



مكتب التنظيم والرقابة
Regulation & Supervision Bureau

Initial Consultation on the Review of Price Controls for
Al Ain and Abu Dhabi Distribution Companies,
Transco, and ADWEC

January 2001



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Foreward

In 1999 the Regulation and Supervision Bureau established price controls for the water and electricity businesses of the Abu Dhabi Transmission & Despatch Company (Transco), Abu Dhabi Distribution Company (ADDC) and Al Ain Distribution Company (AADC). A price control was also established for the direct costs of the Abu Dhabi Water and Electricity Company (ADWEC). These price controls came into effect on 1 January 1999 and were set to run for three years.

The Bureau developed the controls in accordance with its Primary and General Duties in Articles (53) and (54) of Law No (2) of 1998. In carrying out its functions under the Law, the Bureau is under an obligation to act consistently, to minimise the regulatory burden on licensees, and to give reasons for its decisions. The Bureau must also take account of the financial position of licensees when setting price controls. The Bureau is committed to these precepts and works to ensure transparency and objectivity when dealing with licensees and others. Accountability is further reinforced by the fact that

arbitration.

New price controls are due to take effect from 1st January 2002. The Bureau proposes to consult widely with ADWEA, the licenced companies and other interested parties before finalising the new controls. This initial consultation document sets out issues on which views are sought. Comments on the matters raised in this paper are sought by 21 February 2001. Replies should be sent to:

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The Bureau proposes to make responses to the consultation exercise publicly available.

Zaal Mohammed Al Hameeri
Chairman
The Regulation & Supervision Bureau



Part 1. Introduction

- 1.1. Transco, ADWEC, and the distribution companies have little direct competition in the areas and activities in which they operate and are therefore able to exercise market power when setting terms and conditions for the services they provide to their customers. The exercise of market power often results in outcomes that are not socially acceptable or economically desirable. For example, production is less efficient and costs are higher than in markets where market power is absent. Output of companies exercising market power is often lower and prices to customers are higher than they need be.
- 1.2. To provide protection for customers and promote economic efficiency, Transco, ADWEC and the distribution companies operate under price controls that set a ceiling on the revenue that can be recovered from licenced activities. These controls came into effect on 1st January 1999 and were set to run for three years. New price controls are due to take effect from 1st January 2002. This consultation paper marks the start of a process of review of the initial controls that will culminate in new price controls being set. The duration of the new controls is a matter for consultation.
- 1.3. This document sets out issues on which the Bureau wishes to consult before establishing the new price controls. The remaining sections of Part 1 provide background information on industry structure, the present form of regulation and price control, and the timetable envisaged for the review of the present price controls. Part 2 discusses issues common to all price controlled companies, and Part 3 discusses company specific issues. Annex A is a summary of all the issues on which views are sought.
- 1.4. The initial price controls were set by the Bureau following an open and transparent process of consultation with the companies concerned and other interested parties. Issues discussed when setting the initial price controls are documented in a series of consultation papers that are available from the Bureau on request. Details of these papers and other Bureau publications can be found in Annex B.



Industry Structure

- 1.5. The water and electricity sector of the Emirate of Abu Dhabi comprises the production, transmission, distribution and supply of electricity and potable water to customers. The sector has undergone rapid development since its establishment a little more than 30 years ago.
- 1.6. The last few years have seen a radical change in approach to the organisation, regulation and ownership of the sector: the government has embarked upon a long-term programme for the sector's privatisation. This programme has three core elements:
 - The vertical and horizontal restructuring of the sector;
 - The establishment of independent regulation; and
 - The introduction of private funding and operation within the sector.
- 1.7. The basis for this programme was the passing, in March 1998, of Law No (2) of 1998 Concerning the Regulation of the Water and Electricity Sector in the Emirate of Abu Dhabi.
- 1.8. Electricity is generated in predominantly gas-fired power stations located throughout the Emirate. Transmission lines at voltages of 132kV, 220kV and 400kV connect the major centres of generation and demand, although there are some small centres of population that are not connected to the transmission grid. Distribution to customers is at 33kV and 11kV.
- 1.9. Potable water is produced from groundwater wellfields and desalination plant. Desalination takes place predominantly alongside the generation of electricity in cogeneration stations. There are two water grids for transmission through trunk mains pipelines and pumping stations, in the central and western regions of the Emirate. Interconnection of these grids is likely in the next few years. Distribution to customers is by mains pipelines and, in some areas, road tankers.
- 1.10. The sector has grown rapidly alongside the Emirate's social and economic development. The first generation plant was installed in 1966 and the first desalination capacity in 1970. In 1966 when the government's Water and



