BENCHMARKING & REGULATION – ADVANTAGES AND CONFLICTS

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INTRODUCTION

As national governments strive to reduce demands on their expenditure, there is a world-wide trend to move electricity businesses, and other utilities, from state to private ownership. At the same time there is a drive to reduce costs to customers, to enhance quality of service, as well as to seek to fund investment in this essential service area.

In this paper we review the various types of benchmarking practised in the industry and their application. We further describe various benchmarking studies that have been conducted around the world and record their application, in particular, with respect to their use by electricity regulators.

WORLD'S SECOND OLDEST PROFESSION

Benchmarking may be the world's second oldest profession, but is often considered as far less reputable than the first.

Imagine, if you will, an early caveman seeking to choose between two similar caves…

- What was the primary decision factor?
    - Position, position or position?
    - Was it the light and ventilation or the proximity to fresh food?
    - Hot and cold running water?
- What was the measurement base used?
- How were the criteria evaluated?

We should not be too quick to belittle benchmarking. Everyone is a "benchmarker". If we pick up two cans of soup in the supermarket and make a decision on one over the other we have just conducted a benchmark based on certain factors. Each of us undertakes multiple comparative reviews every day; what to make for dinner, how to travel to work, what tasks to complete at work, etc.

Having established that benchmarking has been around for a long time, we can look at how it relates to application in our industry. The two principle applications of benchmarking as it relates to electricity businesses are;

- Those benchmarks undertaken by the electricity businesses (e.g. for internal and business improvements.), and
- Those benchmarks undertaken on the electricity businesses. (e.g. for external regulatory, stakeholder, owner and customer purposes.)

PB Power have constructed, undertaken and reviewed benchmark studies across electricity, gas and electricity utilities throughout much of the developed world.

Our two contentions for this paper are based on this experience;

- Internal and external benchmark studies are incompatible, and
- Benchmarking should be an input process and not an output process in setting utility prices.

INTERNAL BENCHMARKING

Internal benchmarking is benchmarking for the company, by the company. In other words, the purpose is to improve the business performance by comparing against other like companies, processes or systems.

Benchmarking has a proven history of allowing companies to look externally to their business and see what are the options for business improvement? Where can the management most effectively expend their energies? What can be improved now and what can be improved later?

A good benchmarking program will not only identify where a company is in relation to its peers. A good benchmarking program will also provide;

- The value of the improvement opportunity to the business in terms of both cost and service levels;
- Identification of the underlying factors impeding improvement;
- Costs and timeframes involved in achieving the potential improvement;
- Prioritisation of improvement opportunities, and
- Provide momentum for the internal "selling" of the need for improvement.

In the modern business environment most companies and individuals have to improve and benchmarking is one tool that can enable that to happen.

EXTERNAL BENCHMARKING

Although the process may be similar, external benchmarking has a slightly different need than internal benchmarking.

Benchmarking has long been used as an important tool of government owners and regulators to determine the efficiency of a business. Comparative reporting is probably the simplest form of benchmarking.

Many governments and regulators rely simply on the reporting of costs and service levels to provide a sort of comparative analysis. Public reporting allow the businesses and the public to make their own comparative assessments of performance – albeit at a high level and to widely divergent criteria.

In recent times, benchmarking has taken on a more significant role in the setting of both regulated prices

and service levels. In certain cases, benchmarking has taken the pre-eminent role in setting the standards.

Utility benchmarking has primarily come in two flavours;

- Econometric – Examples include TFP and DEA.
- Quantitative – Examples including process/functional benchmarking.

Whatever, the method utilised the most important criteria for the benchmark (in the eyes of the regulator) is that the results are defensible.

WHY THE TWO DON'T MIX?

It may seem strange to suggest that two approaches to benchmarking the same businesses should not be done in parallel – besides the obvious option of creating more work.

DEFENSIBILITY VS. OPPORTUNITY

The benefits of an internally driven benchmark will be best realised if that benchmarking program identifies every possible opportunity for improvement, whilst the externally driven benchmark seeks to find fully defensible and realistic opportunities.

The potential value of opportunities identified may be enormous, while the real-life implementable solutions will almost inevitably be significantly less.

INFORMATION VS. DATA

Internal benchmarks are typically conducted in an enclosed environment where only small parts of the business are exposed to the full gamut of opportunities that are developed. Many of these ideas will be controversial and non-viable, but all should be explored before they are accepted or rejected.

IDEA GENERATION VS. SELECTION

It is this process of idea generation and exploration that is most dangerous. The majority of ideas and opportunities are not viable. Many will fail because they are too expensive to implement. Some will fail because they are simply too difficult to implement. Others will fail because the company or the environment simply does not allow the opportunity to be developed.

BENCHMARKING – IS IT THE START OR THE END?

Benchmarking is a very valuable part of the regulators toolkit. A utility General Manager was once heard to lament; "If only they had used their powers for good instead of evil". This comment may have been said in jest, but there is a strong element of truth in the statement.

