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ELECTRICITY METER ACCURACY TEST RESULTS

USAID Iraq Economic Governance II

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1. INTRODUCTION

All existing meters in Iraq utilize electromechanical technology which has a rotating disk supported on jewel and pivot or magnetic bearings. These moving parts are subject to wear with age which can have a deprecatory effect on the overall meter accuracy. The more modern magnetic bearing, which is the predominant type in Iraq, suffers less from this problem than a jewel and pivot but wear still takes place in both designs. There are meters in service in Iraq which were purchased and installed as early as 1966 and these meters have never had the benefit of inspection or testing since the date of their installation. The only accuracy checking carried out is to test a meter on site following a complaint when a Customer has queried a bill.

Good industry practice dictates that meters should be removed from service at a maximum of 15 years, refurbished, tested and recalibrated before being reused for a second period of service if suitable. This practice is not used in Iraq and meters are left in service for indeterminate periods without any form of checking or servicing. Appendix A indicates the meter manufacturers currently in use and the period during which these meters were originally purchased.

1.1. Purpose & Scope

The purpose of this deliverable is to collect and analyze a sample survey of meter accuracy and provide results of that survey to ascertain the need to include inaccurate meters in the future meter replacement program and to provide evidence to the Directors General if meter accuracy is having an adverse effect on their non technical system losses.

1.2. Audience

The audience is the Ministry of Electricity Capacity Building Steering Committee and BearingPoint management.

2. METHODOLOGY

Meter testing devices are available at varying levels of accuracy and consist of:

Comparator of class 0.01 for laboratory comparison of high precision Reference Standard Meters

Reference Standard Meters of classes 0.02 or 0.05 for laboratory test of Working Standard Meters

Working Standard Meters of classes 0.1 or 0.2 for laboratory test of Substandard Meters

Substandard Meters of class 0.5 for field test of energy meters of class 2.0

A Substandard Meter is a high accuracy device which is periodically tested against a Working Standard to ensure the accuracy of the measurements and is of adequate accuracy to carry out this sample survey.

The sample data was collected by the MoE metering department utilizing portable Working Standard Meters designed for carrying out accuracy tests on site without the need to remove the meter from service and return it to a testing facility. This method enables speedy collection of the information and causes least disruption to the customer.

The devices used are listed below:

Make	Phases	Date of Manufacture	Origin	Serial Number	Type	Accuracy Class
Landis & Gyr	1	1978	Switzerland	45540594	TVQ4.1	0.1
Landis & Gyr	3	1978	Switzerland	45540595	TVH2.32	0.1
Landis & Gyr	3	1974	Switzerland	39130153	TVP6.1	0.1

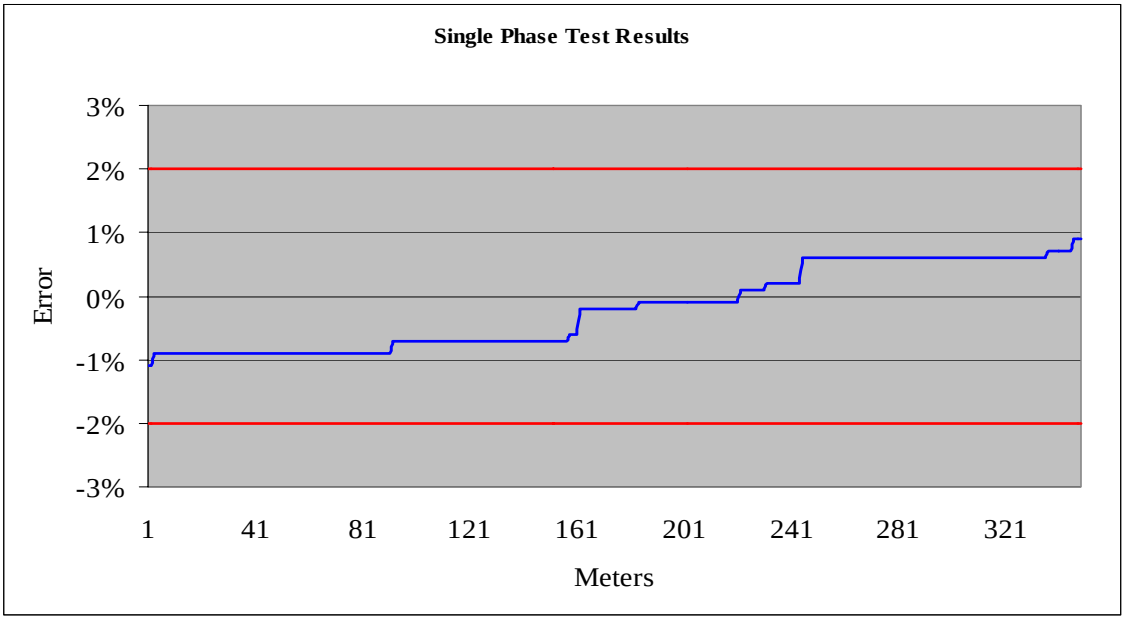
The testing was carried out by temporarily installing the Substandard Meter adjacent to the Customer's meter to measure the same energy and compare the Working Standard Meter reading with the Customer's meter reading.