Electricity Department (WED) was formed the installed generation capacity totalled 3MW. By 1999 generation and desalination capacity had reached 3,586MW and 224MGD, respectively, an annual average growth rate of over 14% since 1970.

- 1.11. The growth in capacity reflects the rapid growth in demand for electricity and water in the Emirate. Growth in peak electricity demand has averaged 14.4% each year since 1973. In the past 10 years, peak demand (excluding the Western Region) has increased from 1,524MW in 1989 to 2,908MW in 1999.
- 1.12. Water demand has historically grown at a slightly faster rate than electricity demand. However, figures for water demand have to be treated with some caution: considerable quantities of water, not all of it potable, have been produced in the past, and continue to be produced, from groundwater sources that were not under the control of WED. In addition, demand on the WED system has been constrained by available supply of potable water from desalination and groundwater sources. In some parts of the Emirate, customers continue to receive a timed supply and other customers are supplied by road tanker.

The Restructuring and Privatisation Initiative

- 1.13. In 1996 the government of Abu Dhabi established a Privatisation Committee for the Water & Electricity Sector. The Committee was charged with examining the options for restructuring and privatising the water and electricity sector with the following objectives:
 - Ensuring the security of water and electricity supply;
 - Improving economic efficiency and the level of service;
 - Promoting both local and foreign private sector investment and participation;
 - Creating employment and training opportunities for UAE nationals; and
 - Maximising revenues from asset sales.



- 1.14. The Committee's work resulted in the drafting and passing, in March 1998, of Law No (2) of 1998. The main provisions of the Law are:
- The creation of the Abu Dhabi Water & Electricity Authority (ADWEA), which is responsible for government policy towards the sector, including its privatisation;
 - The transfer of control of WED to ADWEA;
 - The establishment of new sector companies and, through the definition of their duties, the creation of a new structure for the sector;
 - Provisions for a Transfer Scheme under which all assets, liabilities and employees of WED would be transferred to one or other of the new sector companies; and
 - The creation of an independent regulator for the sector, the Regulation and Supervision Bureau for the Water and Electricity Sector in the Emirate of Abu Dhabi.
- 1.15. Following the passage of the Law, ADWEA set about restructuring WED in preparation for the new sector companies assuming their responsibilities. WED operated as a single, vertically integrated government department, albeit with some internal organisational division along geographic and functional lines. The new structure for the sector required both vertical and horizontal "unbundling" of WED.
- 1.16. Abu Dhabi's sector has been separated into segments separately responsible for production, transmission and distribution. Additionally, planning and contracting for new production capacity was made the responsibility of a "Single Buyer", the Abu Dhabi Water & Electricity Company (ADWEC).
- 1.17. WED's electricity generation and water desalination plant were split between four new generation and desalination companies (G/Ds): Al Taweelah Power Company, Bainounah Power Company, Umm Al Nar Power Company, and Al Mirfa Power Company.
- 1.18. Transmission of both electricity and water is the responsibility of Abu Dhabi Transmission and Despatch Company (Transco).



- 1.19. Distribution and supply to customers is the responsibility of Abu Dhabi Distribution Company (ADDC) and Al Ain Distribution Company (AADC).
- 1.20. Responsibility for WED's groundwater production facilities passed to the Abu Dhabi Company for Servicing Remote Areas (ADCSRA). ADCSRA also has responsibility for supply to remote areas of the Emirate not connected to the main electricity and water grids.
- 1.21. In parallel with the restructuring of WED, the Privatisation Committee issued in late 1997 a Request for Proposal (RfP) for a new generation and desalination station on the Taweelah site, known as Taweelah A2.
- 1.22. As described above, in the new market, production capacity is contracted to ADWEC. The RfP for Taweelah A2 therefore represented the first competitive tender organised by the Single Buyer. The Bureau understands that the procurement of new generation and desalination capacity will be subject to a similar process of competitive tender. With little competition *in* the production sector, competition *to enter* the market will help constrain production costs to competitive levels.



