, combining even (say) 2 years production could half the testing costs for a particular meter type.

It is clearly in everybody's interest that the IST methodology is cost effective and the Governance Body/Regulator would be supportive of any refinement to the IST system that would reduce the burden to the industry. However there must be supporting evidence for any proposed changes i.e. changes should not be made solely to reduce costs.

The cost of IST could also be reduced by standardising the number of meter types. This costing report is based on 10 domestic meter types for both gas and electricity. However the mass rollout of smart meters will mean that meters are not being exchanged piecemeal and MAMs may decide to standardise their assets (if only to reduce the cost of IST).

It should also be remembered that:

- Doing nothing is not an option. There is a legislative requirement for meters to be kept in proper order, etc.
- Maintaining the current National Sample Survey is also not an option. MID meters do not have a certification life and meters approved under UK national legislation cannot be placed on the market after 2016.
- An effective IST scheme should lead to increased consumer confidence (although clearly it is impossible to quantify this). Increased confidence should result in a reduction in the number of disputed meters (which the industry indirectly pays for).
- The model assumes that all gas meters have a 20 year life and all electricity a 23 year. This results in the "steps" in the costs as tranches of meters are replaced. In practice this will not occur and MID meters can continue in-service for as long as they continue to meet the requirements.

# 9 Implementation Approach

This section discusses how the IST regime could be implemented and highlights the advantages and disadvantages of the three governance options set out in section 3 above.

## *9.1 Incorporate into existing code governance*

Under this option IST for electricity meters would be captured under the BSC and gas meters would fall under MAMCoP. In the electricity regime Suppliers are required to become parties to the BSC and would therefore be responsible for ensuring that their MAMs comply with the testing requirements. In the gas regime the MAMCoP applies directly to MAMs. In addition, Suppliers to domestic consumers are obliged by their Licence conditions to use MAMs that comply with the MAMCoP.

The following advantages and disadvantages have been highlighted in relation to this option:

**Advantages**:

- Ease of adoption into existing arrangements;
- Use of established cost recovery mechanisms; and
- Use of existing validation processes and sanctions for non-compliance.

**Disadvantages**

- Potential for divergence between gas and electricity regimes; and
- Separate (competitive) appointment processes and duplication for IST administration.

### 9.1.1 Electricity

#### *9.1.1.1 Incorporating the IST Requirements*

Under the BSC, Code of Practice (CoP) 4 'Code of Practice for the Calibration, Testing and Commissioning Requirements of Metering Equipments for Settlement Purposes' currently contains requirements for Half Hourly Meters, including requirements to carry out IST. In addition there is a place holder for any new requirements to cover testing of Non Half Hourly Meters. Therefore the new IST requirements could be incorporated within CoP 4. The BSC Panel would need to appoint an administration body to manage the process for defining samples and collating and reporting results.

#### *9.1.1.2 Governance*

In addition to the technical requirements that would be included in CoP4, the new IST regime requires a governance process to cover enforcement, cost recovery and change management. These requirements would need to be included in the BSC itself and therefore a modification would need to be raised, progressed and approved. It should be noted that the BSC already contains provisions for enforcement, cost recovery and change management, therefore the modification would focus on ensuring that the current provisions can be extended to cover the new testing regime. Some of the enforcement aspects may require referral to Ofgem/NMO in the same way that some of the current breach and default provisions require Ofgem involvement.

It is anticipated that this modification would be raised by a BSC Party and progressed through the standard modification procedures which would involve a full industry impact assessment to ascertain costs and timescales for implementation (n.b. the work performed by the IST3 Group would be taken into account here) and also a full industry consultation to consider the benefits of the proposal in terms of the Applicable BSC Objectives. This consultation is open to BSC Parties, party agents and other interested parties.

#### *9.1.1.3 Participation and compliance*

Electricity Suppliers are obliged by their Licence to become a party to the BSC, and are therefore obliged to comply with all of the relevant requirements. Party Agents such as Meter Operators are not able to accede to the BSC themselves, therefore it is the Supplier's responsibility that all of its agents comply.

Meter Operators are Qualified under the BSC and the BSC Auditor carries out an annual audit to confirm that Parties and Party Agents are compliant with the BSC and its subsidiary documents. The scope of the audit could be extended to capture compliance with the requirements of the IST scheme. Alternatively the BSC includes a process for technical assurance checks which could also be extended to cover the IST requirements. Parties failing to comply could be referred to the BSC Panel with further escalation to the Authority if necessary.

