



PEZA GTZ Cooperation Eco Industrial Development (EID)
Project

Service Orientated Energy Management Guideline

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August 2007**

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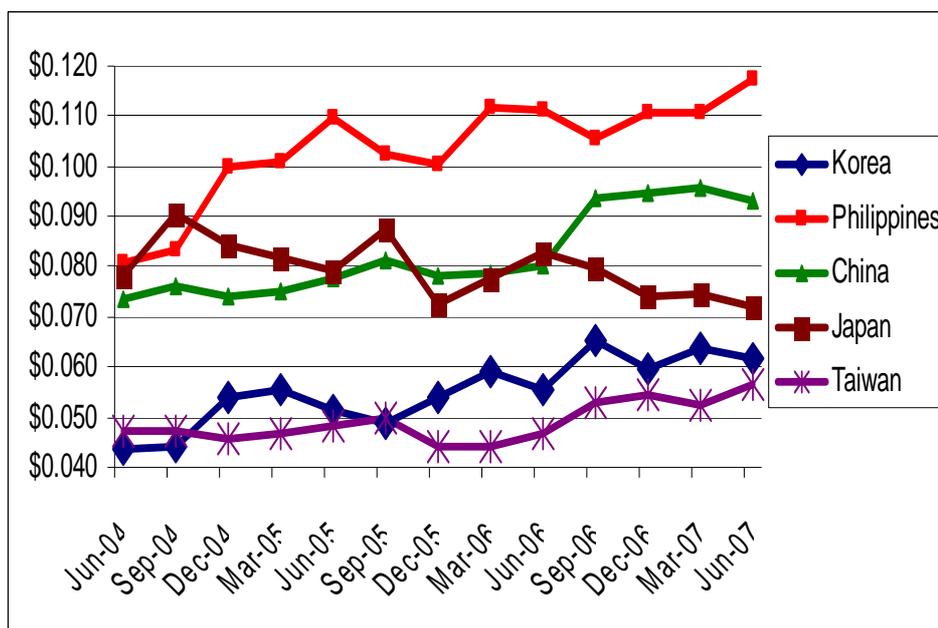
1. Introduction

The Philippines Ecozone Authority (PEZA) in partnership with the German Technical Cooperation (GTZ) have established a pilot project in the Mactan Economic Zone (MEZ1 + 2). The project aims to reduce the environmental impact of industry's operations while enhancing business competitiveness by promoting integrated system solutions in efficient resource utilisation, using modern production and management techniques. The joint management project is known as the Eco-Industrial Development (EID).

EID is a management framework for planning and operation clustered or networked industries. Part of the work that the EID wants to undertake is the formation of an Energy Management Service. This will help locators reduce their cost of energy whilst at the same time reducing the environmental impact through less CO₂ emissions to atmosphere. One of the key performance indicators of the EID initiative is 'to decrease energy consumption by 15% per production unit in MEZ1 and MEZ2'.

Power supply is identified as one of the main technical/environmental issues to be addressed by the EID initiative. The cost of power is the highest in the region (second to Japan) and this is becoming an increasing factor in the decision-making process as to whether industrial enterprises start a business in the Philippines, or even expand their activities. By reducing energy costs, locators can add any saving directly to their company profits whilst also helping to improve the environment.

Cost of Energy in the Region



This paper provides guidelines on how EID should set about designing, establishing and operating an Energy Performance Contracting Model in the PEZA economic zones.

The essential components of a service oriented energy management initiative are shown in the following table.

Service Provider				ESCo
Skilled Operators	Quality Control	Equipment Bank	Administration	
Qualifications	ToR	Certificated	Contract	
Training	Report	Calibration	Payment	
Accreditation				
Service Advertising and Promotion				

There are two main ways to support energy management projects:

Service Providers – are independent consultants who have no links to products, and their services are paid for directly by the locator. The locator pays for the recommendations for improvements they make.

Energy Service Companies (ESCOs) – are generally linked to a specific product that they are keen to endorse. They provide a free service to assess the energy saving opportunity and provide finance for the project. The savings that come about are then shared with the locator.