Developments since 1999

- 1.23. The Taweelah A2 project awarded to CMS Energy achieved financial close in April 1999. The project involves the construction of a 710MW net-capacity combined-cycle generation plant with 50MGD of multi-stage flash desalination capacity. In July 1999 a Request for Proposal (RfP) was issued relating to the sale, refurbishment and extension of the Taweelah A1 plant. The project was awarded to TotalFinaElf and Tractebel, who each own 20 per cent of the project, and the Gulf Power Company, a wholly owned subsidiary of ADWEA who owns the remaining 60 per cent. The price to be paid for the output of the new plant was set at the same level as the final price for Taweelah A2. The A1 project achieved financial close in December 2000 and will see the net capacity of the station increase to 1,350MW and 84MG by 2003.
- 1.24. ADWEA has decided to reorganise the activities undertaken by ADCSRA. The reorganisation will see the distribution assets of ADCSRA transfer to ADDC, along with the majority of ADCSRA staff. ADCSRA will retain ownership of its well-field assets, and the assets used to produce electricity, water, and standby generation for customers in remote areas. ADDC will operate all the assets owned by ADCSRA and will recover the costs of operating and maintaining these assets, including a management charge, from ADCSRA.
- 1.25. The legal framework of the water and electricity sector recognises the importance of health and safety issues. All companies are required by the terms of their licence to prepare a Health, Safety and Environment (HSE) policy. These policies are subject to Bureau approval. Most companies now have an agreed HSE policy and these will be implemented once the necessary monitoring and support systems are in place. A further development is that incident reporting and investigation regulations will come into force in 2001. These regulations require major incidents arising from the activities of licenced companies to be reported to the Bureau.

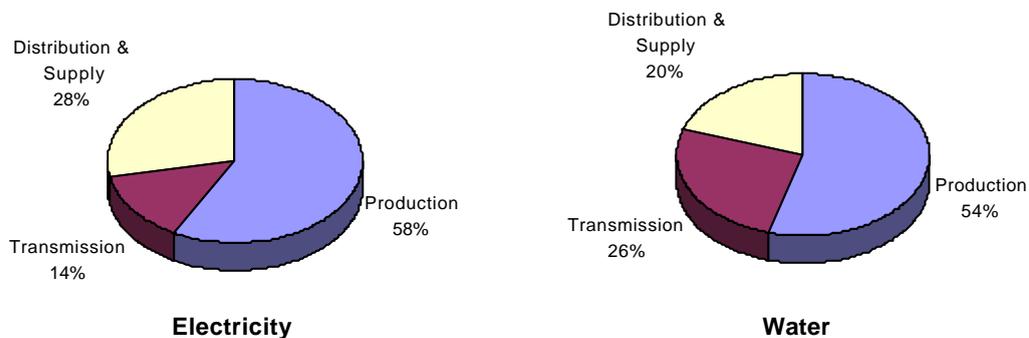


1.26. The distribution companies are required by the terms of their licences to report on their performance against an agreed set of standards. The Bureau has now set guaranteed and overall standards of performance and looks to the distribution companies to review their performance against the standards each year, and to make the results of these reviews available to customers.

Electricity & Water Costs

1.27. The separation of the sector into segments separately responsible for production, transmission, and distribution has increased the transparency of sector costs. Figure 1 shows the composition of electricity and water costs in 1999, the first year of the initial price controls. For both water and electricity, production costs account for more than half of total costs. The balance between transmission and distribution and supply, however, varies significantly between the two products. Transmission accounts for a higher proportion of water prices than distribution and supply but distribution and supply accounts for twice the proportion of electricity prices accounted for by transmission.