Starting from the ground up;

- Regulators/owners want an efficient and effective outcome for consumers.
- Regulators/owners do not want to run the day-to-day functions of the business (controversial) and therefore are reluctant to enter into a benchmark study at the functional and operational levels.
- Benchmarking can provide targets for regulators to set future expenditure levels
- A benchmark that does not provide the "how" will not be well received by the regulated businesses. The businesses will not be able to confirm their ability to achieve the proposed efficiency improvements.
- Many benchmarking studies have also failed due to the so-called "Black Box". This is where the internal mechanisms of the benchmark are unable to be confirmed or reviewed by all parties involved.

However, a benchmarking study that is supported by a technical review can meet the objectives of identifying and validating the opportunities.

This will satisfy the regulator/owner in providing a defensible outcome while providing the regulated utility with a clearer indication of how the efficiencies can be achieved.

The following examples of, and extracts from, reports describing external benchmarking exercises undertaken internationally are used to illustrate the methods used in benchmarking, the benefits to be gained from benchmarking but also to highlight the pitfalls associated with the techniques and consider recommendations for improving the results.

PAN-EUROPEAN BENCHMARKING OF ELECTRICITY DISTRIBUTION COMPANIES1

The Union of the Electricity Industry - EURELECTRIC, formed as a result of a merger in December 1999 of the twin Electricity Industry Associations, UNIPEDE1 and EURELECTRIC2, is the sector association representing the common interests of the European Electricity Industry and its worldwide affiliates and associates.

Its mission is to contribute to the development and competitiveness of the Electricity Industry and to promote the role of electricity in the advancement of society.

After fact finding by an ad hoc group, EURELECTRIC decided to launch a "hands-on" project, in order to gain practical experience on benchmarking of electricity distribution companies. It was concluded that in order to anticipate the possible co-operation in this field by the European energy regulators, it would be useful to gain experience in an international benchmarking project. This would allow the companies to 1) gain experience in benchmarking, 2) develop a strategic tool for discussions with regulators and 3) obtain useful information for the development of business processes in order to increase their efficiency.

During spring and summer 2002 EURELECTRIC carried out a pan-European benchmarking of electricity

[1] Final report, Working Group on Distribution Benchmarking EURELECTRIC

distribution companies. Altogether 48 distribution companies from 22 European countries were benchmarked. This final report presents the method used as well as the main results and learning points of this project.

This benchmarking project employed the "Grid Volume" model, developed by PA Consulting group. The actual benchmark calculations, as well as technical expertise, were provided by the PA Consulting Group.

The Report summarises the background, findings and conclusions from the project as follows:

- Benchmarking is increasingly becoming a strategic issue for distribution companies; the regulators are also stepping up their international co-operation
- The results of regulatory benchmarking have an inherent uncertainty, and the use of international benchmarking would increase that uncertainty
- In the project it was possible to establish an indicative performance benchmark, but this is assessed to be far too uncertain to be used for regulatory purposes
- The main drivers of uncertainty are data uncertainty created by different accounting principles, the need to correct for different labour cost and efficiency levels, and the comparison of urban and non-urban operations

The report concluded that EURELECTRIC should further develop an insight in regulatory benchmarking with particular view to international comparisons of efficiency.

ASSESSMENT OF PERFORMANCE-DRIVEN INVESTMENT STRATEGIES OF DISTRIBUTION SYSTEMS USING REFERENCE NETWORKS2

Distribution systems are inherent monopolies and therefore they have generally been regulated to protect customers and to ensure cost-effective operation. In the UK this is one of the functions of the Office of Gas and Electricity Markets (OFGEM). Initially the regulation was based on the value of assets but there is now a trend towards performance-based regulation.

Benchmarking of distribution network reliability performance is one of the aims of the Reference Network Project being developed by University of Manchester and due for completion in 2006. PB Power is a financial sponsor of the project along with three UK distribution businesses. Ofgem is being kept informed of the development of the project.

A methodology is developed that enables the reliability performance associated with alternative investment strategies to be compared with the investment cost of these strategies. At present there is no accepted approach for such assessments. An approach based on the concept of reference networks is proposed. The essential idea is to analyse a small number of networks that represent the real feeders of the system being considered. The main stages are: to classify the real feeders into coherent clusters, to construct a representative network for each cluster, to assess the reliability of these representative networks and to re-aggregate the results to give those for the overall system. These representative networks are then analysed repetitively for different investment scenarios and the corresponding reference networks derived. The approach can be used to assess individual companies on an absolute basis or to compare the relative performance between companies. The approach, its implementation in conjunction with a number of distribution companies, and its effectiveness when approach using the underground part of a real system is described in the Report.

Since the privatization of the electricity supply industry (ESI) in the UK, the regulator (OFGEM) has been responsible for controlling the revenue recovered by distribution network operators (DNOs) to ensure cost effective operation and to protect customers. Initially, the regulation was based on the value of assets owned by the DNOs. Although this is still predominantly the case, considerable interest has been shown worldwide in moving from this asset-based regulation to performance-based regulation [1–6], to relate capital and operational expenditure to the benefit that customers derive from such expenditure. This implies that the overall distribution revenue is a function not only of the capital and operational costs incurred by a DNO, but also of the quality of service they provide to customers. In the UK, limited aspects of performance-based regulation have been introduced through the information and incentives project (IIP3).