Discussions with locators during the mission to the Philippines in August 2007 has identified that they are keen to get some help to reduce their energy consumption. They know the value of investment in energy saving through energy management, however the companies have stressed that they would like independent advice that is not specific to any particular product.

Whilst the development of service to be provided by the PEZA GTZ Cooperation should be heavily focused on the Service Provider, there is in the author's view, a place for the ESCO.

1.1 What is a Service Provider?

A Service Provider can best be described as an independent consultant who has many years of engineering experience. Sometimes working alone or as part of a group, Service Providers can be contracted to undertake assessments of projects on a contract basis. In most cases the Service Provider will charge for their services on a daily or hourly rate, or sometimes on a 'job rate'. The main advantage over any other source of advice that the

Service Provider gives is that they would usually be completely independent of any branded project, and would normally offer advice on a technology rather than a product. This gives the locator a much better opportunity to identify the best price for the equipment via a tender exercise. In most cases a Service Provider is the best way to fund a project, providing the locator has the capital funding or expenditure (Capex) available to support the project. If the locator does not have the Capex available, then an ESCO may be more attractive.

A Service Provider will undertake the following activities:

- Energy Auditing
- Provide energy management and energy efficiency technical knowledge

and if requested

- Project management
- Client/bank/supplier relationship management
- Marketing & sales
- Procurement

The Service Provider can be asked to undertake only an energy audit or survey and come up with a list (or Action Plan) of energy management or technical opportunities that the locator can then undertake in-house. Alternatively, they can be contracted to provide also, a follow-up service to undertake the project design, procurement (direct or tender), installation, commissioning and project management.

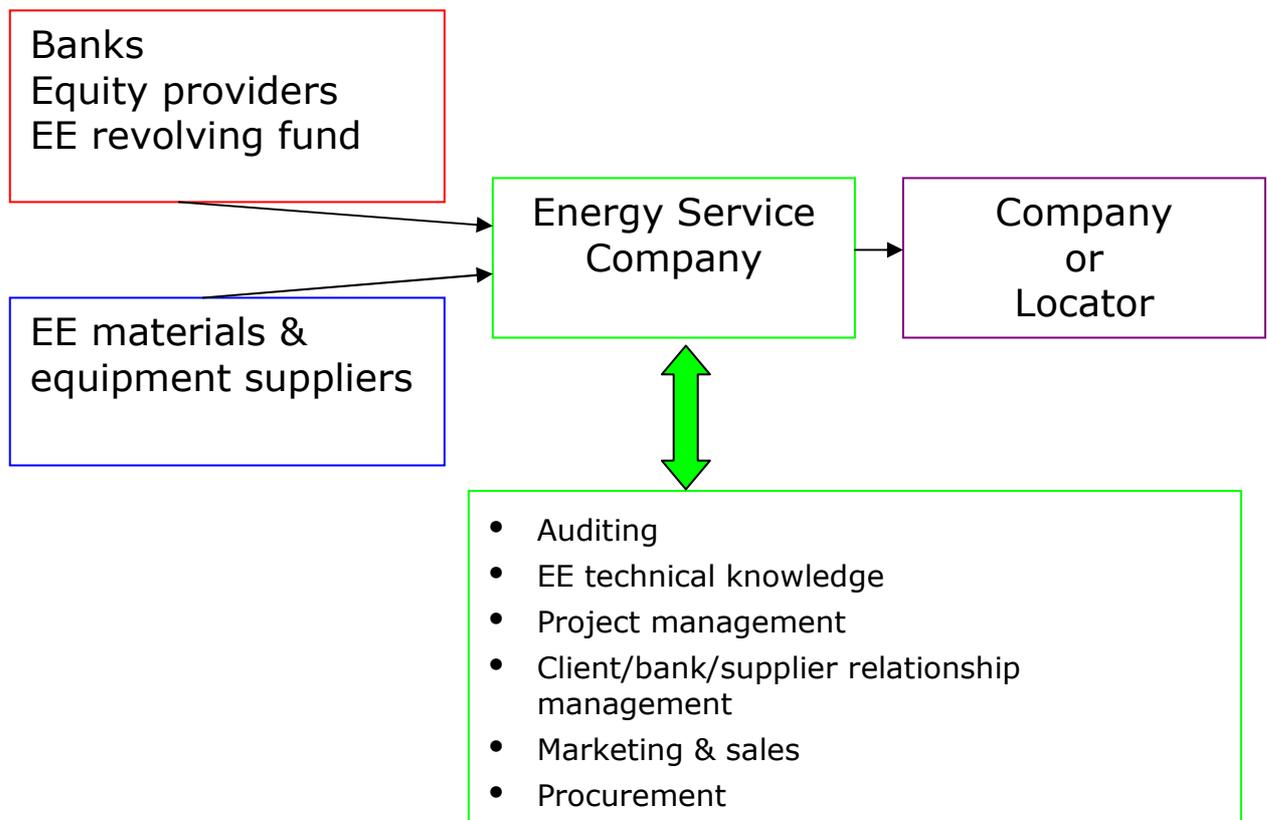
Payment terms can be negotiated on the basis of work undertaken or results. Some Service Providers have been known to work on a 'risk and reward' basis, for example:

1. The Service Provider carries out an energy audit or survey with an Action Plan. He/she is paid for this work on completion.
2. The Service Provider is then contracted to arrange for the complete service to undertake the tender, installation and commissioning of the equipment. A contract is drawn up for this part of the work based on the project success, ie when the savings start to be made, the contractor is paid after a period of monitoring. As the Service Provider is taking a risk in this type of contract there may be a 'reward added' over and above the normal hourly/daily rate charged.

This type of contract has some advantages in that the company or locator does not own all the risk and it is shared with the Service Provider. However the disadvantage is that there is always the chance of disagreement over the final payment and is often subject to the quality of monitoring.

1.2 What is an ESCO?

An ESCO is a company that fulfils all the following requirements: it provides integrated energy services to customers (mainly large energy users, but also utilities), which may include implementing energy-efficiency projects (and also renewable energy projects), in many cases on a turnkey basis. An ESCO provides performance and savings guarantees, and its remuneration is directly tied to the energy savings achieved. Therefore, an ESCO risks its payments on the performance of equipment and services implemented. Some ESCOs finance projects, recovering their investment cost from the resulting savings.



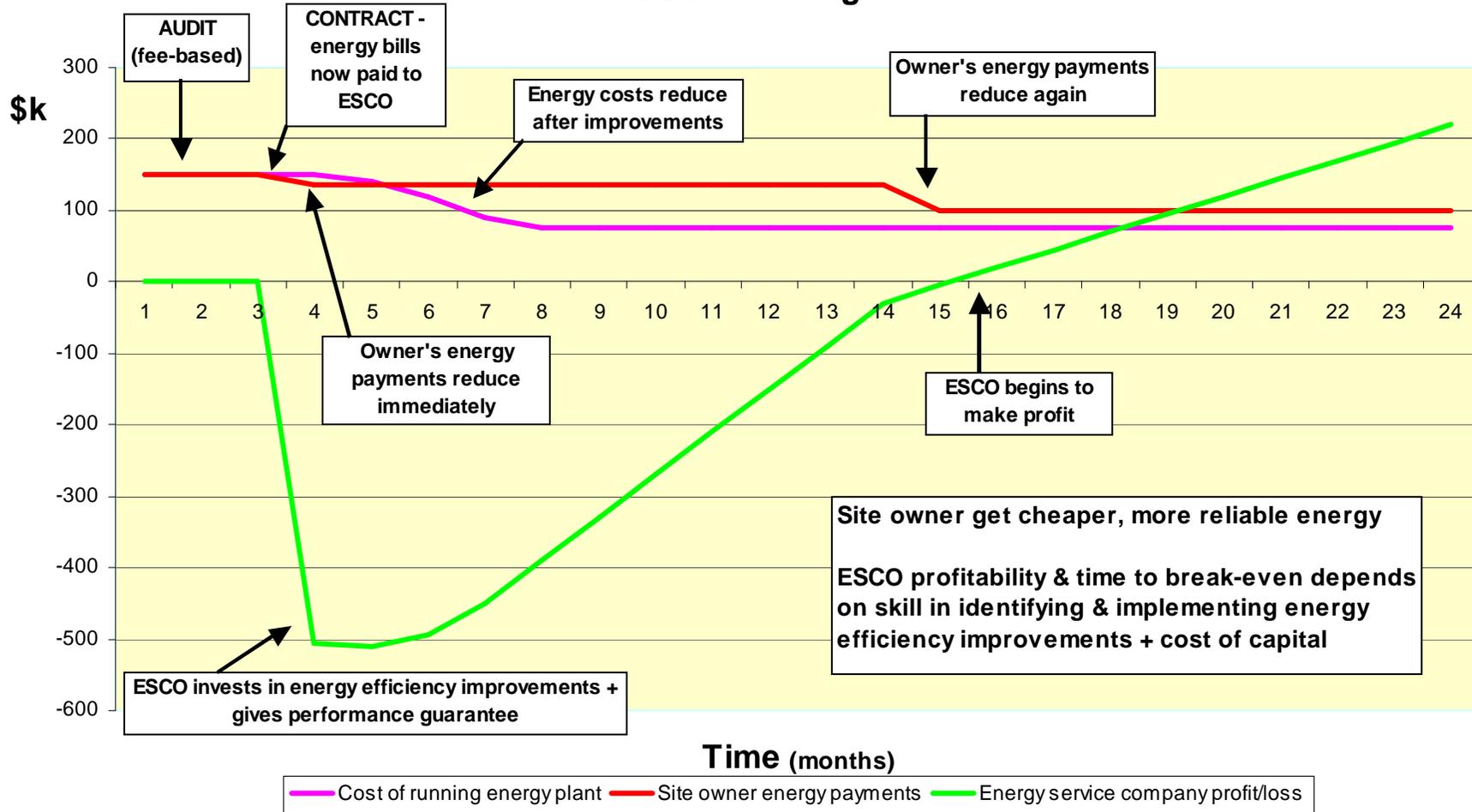
ESCOs can provide the following elements:

- Investment grade energy audit; identification of saving and efficiency improving actions
- Comprehensive engineering, and project design and specifications
- Guarantee of results by contract clauses ('engineering and procurement contracting')
- Project management; procurement, installation and commissioning
- Facility and equipment operation & maintenance for the contract period