### 9.1.2 Gas

#### *9.1.2.1 Incorporating the IST Requirements*

The MAMCoP currently includes a section at 17.5 on verification of meter accuracy. (See Appendix 2 for text). Thus, the new arrangements defined for IST could be incorporated into the MAMCoP and the governance provided by the MAMCoP Scheme Management Board. The terms of reference for the MAMCoP Scheme Management Board describe a change process by which the IST rules could be included in MAMCoP.

The Scheme Management Board could be charged with selecting a body to provide administration of the scheme. This could potentially be the same body that would provide services to the BSC.

#### *9.1.2.2 Governance*

The MAMCoP Scheme Management Board meets on a quarterly basis, under Ofgem chairmanship, and is attended by MAMs and other parties. The MAM approval/qualification is handled by Lloyds Registrars (under contract to Ofgem). The MAMCoP itself is mostly a technical route map that refers to other legislation and standards. The MAMCoP section 17.5 could be amended so that it requires MAMs to participate in meter testing in accordance with the IST arrangements. This would require the IST arrangement to be captured in whole by the MAMCoP (although it may be necessary to undertake some redrafting to restrict the document to references relating only to gas meters.

By its nature and constitution the MAMCoP is primarily an organisation for MAMs and therefore does not normally have the perspective of wider industry interests. The Scheme Management Board would be well qualified to consider technical issues relating to appeals or modifications to the parameters of the testing. If the scheme needed a more fundamental review then the governance body should take into account a broader range of views and should for example commission consultations and debate such as delivered by IMAG.

#### *9.1.2.3 Participation and compliance*

Domestic gas suppliers are obliged by Licence to employ a MAM that is accredited under the MAMCoP. Thus, if the MAMCoP contains obligations to comply with a particular meter proving scheme (or to otherwise demonstrate appropriate alternative arrangements) then MAMs will need to comply in order to retain their Ofgem approval.

Lloyds registrars conduct periodic audits on MAMs to test compliance. The scope of that audit could be extended to capture compliance with the requirements of the IST scheme. (Note that such audit would not expect to cover the technical evaluation of the meter testing itself; that aspect should be ensured through approval of the test station.)

The inclusion of governance for IST would be marginal to the existing costs for the MAMCoP scheme management. Currently the board is supported by (free) participation of members. Ofgem provides chairmanship, hosting and secretariat. Individual MAMs are responsible for settling the costs of audit directly with Lloyds registrars. The obligations within the MAMCoP would have to be extended to require MAMs to contribute towards the costs of the IST administration body.

## 9.2 Develop new industry governance and code(s)

The new arrangements could stand separately for gas and electricity or could be combined under a single facilitating code. Whilst a single code and governance that focuses expertise, experience and effort associated with IST in single activity rather than across the two sectors might ensure consistency, the 'stand-alone' nature makes it more difficult to deliver as it does not benefit from the existing governance infrastructure. In addition, the need to co-ordinate network and metering activities and also metering and supplier activities would in any case drive a requirement for interfaces with the bodies holding responsibilities in these other sectors.

**Advantages**:

- Greater consistency across both fuels under a single organisation; and
- Specialist knowledge pool would be created relating to metering issues.

**Disadvantages**:

- Potentially greater effort to create a new scheme;
- Unclear who would appoint the scheme operator(s);
- New stand-alone fund raising mechanism may be required; and
- Expert input required and as this would probably be drawn from BSC and MAMCoP it would lead to duplication.

#### 9.2.1.1 Implementing the IST Requirements

A new arrangement would need to be set up and an exercise conducted to appoint the scheme operator(s); either stand-alone electricity and gas or alternatively under a single new code. In the former, the industry sectors could separately commission independent arrangements. In the latter the arrangements would more sensibly be constructed under governance of a body such as Ofgem or NMO that has oversight across gas and electricity.

A new stand-alone scheme operated by a third party would require funding from participants. The scheme(s) would require a commercial contract in order to levy charges on participants. There would be several elements to the costs;

- Development of agreement (legal resource requirement);
- Accession of all relevant parties;
- Appointment of auditor;
- Secretariat for scheme management group(s);
- Reimbursement of costs for scheme management meetings;
- Periodic charges to participants; and
- Audit of compliance could be centrally funded or paid separately by each participant.

It is presumed that unless the scheme is to be operated by an industry regulator itself it would be necessary to undertake a formal competitive tendering for the services. In practice it is unclear how such an exercise could be conducted other than by the Regulators (Ofgem/NMO) as there are no other entities (other than BSC and MAMCoP) with the powers to award concession contracts on behalf of the industry.