3. DATA

The tests were applied to 349 single phase and 130 three phase meters of varying manufacture and age. The full results are given in Appendix B for single phase and Appendix C for three phase meters.

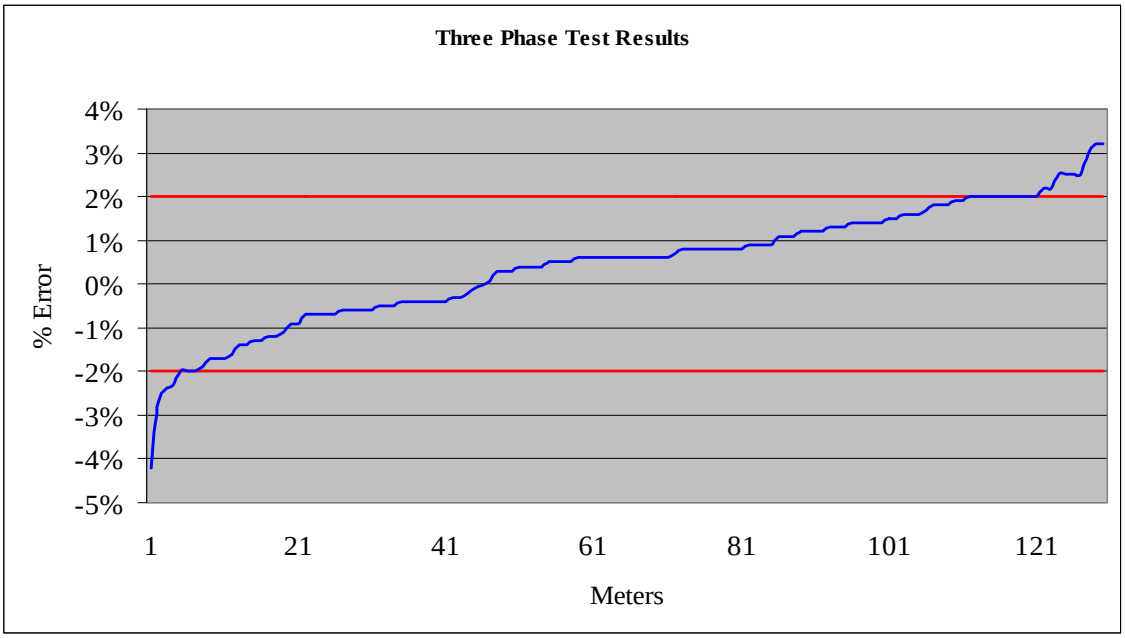
3.1. Single Phase

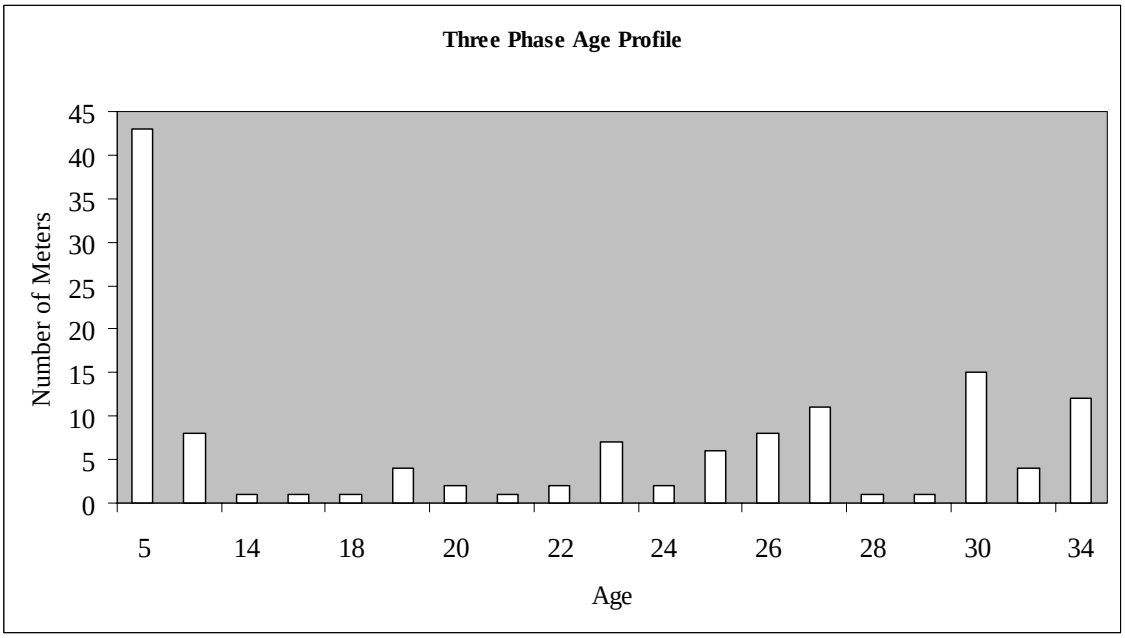
The following graphs shows the accuracy test results and a graphical representation of the age profile of the single phase meters tested.



3.2. Three Phase

The following graphs shows the accuracy test results and a graphical representation of the age profile of the three phase meters tested.





4. CONCLUSION

Meter Classification indicates the expected maximum error levels under normal operation i.e. between 20% and 100% of full load. Class 2 meters have a maximum error of +/- 2% and should be used for all electricity supplies up to 1 MVA i.e. Residential, Commercial and small to medium Industrial Customers. Class 1 meters have a maximum error level of +/- 1% and would be required for loads between 1 MVA and 10MVA i.e. large Industrial Customers. All the three phase test results were taken from Customers with less than 1MVA and therefore the results would be expected to be within Class 2 limitations. All the single phase results would, likewise, be expected to fall within Class2.

Single Phase

All single phase meters tested produced results within -1.1% to +0.9% which, with an age profile varying between 5 and 27 years old is truly remarkable and far better than could have been anticipated.

Three Phase