- Monitoring and verification of the savings results
- Project financing
- Capturing opportunities created by energy sector deregulation, such as bulk purchasing of commodities and real-time pricing strategies
- Mitigate energy-related risks and costs
- Implement new energy strategies such as distributed generation, cogeneration, electric-to-gas conversions, geothermal heat pumps, landfill reclamation, etc.
- Increase occupant comfort
- Reduce energy consumption and operating costs

While the ESCO will ensure all the above actions, it is not necessarily responsible for all of them. Some actions can be subcontracted; however, the ESCO has to ensure the results and project implementation. Some experts have compared the role of the ESCO to the architect in new property development: the architect has to define the project, select the engineering firm, supervise the building construction, obtain the permits, etc. The financing of the project is ensured through a guaranteed savings contract, where the client assumes the credit risk, while the ESCO assumes the risk for the savings.

The following figure illustrates ESCO financing for a given project (such as replacement of a heating system at an industrial site). Following an initial, fee-based audit, the ESCO invests capital in energy efficiency improvements, recouping its investment and profit from the cost savings that result. The site owner does not risk capital and sees quick benefits. The more proficient the ESCO, the cheaper it can raise the capital.

ESCO financing



1.3 Locator Ways of Funding Projects

A popular way for financing energy efficiency schemes is a '**Rolling Energy Efficiency Fund**'. This is a 'pot of money' which is used for funding energy efficiency projects, and the payback on investments is fed back into the fund, as is the capital with time. Follow-up measures are also financed from the fund, which is repeatedly topped up and drawn from.