The primary objective of this IIP is to establish a framework in which the quality of supply will be properly valued and incentivised. Investment in a distribution system is driven by the need to at least maintain the present condition and performance of he system and its component parts. In addition, present regulation continues to insist that this performance improves year-on-year and that these improvements are achieved in the most cost-effective way. Consequently there is a need for a framework and methodology that demonstrates the effectiveness of each alternative investment strategy. The reference network approach is able to provide this framework.

In a real distribution system, every feeder is different in some detail from every other feeder, even if only slightly. It is impossible to make strategic decisions on the basis of a model that includes every single feeder of the system. What is required is a reduced, hopefully greatly reduced, number of typical feeders, with each real feeder being associated with one of these typical feeders. These typical feeders are defined as representative networks, with each representative

[2] V. Levi, G. Strbac and R. Allan

[3] Ofgem: Information and incentives programme, Comparing quality of supply performance, October 2002, http://www.ofgem.gov.uk/temp/ofgem/cache/cmsattach/1388_oct2002.pdf

network being the best fit to a specific cluster of real feeders.

A procedure is therefore required that translates the real network into a number of representative networks, each of which can then be assessed separately.

The reference network of a distribution system is defined as the optimum network that could be developed if enough investment is made. The reference network can be considered to be an 'optimum' network of a company, i.e. one that has the maximum ratio of benefit to cost. In practice, however, other investment considerations may be needed, such as safety features. In addition, compromises must be accepted and restrictions imposed on the considerations being made.

The benchmark network is one that is used to compare performances between companies. It is conceptually very similar to the reference network, and is derived in almost the same way. The key differences are the choice of the variable parameters and their values. The regulator is likely to decide and define these variable parameters, albeit in consultation with the relevant companies.

The evaluation of the network reliability is central to the methodology, and there are a number of ways in which this can be done. Since the present studies are associated only with radial networks, including meshed ones operated radially, the evaluation approach can be relatively straightforward.

A "Reference Network" is constructed using a limited number of generic reference circuits to enable the modelling of the reliability performance of a DNO's entire 11kV network which typically may have some 25,000km of 11kV network, 2,000 circuits and 2 million customers. The reference circuits are then weighted to derive a reference network which would reflect the physical, topological and economic attributes of a real system, avoiding the need to model all the 2,000 odd circuits individually.

The Report concludes that the reference network methodology can be used in an absolute sense to study the predicted performance being driven by network investments within a company. Also it can be used in a relative sense to compare the performances between companies and to identify the reasons for any differences.

SUMMARY REPORT OF 1998 DISTRIBUTION BENCHMARKING4

UMS Group has been benchmarking the electrical distribution industry for more than 10 years and during this period the Australian industry has produced some of the most dramatic improvements that we have seen. Australian companies are now the world leaders in service level and productivity outperforming the United States, United Kingdom, Canada, Ireland and New Zealand.

Against this backdrop, the NSW industry is performing at relatively high levels of productivity and service.

No company in the history of UMS studies has been a best performer in every functional area. The key to the success of the NSW and Australian companies is that they are solid performers in most key functions resulting in high overall performance. Most international companies achieve excellent performance in two or three areas and are average to poor performers in the others - resulting in an overall lower performance level.

This report details the methodology, background and influences to these findings. The data contained in this report was provided by the NSW companies for internal efficiency and improvement purposes. The results of the report should be considered in conjunction with each company's supplementary reports.

The report has been prepared at the request of five of the NSW distribution companies to provide the results from the 1998 benchmarking programs in a format that can be utilised by IPART as part of the 1999 rate review.

The report concludes that benchmarking studies typically suffer from many weaknesses:-

Cost vs. Service Level – Cost data is not meaningful by itself. If cost is the only driver, it can quickly be improved at the expense of service. Any benchmark without both measures will not reveal true performance and may provide the wrong incentives.

Inconsistent data – Data inconsistently reported, other sources not adequately audited.

Weak peer groups – Comparison must be with strongest competitors to establish authoritative benchmarks.

Structural and environmental differences – Many structural differences drive costs, raw data not comparable. Weather, terrain, and customer density are prime examples of environmental conditions that are outside of a company's control and can dramatically influence costs and performance.

Superior performance not tied to underlying practices and methods – Relevance of results unknown, no basis for establishing performance aspirations.

BENCHMARKING AND REGULATION OF ELECTRICITY TRANSMISSION AND DISTRIBUTION UTILITIES: LESSONS FROM INTERNATIONAL EXPERIENCE5

Since the early 1980's, many countries have implemented electricity sector reforms. Many of these reforms have unbundled the generation, transmission, distribution, and supply activities of the sector and introduced competition in generation and supply. An increasing number of countries are also adopting

[4] UMS Group for INDEPENDENT PRICING AND REGULATORY TRIBUNAL OF NEW SOUTH WALES

[5] Tooraj Jamasb - Department of Applied Economics, University of Cambridge
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incentive regulation to promote efficiency improvement in the natural monopoly activities - transmission and distribution. Incentive regulation almost invariably involves benchmarking or comparison of actual vs. some reference performance.