The three phase meters tested produced results within -4.2% to +3.2% with an age profile varying between 5 and 34 years old. Thirteen meters were found to be outside the 2% limits out of the total of 130 tested which is a 10% failure rate. The actual loading of each meter at the time of the testing is unknown, but the simple average error across all 130 meters is +0.44%.

Overall

The single phase meters results were excellent and cause no cause for concern regarding their early replacement outside any future proposed metering replacement program.

The three phase meter results show that, of the 130 meters tested, there were 4 meters greater than +2% (3.1% of the total) and 9 meters greater than -2% (6.9% of the total). However, there is no indication of any generic degradation of the three phase metering systems.

The metering systems proved to be in good condition and there is no evidence that the non technical losses are being adversely affected by the aging metering population.

5. APPENDICES

5.1. Appendix A

Existing meters in use in Iraq

Manufacturer	Type	Country	Period of use
Ferranti	**FNEA 34 Q**	**England**	**1966**
Landis & Gyr	**ML 3**	**Swiss Philippines**	**1966-1980**
Ganz	**HNG 4**	**Hungary**	**1968**
Grizik	**ET 414 K**	**Czechoslovakia**	**1971**
Diyala	**ML 230 XF3**	**Iraq**	**1975 – 2005**
AEG	**DHICZC 19 WI**	**Germany**	**1982**
Siemens	**7 CA 5461**	**Germany**	**1982**
Holly	**DT 862**	**China**	**1999**
Hindi	**EH-341**	**India**	**1999**
Sewede (Electronics)	**Unknown**	**Egypt**	**2004**

This information was supplied by the Metering representative of the Ministry of Electricity.

5.2. Appendix B

Single Phase

5.3. Appendix C

Three Phase