An advantage of this type of fund is that during an energy audit or survey, opportunities are found for making savings that are said to be 'housekeeping measures' or 'no cost'. If these projects are undertaken before any of the 'low' cost measures are initiated, then the fund starts at no initial outlay. Subsequently medium and high cost (Capex) projects can be funded from savings achieved from the low cost projects etc.

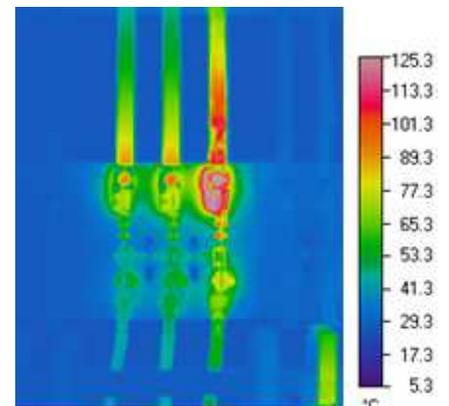
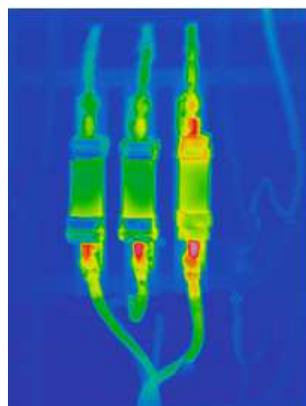
For no or low cost initiatives, companies or locators can pay for an energy saving measure out of a **maintenance budget**. Where a project or saving opportunity is seen as a housekeeping measure or the cost is low and has a fast payback time, then this is a reasonable way to pay for the work. Example, a locator initiates a compressed air leak detection programme, often the cost is just a fitter working in periods when there is no production, tightening up glands or replacing a small number of fittings/pipes. The cost is very low and the benefits can be seen immediately.

Often companies or locators are happy to fund both the cost of the Service Provider's time to undertake the audit and the cost of the project, out of their own funds. For an expensive project there may be a need to identify some capital expenditure (**Capex**). This might mean building in the cost to an annual budget, and can on occasion cause a short delay in the project.

ENERGY EFFICIENCY AUDITING SERVICES



INSPECTION OF HEAT AND WATER SUPPLY SYSTEMS



THERMAL IMAGES OF HEAT OR ELECTRICAL LOSSES (FAULTS)

2. Service Oriented Energy Management Guideline

2.1 THE PEZA-GTZ EID PROJECT

During the period of 1 to 18 August 2007, Mike Birks - International Consultant and Ms Dr Alice Herrera had the opportunity to undertake some 'one day walk-through energy surveys' of locator companies in the MEZ1 and MEZ2 economic zones. This, combined with discussions with Service Providers, Philippines Government Offices and PEZA representatives, has helped to form an opinion on how a Service Oriented Energy Management system should work for the EID project.

The overriding feedback from locators is that they would much prefer to have an independent advice service available to them which they pay for. They are then happy to undertake their own assessment of the merits of each of the opportunities for energy savings identified in the resulting Action Plan, and also to undertake the work. This type of service is therefore better undertaken by Service Providers.

Whilst this may be the overriding feeling of locators, there may be some who are not in a position to provide the finance for the recommended measures although they have the desire to act on the suggestions in the Action Plan. For these locators an ESCO arrangement may be more interesting.

In the opinion of the author, there is a place for both Service Provider and ESCO and these are discussed in the suggested approach below.

2.2 SUGGESTIONS ON THE COMPONENTS OF THE EID SCHEME

Companies or locators are looking for independent advisors to help them identify energy management or technical savings opportunities. To help with its goal of achieving 15% savings at each production unit in MEZ1 and MEZ2, it is in EID's interest to help set up a quality Service Provider network that is completely independent of any product, and is energy management or technically biased. To design such a service the essential components that need to be considered are as follows:

2.2.1 FOLLOW-UP WALK THROUGH SURVEYS

In order to keep the initial impetus going which was initiated by the pilot walk-through energy surveys undertaken by Mike Birks and Dr Alice Herrera, the service needs to be continued by EID.