Figure 1: The Component Costs of Electricity & Water



Source: Bureau calculations

1.28. The water and electricity tariffs paid by customers are below the economic cost of provision. The difference between customer revenue and the economic costs of the sector is the subsidy required by the sector from the government. The effectiveness of the price controls discussed in this paper will therefore have an important bearing on the level of subsidy required by the sector over the medium term.





Regulation & Price Control

- 1.29. For the companies in the water and electricity sector with significant market power, direct price-capping by the Bureau is a feature of the companies' licences. Al Ain and Abu Dhabi distribution companies, Transco and ADWEC all have charge restriction conditions in the licences granted by the Bureau. The initial controls were set to run for three years starting in 1999.
- 1.30. The price controls set by the Bureau are, for the most part, of the "RPI-X" type increasingly adopted worldwide as delivering the best long-run combination of low prices and high quality of service to customers.
- 1.31. Given the highly capital-intensive nature of the water and electricity sector, a crucial aspect of the price controls is the assessment of the cost of capital of the businesses concerned. Whilst there are well-developed techniques for estimating the cost of capital, there is comparatively little information available to the Bureau regarding the capital markets of the UAE. A number of respondents to the consultation on the initial price controls were of the view that local capital market information was available and would inform an assessment of the required cost of capital for the Abu Dhabi companies. For the new price controls, the Bureau has reviewed the development of capital markets in the region and the availability and type of information they provide. The results of this review are discussed in Part 2.
- 1.32. When setting the initial controls the Bureau examined estimates of the cost of capital for similar businesses in other countries with similar regulatory regimes. It supplemented this examination with available information regarding the cost of capital in the UAE, from the UAE's sovereign debt ratings, and the financing of the Taweelah A2 project.
- 1.33. On the basis of the analysis outlined above, the Bureau estimated the weighted average cost of capital for the network businesses at 6 per cent in



- 1.34. A final significant feature of the price controls for the network businesses is the treatment of capital expenditure. In other jurisdictions, it has been commonplace to set price controls on the basis of a forecast of capital expenditure. The price controls concerned typically only include a return on the capital expected to be invested and an element of depreciation of that capital. This leaves the undepreciated portion of the asset base to be remunerated through subsequent price controls. Nevertheless, in present value terms a significant proportion of the expenditure concerned is recovered in the period in which it is incurred. This places a significant burden on the accuracy of capital expenditure forecasts. The Bureau was concerned that accurate forecasts of capital expenditure were not available for the network operators and that, in the context of recent rapid demand growth, there was scope for large errors in forecasting capital expenditure.
- 1.35. The Bureau therefore set the initial price controls assuming no capital expenditure in the price control period. When setting the new controls, the Bureau will take account of actual capital expenditure during the current period, provided that expenditure carried out was consistent with the planning standards and was efficiently procured. This gives customers the assurance that they will not be asked to pay for capital expenditure that may not be carried out and before they have received the benefit of enhancements to the networks.
- 1.36. The following sections summarise the structure of the present price controls.



Transmission

- 1.37. Transco has separate price controls on its water and electricity transmission businesses. For both businesses, revenue in each year is determined by a formula with three components, or revenue drivers: a fixed term; an amount related to the peak demand met by the transmission system; and an amount related to the total throughput of the transmission system.
- 1.38. Each of these revenue drivers changes from year to year by the rate of increase in inflation less an "X" factor. The rate of inflation used in the price control formula is a composite of US and UAE consumer price index (CPI). The use of US CPI recognizes that much of Transco's expenditure, particularly for capital items, is on imported goods, for which UAE CPI might be an inappropriate index.
- 1.39. Figure 2 below shows the value for each revenue driver in 1999 and the "X" factor for the water and electricity transmission businesses. The fixed terms have a comparatively high weighting, accounting for 50% of revenue in 1999. This reflects the fact that over the three years of the control, costs are not expected to move significantly with short-term changes in demand, albeit over the longer-term transmission system costs should bear a much stronger relationship to output.