This paper reviews the main approaches to incentive regulation and discusses various benchmarking methods and also presents the findings of a survey of the use of benchmarking methods in the OECD and a few other countries. The survey finds a variety of methods used by the electricity regulators although with a notable preference for the non-parametric methods.

The Report then draws conclusions based on the findings of the survey highlighting the main outstanding issues and lessons for best practice implementation of benchmarking in electricity regulation.

The main objective of incentive regulation method is to improve efficiency by rewarding good performance while the actual performance is measured relative to some pre-defined benchmark. As the rewards are based on performance measurements, two key issues are the choice of benchmarks and the techniques used to measure the performance. Regulators have adopted a variety of benchmarking methods and techniques in incentive regulation. According to one classification, actual performance can be measured against benchmarks that are "linked" (endogenous) or "un-linked" (exogenous) to performance or behaviour of individual firms.

The survey was conducted through a questionnaire containing 20 questions addressing different aspects of power sector and benchmarking methods and processes. The survey includes 17 OECD and 4 non-OECD countries.

The results also show that benchmarking is almost invariably conducted by independent regulators. The notable exceptions in this regard are Japan and Chile with government ministries functioning as the regulatory authorities. In the near future, more countries are expected to establish independent regulatory bodies.

The survey results indicate that countries that use benchmarking usually have or are in the process of establishing spot markets and a high degree of end-user market liberalisation both of which can be regarded as indicators of advanced levels of market liberalisation and regulatory reform.

There is a variety of benchmarking methods adopted by the regulators across the countries and jurisdictions within the same country such as in the case of the Australian states.

The regulators in Great Britain, Norway, Netherlands, New South Wales, and Colombia have used DEA in benchmarking as part of the price review process while in Finland the method has been used outside the price-setting process. The regulator in Queensland has replaced DEA with econometric methods. Regression based models are also used in Great Britain (COLS) in benchmarking of operating expenditures of distribution utilities.

The Ontario regulator uses the historical development of TFP in 47 distribution utilities. Among the average or mean-based benchmarking methods, regulators have generally chosen some form of yardstick regulation. In Japan, yardstick regulation is used together with ROR regulation by placing utilities in 3 performance groups for the purpose of setting the allowable costs and determining the rate base. Also, the Netherlands and Ontario envisage the use of yardstick regulation in the future following transition periods during which the performance gap among the utilities is reduced and better data is collected.

The regulators in Chile, and Spain, use theoretical or model firms in benchmarking of distribution utilities and yardstick regulation. The model firms are designed and dimensioned to represent efficient utilities that serve as reference or benchmark. This approach attempts to reduce the need for and reliance on cost information from the utilities to determine the benchmark by constructing models of efficient firms. In Chile, the representative model firms are used in yardstick regulation of distribution utilities. The Chilean model has also been adopted in some other Latin American countries (e.g. Peru). In Spain the model firms are used in allocating a portion of the total revenues of the system among the distribution utilities.

In addition to the above approaches, ROR can be combined with profit and loss sharing mechanisms and used in incentive regulation. The regulator in California uses a PBR scheme in distribution regulation of Southern California Edison (SCE) that combines price cap regulation with a profit and loss sharing schedule triggered by the difference between a benchmark ROR and the actual ROR. The electricity regulator of the state of Orissa, India uses a ROR-based reward system in a targeted incentive scheme. The utilities are rewarded with 1 percentage point ROR above the benchmark level for each percent reduction in transmission and distribution losses below the 35% level.

Nearly all regulators require submission of information by the utilities in standardised formats. This information is however subject to different audit requirements. Most regulators rely on independent audits while others check or control the submitted information. However, publication of information on the regulatory procedures and decisions is not necessarily an integrated part of the benchmarking process. The most extensive public information is provided by the regulators in the Netherlands, Great Britain, Norway, Ontario, and the Australian states.

Norway, Brazil, and Spain indicated active research sponsorship or joint studies and research projects. Indirect influence of academic and empirical research on adopting of benchmarking is rather difficult to determine but have been indicated by the regulators in Colombia and the Netherlands. However, several countries such as Turkey, Greece, Sweden, New Zealand, Switzerland, and Denmark for which there are

independent efficiency studies do not to use benchmarking as part of the regulatory process.

The incentive regulation and benchmarking in most countries is in the first or second regulatory period. The survey showed that a number of regulators are using or considering benchmarking in the regulatory process. Most reforms have involved establishing independent regulatory authorities. New regulators seem to be less bounded by path dependency of institutional constraints to adopt new regulatory tools such as benchmarking. Therefore, benchmarking is likely to become more common as more countries implement reforms.

The time lag between implementation of reforms and establishing new regulatory agencies and adoption of benchmarking appears to be decreasing. As the number of regulators increases, there is more scope for exchange of experience with regulators in other industries and countries. Most incentive regulations use price and revenue caps. As we saw, the Southern California Edison's PBR is essentially a price cap regulation with profit sharing.