Ofgem has indicated that it is not a preferred option for it to take on responsibility for procuring the services of a scheme operator although NMO would consider this.

#### 9.2.1.2 Governance

The governance arrangements would have to be developed as a part of the appointment of the scheme manager. It is likely that arrangements would be chosen based on models already in use in the industry. It is likely that the Governance Body would need the support of experts drawn from BSC and MAMCoP.

#### 9.2.1.3 Participation and compliance

In the case of a single scheme or separate electricity and gas arrangements it would be necessary to construct an obligation for MAMs to comply with the relevant rules. A suitable mechanism could be to place obligations in the Energy Supplier licence such that a supplier must contract only with MAMs that participate in the relevant scheme(s). Alternatively, the obligations could be inserted into the BSC and MAMCoP and thereby require MAMs to support the scheme. In the latter case it would be necessary to progress modifications to the relevant Codes in order to insert such obligations.

## 9.3 Ofgem or NMO to enforce compliance under statutory powers

#### 9.3.1.1 Ofgem – NMO transfer

The 2008 Energy Bill provided for the transfer of technical gas and electricity metering responsibility from Ofgem to NMO. Since April 2006 most of these statutory functions in relation to the technical aspects of gas and electricity meters have been carried out by NMO under an administrative arrangement set out in a memorandum of understanding.

This was a first stage in creating a single point of reference and expertise for measuring instruments in the UK and ensuring full alignment of UK legal metrology policies, particularly regarding consistency with the MID.

The transfer involves only those functions of Ofgem which relate to legal metrology (essentially the accuracy of meters and ensuring long term conformance to performance requirements), NMO will not be assuming responsibility for other areas of policy relating to meters (such as rollout of smart meters or the rules covering, or application, of prepayment metering systems).

#### 9.3.1.2 Implementing the IST Requirements

Regulators could ensure compliance with the Electricity and Gas Acts using the IST1/2 methodology to evaluate whether the responsible parties are "maintaining meters in proper order". For example, the IST1/2 methodology could be published in the form of a 'guidance note' and the regulatory test would ask whether parties could demonstrate compliance with the advice.

Where such responsibility rests on the energy supplier it is to be expected that suppliers would 'back-off' such obligations through contractual arrangements with their MAMs.

An alternative model, where the regulator acts to appoint an administration body tends towards the solution in options 1 and 2 above.

A difficulty may remain if the regulator is acting in the role of judge and 'executioner', i.e. if it is acting to operate the governance scheme and also providing final decisions (after appeal) in respect of particular MAMs or meter models. However this currently happens in other circumstances so should not be a problem.

**Advantages**:

- Requires no industry-wide development; and
- Costs could be recovered through Supplier licence fees.

**Disadvantages**:

- Lacks transparency and therefore subject to legal challenge;
- No obvious arrangement for co-operation between parties, therefore this may be inefficient; and
- May compromise regulatory independence to hear 'appeals'.

If costs are recovered through licence fees then it would be impractical to disaggregate the costs, i.e. there would be no 'refund' for any party wishing to exercise the 'opt-out'.

# 10 Other Issues

The IST3 Group discussed other issues that were relevant to all options:

## *10.1 Opting Out*

The IST1/2 report allows that MAMs could opt-out from the central scheme if they are able to demonstrate compliance through an alternative that is equal or superior.

Some concerns have been identified regarding 'free-riding' if the results of the central scheme are published and thus available to all MAMs regardless of their participation in the scheme.

A MAM wishing to opt out would need to demonstrate robustness of its results and accept that the process and results should be subject of independent scrutiny. It is likely that industry 'expertise' will be vested in the established IST scheme so these may in any event be the means by which a MAM is able to validate any alternative scheme.

In addition, a MAM wishing to act independently would need to ensure that samples are drawn in sufficient size to ensure statistical robustness. The minimum sample sizes that are specified under IST1/2 would apply and for this reason it may be more viable for a MAM to 'pool' its sample requirements. In addition, the availability of meters from 'churn' has a significant effect on the costs of operating a testing scheme, particularly in the early years when it is anticipated that there will be very few meters in churn.

In any case, should a MAM choose to opt in or out, they should remain in or out of the scheme for the duration of the process.

## *10.2 Commercial Confidentiality and Freedom of Information*

In simple terms, if information is held by a public body e.g. Ofgem or NMO, then disclosure of that information may be requested under the Freedom of Information Act 2000. The experience to date has been that detailed information identifying specific manufacturers or owners of meters is considered to be commercially sensitive and thus may be exempt from disclosure. Cases presented to the Information Commissioner continue to build the precedent in this area.