The Facilities & Manufactures Association (FAMEA) is in a position to offer this service. As representatives of the locator companies, they are 'in the right place' to help and have the necessary skills to help keep the initiative going.

FAMEA would be able to provide the following feedback from the pilot walk-through surveys:

- Each locator will be provided with a confidential survey report
- PEZA-GTZ project managers will be provided with a short company profile

The report to the locator will be designed to help them initiate and implement their forward energy management programme. As part of the pilot only, the locators will be provided with the surveys free of charge.

However there needs to be a number of issues resolved by EID before this part of the project commences. Such as:

- Are FAMEA members able to help by providing assistance with the follow-up walk-through surveys?
- If FAMEA members can help, will they need payment to participate in the walk-through surveys?
- Is it possible for FAMEA members to link some of their time for the walk-through surveys to their personnel allocation of Corporate and Social Responsibility (CSR)?
- FAMEA members will need to be assured that there are no issues regarding locator confidentiality?
- Are there any issues regarding the involvement of FAMEA members taking part ie. insurance, safety, etc?

A Position Paper has been submitted by Mike Birks to EID for onward submission to FAMEA, that discusses not only their involvement, but also the issues above.

Although it was not possible to set up a meeting with FAMEA whilst Mike Birks was in the Philippines, the individual members listed below gave the impression that they were very capable of taking on this work:

- Mr Edwin Semilla, Facilities Services Director, Fairchild Semiconductors
- Ms Jessica Arevalo, Environmental Manager, Fairchild Semiconductors
- Mr Noel Fernandez, Operations Manager, East Asia Utilities Inc
- Mr Roseller Bucoy, Facilities Manager, Pentax Cebu

It is hoped that FAMEA members will look upon the Position Paper favourably and that a way forward can be developed with EID.

2.2.2 SERVICE PROVIDERS

In a previous section of this report the role of a Service Provider has been described. In the following section the links to the EID operated scheme are discussed.

Independent consultants can provide this service but need to have the following attributes:

- Qualifications – ideally, qualified engineers
- Training – they should have up-to-date training in several disciplines or have three years 'on the job' experience in the same. Disciplines seen as appropriate include: Energy Management, Heating, Ventilation & Air Conditioning (HVAC), Compressed Air, Lighting, Boilers and Steam Distribution, etc
- Accredited – to ensure their independence and to help locators, EID should compile a list of Service Providers ensuring that they have the requisite skills which should be in place before they are accredited.

During the mission of Mike Birks and Dr Ms Alice Herrera to Mactan in August 2007, a meeting was held with Mr Benny Gonzales who is an independent consultant of many years experience. Mr Gonzales is currently undertaking some work on HVAC for the Shangri La hotel chain. He is optimising their systems to ensure the best possible efficiency and cost effectiveness. Mr Gonzales has a wide all round knowledge of energy efficiency. In the author's opinion, Mr Gonzales would be an ideal recruit to the EID Service Providers list. A major advantage is that Mr Gonzales is a local resident living on the island of Cebu.

2.2.3 QUALITY CONTROL

To operate effectively and to ensure that the feedback given to locators is of the highest quality, it is important that the Service Providers deliver first class reports. The following initiatives should be developed by EID for this:

- Terms of reference for the survey/audit (ToR)
- Report templates
- Report assessment scheme to check the quality of the engineering advice provided to the locator, and the standard of English (links to ISO19000)
- Report consistency – to ensure that the quality is consistent and fits the templates

- Guidelines on time/cost of the service (day rates etc) These should cover the cost of the Service Provider's time but also might need to cover EID administration cost, equipment (see below), insurance, T&S, etc
- Quality checks on equipment/instruments (audits)

2.2.4 EQUIPMENT BANK

When undertaking an energy survey/audit, it may be necessary to provide some detailed monitoring. Measurements might need to be taken instantaneously or over a period of time to ensure that the correct and appropriate advice is given. Whilst some Service Providers may have their own equipment (which should be regularly calibrated to ensure quality) it is unlikely that all Service Providers will have the breadth of equipment necessary to provide a complete service, therefore it will be in EID's interest to set up an Equipment Bank. A list of suggested equipment to be included is identified in Appendix 1.