Further, the study found that benchmarking is mostly practised in countries with well-developed upstream competition, spot market, and a high degree of market liberalisation.

Finally, to the extent that consultation between the regulator and industry and high degree of published information are regarded as indicators for transparency of the regulatory process, most benchmarking countries exhibit such transparency.

INTERNATIONAL UTILITY BENCHMARKING & REGULATION: AN APPLICATION TO EUROPEAN ELECTRICITY DISTRIBUTION COMPANIES6

Due to a shortage of data and increased international mergers, national energy regulators are looking to international benchmarking analyses for help in setting price controls within incentive regulation. The Report presents an international benchmarking study of 63 regional electricity distribution utilities in 6 European countries that aims to illustrate the methodological and data issues encountered in the use of international benchmarking for utility regulation. The study examines the effect of the choice of benchmarking methods using DEA, COLS and SFA models.

This study uses the frontier-oriented benchmarking techniques DEA, COLS, and SFA described below: -

Data Envelopment Analysis (DEA)

DEA is a non-parametric method and uses piecewise linear programming to calculate (rather than estimate) the efficient or best-practice frontier of a sample.

Corrected Ordinary Least Squares (COLS)

An alternative frontier-oriented approach to measure relative efficiency of firms is to use statistical methods to 'estimate' the best practice frontier and efficiency scores. COLS is one such method based on regression analysis (Richmond, 1974). Similar to DEA, the method estimates the efficiency scores of the firms on a 0 to 1 scale.

Stochastic Frontier Analysis (SFA)

SFA is another parametric method used to estimate the efficient frontier and efficiency scores. The statistical nature of the method allows for inclusion of stochastic errors in the analysis and testing of hypotheses. Similar to COLS, this method requires specification of a cost or production function involving assumptions about the firms' production technologies.

Another factor that complicates international efficiency comparisons is that technical standards and definitions of transmission and distribution systems vary across the countries. These differences can have implications for the level of capital stock and operating expenditures of utilities and influence the benchmarking results. In particular, the voltage levels of the cut-off points between the transmission and distribution functions of networks differ across the countries. At the same time, it is difficult to determine the direction and extent of cost implications of these differences for the utilities.

The results show a strong correlation between the non-parametric base model DEA-1CRS and the parametric COLS and SFA models.

If regulators were to decide it is worth co-ordinating further international benchmarking exercises the Report recommends the following; -

- Regulators need to agree upon long-term commitment and procedures for data collection, common templates, and submission deadlines for data standardisation. It is important to identify and define a minimum set of input, output, and environmental variables for data collection. Some potentially useful additional variables are maximum demand, transformer capacity, service area, quality of service, and voltage-based physical and monetary breakdown of assets. The sample should also sufficiently represent different size groups and types of utilities.
- In order to reduce the effect of measurement errors and data shocks; the data should be in the form of time-series for the recent past and then collected annually for future years.
- Regulators should also discuss benchmarking models and functional forms such as CRS versus VRS models or consider assigning different weights to inputs and outputs suitable for regulation of electricity distribution and transmission utilities.
- Exchange of data and experience can be facilitated by co-operation with bodies involved in international utilities data such as the US

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Federal Energy Regulatory Commission (FERC), Secretaría General de la Comisión de Integración Eléctrica Regional (CIER) in Latin America, and the Australian energy regulators.

REGULATORY EFFECTS ON THE INVESTMENT STRATEGIES OF ELECTRICITY DISTRIBUTION COMPANIES7

In this paper, the dependences between the regulation model and investment strategies are analysed. Regulatory effects are analysed by theoretical analysis and with practical examples.

The main aim of the analysis is to show out how companies might adapt to the regulatory environment when deciding their investment strategies.

The regulation of the electricity distribution companies is needed in order to prevent the misuse of the monopoly position, in which these companies operate. Regulation is usually focused either on the price of the electricity or on the profit of the company. Efficiency benchmarking is in many cases included in the regulation in order to provide companies with incentives for efficiency improvements. Depending on the regulation method and the parameters of the benchmarking the investments could have different impact on the incomes of the companies.

Rate-of-return regulation

In the rate-of-return regulation allowed profit is defined for each company based on the current value of the network assets.

Price cap and revenue cap regulation

In the price cap regulation the regulator sets the limit for the price of the electricity. Price caps are adjusted annually by an inflation factor, X-factor that reflects efficiency improvements and Y-factor that allows for pass-through of the specific cost-items outside the company's control.

Role of power quality in the regulation

Regulation should ensure that the price of the electricity is at reasonable level and that the power quality is high enough. However, the increasing of the power quality increases usually also the costs of the supply.

Yardstick regulation

In the yardstick regulation the allowed income of the company is dependent on the performance of the other companies. Yardsticks can be used in connection with other methods, such as for price adjustments in the price cap regulation. Yardsticks are usually determined by benchmarking the companies against each other. The special case of the yardstick regulation is benchmarking based on hypothetical efficient company or hypothetical distribution network in the case of the electricity distribution business.