An alternative point of view on this matter is to establish with meter vendors that such information would be made available to all relevant parties in the industry to promote transparency and confidence in the processes.

# 11 Terms Used In This Document

| Acronym/Term | Definition |
| --- | --- |
| BSC | Balancing and Settlement Code |
| CoP | Code of Practice |
| IMAG | Industry Metering Advisory Group |
| IST | In Service Testing |
| MAM | Meter Asset Manager[4] |
| MAMCoP | Meter Asset Manager Code of Practice |
| MAP | Meter Asset Provider |
| MID | Measurement Instrument Directive |
| NMO | National Measurement Office |
| UKMF | UK Metering Forum |

# 12 References

| Ref. | Document Title | Owner |
| --- | --- | --- |
| 1 | IST1/2 Report | IMAG |
| 2 | IST3 Terms of Reference | IMAG |

[4] The term MAM is used throughout this document to include Meter Operators

## Appendix 1: IST3 Group Membership

| Member | Organisation |
|---|---|
| Tom Chevalier (Chairman) | Association of Meter Operators (AMO) |
| Alan Dick (Secretary) | UK Metering Forum (UKMF) |
| Keith Campion | ELEXON |
| Sarah Jones | ELEXON |
| Bob Gibbs | Energy Retailers Association (ERA) |
| Eric Fowler | National Grid Metering |
| David Moorhouse | National Measurement Office (NMO) |
| Steve Rowe | Ofgem |

## Appendix 2: MAMCoP Extract

17.5 Verification of Meter Accuracy

17.5.1 Meters shall be maintained in proper working order for registering the quantity of gas supplied. This can be achieved by an appropriate maintenance regime described in Section 12 or by the procedure in sub-section 17.5.2. *Note: In addition to the requirements of the MAMCoP, there may be additional contractual requirements.*

17.5.2 Procedure for Sample Testing

- If sampling is employed, it shall be undertaken periodically by manufacturer, meter designation, badged capacity and year. Sample sizes shall be statistically robust with respect to determining the in-service accuracy requirements determined by legislation or best industry practice.

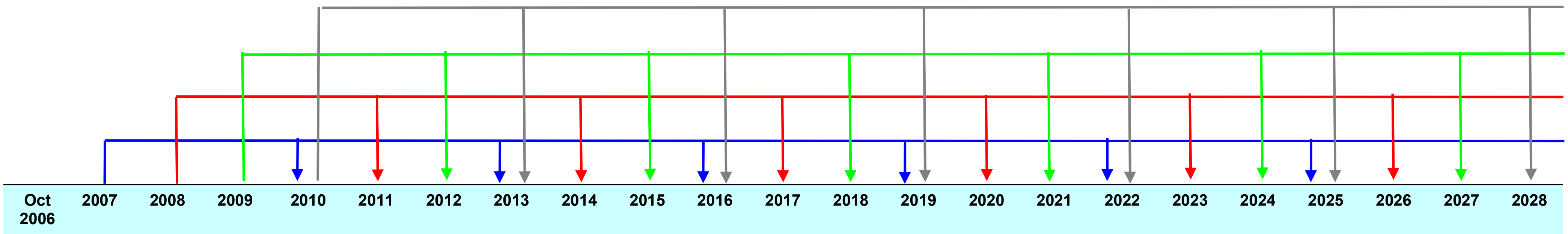
- Appropriate testing of meters shall be carried out using test equipment calibrated to nationally traceable standards and recommended test procedures. Records of results of the sampling exercise shall be maintained such that the requirements to maintain meters in proper working order for registering the quantity of gas supplied can be evidenced to interested parties (for example Ofgem, meter manufacturers).

## Appendix 3: Example Test Reports

The example test reports for electricity and gas are attached as attachment 1 and 2 respectively.