Mike Birks and Dr Ms Alice Herrera had a short meeting with the **Department of Science & Technology (DOST)**. DOST have plans to set up a Service Provider network of their own and aim to identify the experts, train them, provide equipment, etc. During the meeting Mike and Alice were not completely convinced of the strategy that DOST has for setting up their service, primarily because the experts will come from academia and not have all round industrial experience. However DOST do offer an opportunity to EID to provide a route to training and equipment for their own Service Providers.

To be assured of the quality of equipment and instruments, it is important that they are stored carefully and are **calibrated** on a regular basis, and issued with **certificates** to ensure they are of the highest quality. DOST could help provide this to EID.

Training also is a specialised area and if DOST can offer this as a service to EID Service Providers, it represents a very good opportunity to gain the training locally which will hopefully be of a good standard.

The author recommends that EID start some early dialogue with DOST to come to a mutual understanding of how they could work together in the future.

2.2.5 ADMINISTRATION

It would be in EID's interest to provide the administration support to the Service Providers. Whilst there will be some cost involved, it will be possible to pass this on to the locators as part of the overall

service. Some of the work required under the administration is likely to be as follows:

- Create a register of Service Providers and maintain the list for reference by locators
- Ensure the Service Providers' qualifications and training is up to date
- Provide liaison between customer (locator) and Service Provider (this might include providing payment)
- Liaise with the locator on the service required and write/provide the ToR and contract to the Service Provider
- Ensure timely delivery of outputs and reports
- Payment of Service Providers or arrangements for locator to make payments
- Quality control of final reports
- Impact assessment – in order to ensure that the EID target of 15% is being met, it will be important to visit locators and ensure that the Action Plan developed for the locator by the Service Provider is being followed-up

2.2.6 ROLE OF ESCOs IN THE EID SCHEME

Whilst the main thrust of services to be offered by EID should be focused on Service Providers, there is a role that ESCOs can provide. It is the author's opinion that ESCOs can provide more specialist services where more detailed measuring equipment or technical knowledge is required. Examples of this might be:

- Co-generation opportunities (CHP). The assessment of these schemes can be complicated and requires significant knowledge. The schemes also lend themselves to ESCO type financing schemes because the risk will always be high.
- Power Factor Correction (PFC) equipment. Again this can be a complicated area. To be effective, the quality of the electrical system should be assessed for the amount of harmonics and in some cases filters need to be included with the equipment. PFC suppliers or ESCOs will be much more geared up to provide this service than Service Providers.

During Mike Birks' mission to the Philippines, he discussed electricity supply side issues for MEZ1 & 2 with Atty. Jesus S. Sirios. PFC was discussed and it became clear that current electricity tariff structures in MEZ1 & MEZ2 did not encourage improved PFC, therefore this was detrimental to energy efficiency. This situation will change soon and new tariffs are being considered and the result being that locators will have an incentive to improve their power factors (PF).

One company active in the area of PFC is Abolitiz Energy Solutions who operate as an ESCO in this area. The company has an office in Lapu Lapu City, Cebu.

There would be little work for EID to support ESCOs as all administrative issues would be undertaken by the companies themselves. EID might however like to keep a record of the ESCOs abilities to undertake work which they can pass on to locators.