In the yardstick regulation, the incentives for investments are dependent on the benchmarking method and the factors of the benchmarking. One of the more common benchmarking methods is Data Envelopment Analysis (DEA), which is a linear programming application. In DEA the efficiency score is calculated by maximising the ratio of the weighted outputs to weighted inputs.

Since factor weights are chosen to show each company in the best possible light, these weights can vary significantly between factors and between companies. The effects of the changes in the different factors of the benchmarking therefore also vary greatly and this will affect investment strategy. For example, if the interruption time is an input factor in the benchmarking, companies will put efforts on improving that parameter, which is the desired effect.

However, in DEA benchmarking the decrease in interruption time could increase the efficiency score of one company significantly and at the same time be totally insignificant for other company.

If the benchmarking is based on the hypothetical network, the historical circumstances, which have led to the current situation, are not taken into account. The distribution network could be oversized compared to a hypothetical network due to, for example, inappropriate town planning. The company must be able to maintain network to retain the level of the reliability of supply. If the costs based on the hypothetical network are too low to cover the fixed and common costs of the distribution company, the viability of the company and the quality of supply could be threatened.

The report concludes that different regulation models provide different incentives for investments and optimal investment strategy is strongly dependent on the regulation method. If, for example the current value of the network assets is used as the regulatory asset base, companies may have a tendency to increase the value of the network assets by investments since investments increase the allowed income of the company.

Revenue cap regulation provides the best incentives for optimizing the total costs. This usually leads to the socioeconomic optimum, if the cost parameters of the power quality factors are at the appropriate level. Similar result can also be achieved by the rate-of-return regulation with the efficiency benchmarking where the total costs are an input factor.

With the ownership of the companies changing from the municipal owners to the capital investors who are normally seeking high profits for their investments and therefore 'regulatory gaming' might increase in the future. Due to that, it is essential that the regulation model provide incentives that direct the investment strategies towards socio-economical optimum.

[7] Samuli HONKAPURO, Jukka LASSILA, Satu VILJAINEN, Kaisa, TAHVANAINEN, Jarmo PARTANEN - Lapeenranta University of Technology - Finland

HM TREASURY EXTERNAL EFFICIENCY REVIEW OF UTILITY REGULATORS, FINAL REPORT, FEBRUARY 20018

WS Atkins was commissioned by HM Treasury in August 2000 to carry out an efficiency review of the utility regulators, namely Ofgem (electricity and gas), Oftel (telecommunications), Ofwat (water and sewerage), and ORR (rail). The review is focused on inputs (procedures, processes and resources) rather than outputs (regulatory effectiveness).

There were three specific objectives: -

To examine the way in which the regulators define, plan, and prioritise proposed areas of work from which programmes and projects are developed;

To evaluate the management of programmes and projects from inception to closure, and

To assess the cost-efficiency of support functions such as human resources, finance, IT, communications, and estates.

The review had five workstrands: -

An interview programme. Some 50 interviews with Directors and managers of the regulators were conducted to consider issues of organisation, planning, budgeting, control of expenditure, management of resources, quality control;

Information Request. An agreed Information Request was submitted to the regulators to collect data (both historical and forecast) on assets, expenditure, human resources, and performance indicators;

. Project audits. Audits carried out of a sample of on-going or completed projects to assess the effectiveness of project management;

. Stakeholder survey. Some 300 stakeholders of the regulators were invited to rate the regulators against a set of 29 criteria. 83 replies were received, 59 of which came from regulated companies, and

Benchmarking survey. Information on the costs, staffing, and management of support functions from 15 "comparator" organisations which included UK executive agencies as well as other UK and overseas regulators was collected.

The report concluded that regulators are professionally run organisations, and there are many examples of good practice. The cost of regulation is rising well in excess of inflation, but it is still very small in comparison to the turnover of the regulated industries and to the benefits received by consumers.

Stakeholders generally accept that the regulators' work is of good quality, and that they have good people in senior positions, although they also have pointed to weaknesses in the way they go about their work.

There are three main areas of concern: -

- The amount of information made available on which to judge their efficiency;
- The cost of support services such as finance, HR and IT is relatively high and on average accounted for about 22 % of the regulators' total expenditure in 1999/00, and
- The regulators need to have a bigger cadre of senior professionals but with fewer staff supporting them, salaries should be increased, and funds switched progressively from consultants to staff.

The table below demonstrates that the cost of regulation is very small in comparison with the turnover of the regulated industries (less than 0.2 %) and as expressed on a per customer basis (less than £ 1/pa).

	Ofgem	Oftel	Ofwat	ORR
Total cost of regulator (£ m)	33.9	13.5	10.8	13.6
Turnover of regulated industry (£m)	36,840	20,800	7,014	8,254
Cost of regulation/turnover	0.09%	0.06 %	0.15 %	0.16 %
No. of customers (m)	48,15	53,9	24	N/a
Cost of regulation/customer	£ 0.70	£ 0.25	£ 0.45.	N/a

SETTING OF TARGETS FOR CONTINUITY OF SUPPLY THROUGH BENCHMARKING9

Electricity regulators in a number of countries are focusing increasingly on the measurement of outputs such as continuity of supply in addition to the control of revenues of distribution companies. Targets and incentive/penalty regimes are being introduced progressively. Using information from OECD countries, the paper examines the fundamental linkages between continuity performance (frequency and duration of long supply interruptions) and network characteristics as well as the methods used and proposed by regulators to set quality of supply targets.