## Appendix 4: Gas Meter Sampling

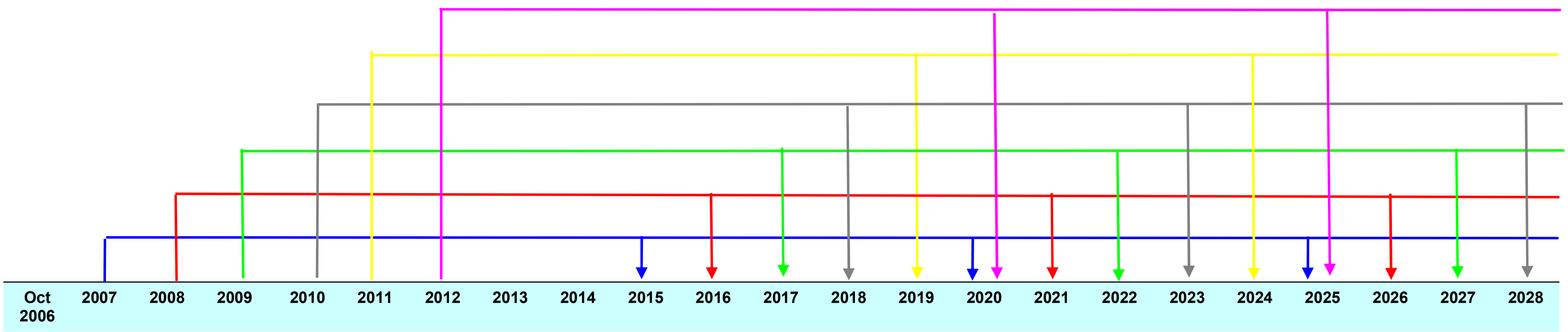
The cumulative effect of gas meter sampling illustrated for four years of meter installations (2007 – 2010):




- MID gas meters will be sampled six times over a 20 year asset life.
- Following successful sampling the meters are returned to circuit and reused.
- On the sixth sample it is assumed the meters do not meet the IST requirements and are removed from service. However, one of the benefits of IST is that meters may continue in-service indefinitely provided they continue to meet the requirements.
- In 2013 the first (i.e. 3 year) sample is undertaken of meters installed in 2010 and the second (i.e. 6 year) sample is undertaken of meters installed in 2007.

## Appendix 5: Electricity Meter Sampling

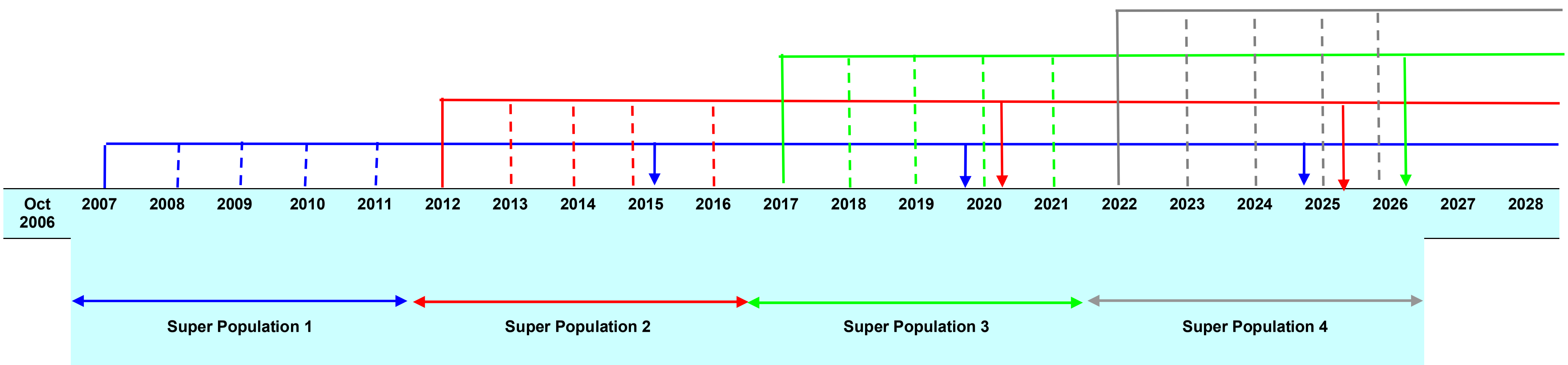
The cumulative effect of electricity meter sampling illustrated for six years of meter installations (2007 – 2012):




- MID electricity meters will be sampled four times over a 23 year asset life.
- Following successful sampling the meters are returned to circuit and reused.
- On the fourth sample it is assumed the meters do not meet the IST requirements and are removed from service. However, one of the benefits of IST is that meters may continue in-service indefinitely provided they continue to meet the requirements.
- In 2020 the first (i.e. 8 year) sample is undertaken of meters installed in 2012 and the second (i.e. 13 year) sample is undertaken of meters installed in 2007.

## Appendix 6:  Electricity Super Populations

The effect of super populations illustrated for four different meter types:




- Up to five years manufacture of meters of the same type may be combined together.
- The results obtained from tests on samples from the first year's population may then be applied to subsequent years without further testing.
- Following successful sampling the meters are returned to circuit and reused.