3. RECOMMENDATIONS

To commission a 'Service oriented energy management service' it is recommended that EID take the following actions:

1. Discuss with FAMEA their involvement in undertaking 'walk-through' surveys in the near future.
2. Identify and recruit a number (suggest five initially) Service Providers with good all round knowledge of energy efficiency measures.
3. Initiate discussions with DOST to assist with the training of Service Providers and the loan of good quality equipment for use by Service Providers.
4. Set up a service to support the Service Providers with all administration requirements, to include: payment terms and conditions, ToR and contracts, equipment loan scheme, training & training records, service quality tracing system, etc.
5. Identify ESCOs local to Cebu who can offer a service to locators in specific areas such as CHP and PFC.
6. When 1-6 are in place, advertise the service to locators in MEZ1 and MEZ2.
7. Set up a system of visits to locators to check the progress of locators in undertaking the savings measures, ie impact assessment.

In addition there are several activities that would help to keep the impetus going for improved Energy Management initiated in the pilot. These are:

1. Consider initiating a Good Practice Case Study of Energy Management in PEZA offices. Under internal guidelines Government Office should undertake energy conservation measures.
2. Consider liasing with Transco to help generate a Good Practice Case in a technical area such as energy efficient street lighting. Some links to the Department of Energy Philippine Efficient Lighting Market Transformation Project (PELMATP) could be beneficial in this activity.

3. Link to the Energy Utilities Management Bureau (EUMB) to explore other technical initiatives for potential Good Practice Case Studies and links to locators.
4. Consider appointing a PEZA Energy Champion to drive forward energy efficiency/conservation in PEZA offices.
5. Consider commissioning a 'Green notice board' at PEZA offices to promote energy efficiency measures and identify opportunities for energy savings at home (to help get staff 'buy-in') with the logo 'Energy Efficiency Starts in the Home'!
6. Commission in-house PEZA newsletters to promote energy efficiency and conservation measures. This could be Internet or intranet based.

APPENDIX 1 SUGGESTED EQUIPMENT LIST FOR SERVICE PROVIDERS

1. Digital thermometers with type K thermocouple probes. One instrument operating in the range - 50 to 200⁰C, ideally with 0.1⁰C resolution, and another for 0-500⁰C with 1⁰ C precision. For high-temperature applications a robust probe is needed. For lower-temperature work, a 'band' probe designed for surface measurements makes a good general-purpose instrument capable also of measuring air temperatures. Even a bare thermocouple junction can be used. Thermocouples can be left in place and read manually by connecting the instrument when required. A compensating extension cable is necessary if the probe is needed to be used at a distance (on the end of a pole), for instance.
2. A sling hygrometer. Alternatively a digital relative humidity probe, especially if moisture contents of product need to be measured.
3. Non-contact thermometers, to give approximate temperatures of inaccessible surfaces, or to scan for hot spots.
4. An infra-red camera. Results of infra-red thermography must be interpreted with caution.
5. Miniature data loggers which record temperature, relative humidity, voltage or pulses. Pulses can be logged from a variety of sources including PIR sensors (logging occupancy levels) or even improvised temporary contacts on valve linkages and other moving equipment.
6. A light meter. An inexpensive unit will suffice, capable of working over the 100-2000 lux range. Photographic light meters are not suitable.
7. A clip-on power meter with a range of current transformers (CT's) and voltage transformers (VT's). Essential for checking on lighting circuits, motor consumption and power loads.
8. A compact camera. An inexpensive 35mm compact model is adequate, but a powerful flash is recommended.

9. A video camera. An inexpensive PC connectable camera can be used in many instances.
10. Pressure/vacuum gauges.
11. Combustion analysis kit. Should be calibrated against a traceable standard. Although relatively expensive, this is a good long-term investment because it enables poor combustion to be detected through regular checks. It should include carbon monoxide measurement. A smoke pump will be required for use with oil or solid fuels.
12. An anemometer to measure air velocities especially in supply and extract ducts (AHU and vent systems).
13. Smoke generator to detect air leaks. Alternatively, improvise with tissue paper tell-tales, or a child's bubble maker.
14. Torch
15. Stopwatch
16. Pocket tape measure
17. Crowbar (for access to water meter)
18. Meter compartment keys
19. Walkie-talkie radio or mobile telephones to co-ordinate 'drop tests' for communication when reading meters whilst also starting and stopping equipment.