The paper presents different approaches to benchmarking of continuity performance as might be used by both regulators and distribution companies. In the latter case the disaggregation of SAIDI approach and in particular the detailed comparison by protected zones requires that the necessary data is available and compiled on a systematic basis. These latter methods provide a high-level indication of inherent factors, inherited and incurred factors and therefore an indication of where improvements can be made. The methods provide a starting point for more detailed optimization studies as might be carried out, say, by using the Reference Network Model being developed by UMIST

[8] External Efficiency Review of the Utility Regulators Final Report WS Atkins Management Consultants in association with OXERA

9 Douglas J.A.K. and Castro Sayas F. PB Power Ltd. - United Kingdom

APPLICATION OF BENCHMARKING TO DISTRIBUTION COMPANIES' 10 BILLION DOLLAR INVESTMENT PLANS10

Transmission and distribution businesses are generally considered to be natural monopolies, as it is not economic for several companies to compete in the same geographic area. Under such conditions there is a possibility of abuse of monopoly power and, without competition, there may be little incentive for companies to reduce costs or improve efficiency. As a consequence it is necessary for such businesses to be subject to regulatory control of the charges made to customers. In the United Kingdom and in a number of other countries where the electricity supply industries are deregulated, 'price cap' regulation is applied allowing incentives for the companies to retain efficiency savings. The 'Price Controls' generally take the form of an assessment of required income with a continuing requirement for efficiency gains that act as a proxy for competition.

In the United Kingdom, regulatory reviews of distribution price controls are carried out at intervals of 5 years. The recent third distribution price control conducted by the British electricity regulator, Ofgem, covered changes to the charges for use-of-system and (to a limited extent) connections, whereas energy costs were the subject of a separate supply price control review. The distribution price control was based upon an analysis of the historic and forecast business operating and capital expenditure requirements and assessed efficiency gains.

In the paper PB Power describe the techniques used in the review of capital expenditure forecasts submitted by each of the companies11. The review of operating expenditures was subject to a separate, but parallel, process in which they also provided Ofgem with assistance on technical and operational aspects.

ELECTRICITY DISTRIBUTION PRICE CONTROL REVIEW, FINAL PROPOSALS, NOVEMBER 2004 265/0412

This paper sets out Ofgem's Final Proposals for the Electricity Distribution Price Control Review, taking account of comments received in earlier consultations. The proposed package of measures will best protect the interests of consumers whilst providing sufficient revenue to allow the distribution businesses to finance their activities and comply with all of their obligations.

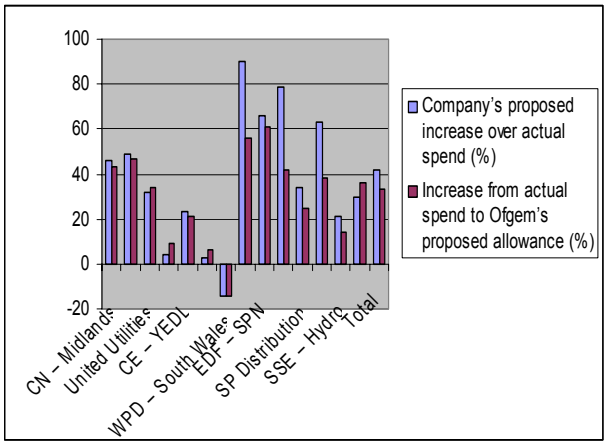
The key issues identified by Ofgem included the following: -

Incentives for investment and efficiency – some of the companies forecast very significant increases in investment - others less so. In total, companies requested an increase of around 50 per cent from current levels of expenditure to maintain current service levels. Ofgem has challenged the companies' plans to ensure the price controls provide value for money. An innovative incentive mechanism has been developed to accommodate the range of approaches. In total these proposals allow for investment of £5.7 billion over the years 2005 – 2010 to deliver improved performance, an increase of 48 per cent over expenditure in the current price control period.

Incentive regulation requires that genuine efficiencies should be rewarded. At this review, a substantial process of data normalisation and adjustment has been required to ensure comparability between companies and consistency with the previous review. The review process needs to continue to improve: with the support of the companies, Ofgem will therefore institute a more effective cost reporting mechanism;

Quality of service – consumers value quality and security of service as well as the price that they pay. Surveys of consumers' priorities suggest that they are willing to pay more for improved service – but only up to a certain point. The Final Proposals therefore incorporate targets for significant improvements in performance, stronger incentives to exceed those targets and streamlined arrangements to provide compensation for prolonged outages following severe weather; and responding to the challenge raised by the Government's objectives for renewable energy - Ofgem has developed revised connection charging arrangements and new incentive arrangements to encourage DNOs to respond proactively to connection requests, removing regulatory obstacles to the achievement of the Government's targets for renewable energy.

The following figure is provided to indicate the large differences that may exist between different distribution business's expectations The figure shows the increased percentages of capital expenditure requested over the actual incurred by the distribution companies and the increased percentages of capital expenditure proposed by Ofgem which were based on the studies undertaken by PB Power referred to in the paper above.



ELECTRICITY DISTRIBUTION PRICE CONTROL REVIEW, PRICE CONTROL COST REPORTING RULES[13]

[10] D I Bailey, J A K Douglas, F Castro Sayas and C H Morris PB Power Ltd, United Kingdom

[11] Ofgem, Electricity Distribution Price Control Review – PB Power Reports on Capital Expenditure

[12] 9404_DPCR_final_proposals.pdf

[13] Instructions and Guidance (version1.0) April 2005 130/05b

A common issue raised in all of the above benchmarking studies is the significant impact of the data used in any benchmarking exercise on the results.

As a result of the issues and lessons learnt from several price setting exercises the UK regulator Ofgem has introduced a set of data and information reporting rules.

The purpose of these rules is to provide a framework for the collection and provision of accurate and consistent cost information from the Distribution Network Operators (DNOs), in accordance with standard condition 52 of the electricity distribution licence.

BENCHMARKING IN THE SOUTH AFRICAN EDI

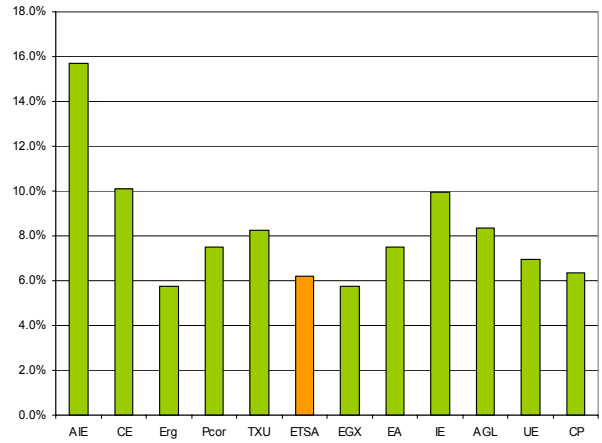
In South Africa the National Electricity Regulator has examined various benchmarking methods although none of this data is available in the public domain.

A figure of maintenance expenditure being 2% of asset value is attributed to the NER and commonly quoted in the industry as a benchmark.

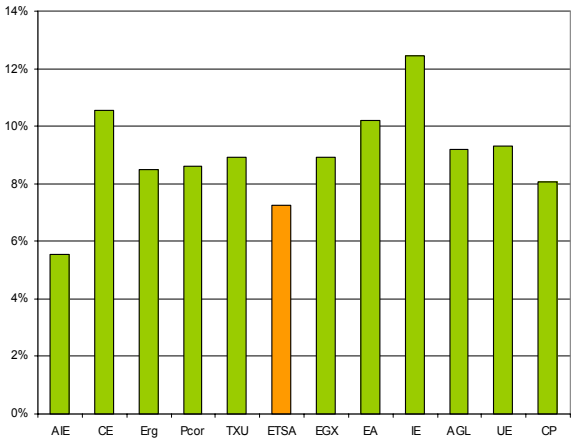
At this early stage of restructuring of the industry in South Africa very few "accurate" depreciated replacement cost (DRC) valuations have been undertaken. Asset values currently available are based on the historical value of the distributors' assets and are, in some cases, understated by over 100%. The use of the 2% "benchmark" in providing an indication of operating expenditure as a % of asset value therefore should be done with caution.

In a study of international benchmarks undertaken by PB Power recently where figures have been normalised to account for South African conditions in terms of power purchasing parity etc, it was found that Maintenance to Asset Replacement values ratios range from 0.5% to 7% with an average of 2.7%.

In Australia where PB Power established certain benchmarks for the regulator in a recent price review the average operating expenditure as a percentage of asset value (DRC) for all utilities was found to be 8.2% and the range across the utilities is illustrated in the chart below.



In terms of capital expenditure, the average expenditure as a percentage of asset value was 9% and the range across the industry is shown below.



Due to the considerable differences in labour costs, purchasing power parity and other factors in the two regions these percentages should not be taken too literally but the small range between the different companies is meaningful. If the first distributor (AIE – long stringy rural network) is excluded from the peer group as being not typical then the range of between 6% and 10% for operational expenditure and 7.5% and 12.5% for capital expenditure is considered very reasonable.

CONCLUSIONS

The undertaking of benchmarking studies in particular for the setting of prices by regulators is well established throughout the electricity distribution industry worldwide.

Lessons can be learnt from published information and if the technique is to be used in South Africa by the industry then a comprehensive strategy and methodology should first be developed in consultation with the distribution businesses in order to make the results of these studies acceptable and creditable to all stakeholders.

The methodology should be transparent and the data used in the studies should be complete and comprehensive without creating a burden for either the regulator in analysing the data or the distribution business in providing it.

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