Figure 2: 1st Price Control Notified Values; Transco

| Transco Electricity Transmission Business | | | Transco Water Transmission Business | | |
|---|---------|---------|-------------------------------------|---------|---------|
| Notified Value | Units | Values | Notified Value | Units | Values |
| A_{pt} | AED m | 186.17 | A_{wt} | AED m | 167.58 |
| B_{pt} | AED/kW | 41.19 | B_{wt} | AED/kIG | 461.89 |
| C_{pt} | AED/kWh | 0.00382 | C_{wt} | AED/IG | 0.00065 |
| X_{pt} | | 6.7 | X_{wt} | | 6.0 |

- 1.40. The "X" factors imply that real unit prices for water and electricity transmission should fall significantly over the price control period. This reflects the expected continued strong growth in demand against costs that are largely fixed in the short-term but also the Bureau's belief that there is significant scope for efficiency improvement in Transco.





Distribution

- 1.41. The price controls on the water and electricity businesses of the distribution companies operate through formulae that place a ceiling on the aggregate level of revenue recoverable in each year of the control. The water and electricity price controls are broadly similar and are described here using the electricity control as an example. The maximum allowed electricity system revenue in a year is calculated according to the following formula:

$$MRE_t = EPC_t + ETC_t + EDSR_t - KE_t \quad (1)$$

- 1.42. EPC_t is the cost of purchases of electricity from ADWEC through the BST. ETC_t is the cost of electricity -of-system charges. These two components are treated as pass through items as they are costs over which the distribution companies have no direct control and are regulated elsewhere. The term KE_t is a correction factor used to adjust for over or under recovery. $EDSR_t$ is the maximum allowed electricity network and customer service revenue. This revenue is set to recover the costs of an efficient distribution and supply business that provides outputs to agreed standards of performance.
- 1.43. The price controls used to determine electricity network and customer service revenue have a similar form to those for Transco. They also employ three revenue drivers and use a composite of US and UAE CPI for indexation. One significant difference is that instead of a measure of peak demand, they incorporate customer numbers as a revenue driver. Whilst peak demand may well be a significant driver of costs for a distribution business, its measurement is not straightforward. Customer numbers are readily available and are likely to be a significant factor in the costs of distribution and supply. One further feature worth noting is that the water price controls contain a revenue driver that relates to metered water quantities. Not all water customers are presently metered. The price control implicitly assumes a significant increase in the number of water customers with meters. If the distribution companies fail to introduce metering to the extent assumed by the Bureau in setting the controls, then they stand to lose significant revenues.



The control should, therefore, act as a significant incentive on the companies to improve the present patchy coverage of water meters.

- 1.44. Figure 3 summarises the main elements of the price controls that determine network and customer service revenue for the water and electricity businesses.

Figure 3: 1st Price Control Notified Values; ADDC & AADC

| ADDC Electricity Distribution Business | | | AADC Electricity Distribution Business | | |
|--|--------------|----------|--|--------------|----------|
| Notified Value | Units | Values | Notified Value | Units | Values |
| A _{pt} | AED m | 141.61 | A _{pt} | AED m | 83.54 |
| B _{pt} | AED/customer | 1,501.79 | B _{pt} | AED/customer | 2,048.49 |
| C _{pt} | AED/kWh | 0.00713 | C _{pt} | AED/kWh | 0.00922 |
| X _{pt} | | 8.0 | X _{pt} | | 6.0 |

| ADDC Water Distribution Business | | | AADC Water Distribution Business | | |
|----------------------------------|--------------|----------|----------------------------------|--------------|---------|
| Notified Value | Units | Values | Notified Value | Units | Values |
| A _{wt} | AED m | 86.35 | A _{wt} | AED m | 28.4 |
| B _{wt} | AED/customer | 1,170.62 | B _{wt} | AED/customer | 866.24 |
| C _{wt} | AED/G | 0.00076 | C _{wt} | AED/G | 0.00699 |
| X _{wt} | | 12.6 | X _{wt} | | 11.3 |



Power & Water Procurement

- 1.45. As discussed above, ADWEC's price control is somewhat different to the controls for the network businesses. Most of ADWEC's costs represent payments under the PWPA and fuel supply agreements. Linking these costs to movements in demand and general price inflation would be complex and would significantly increase the business risk of ADWEC's activities. In these circumstances, the Bureau considers it appropriate that the competition required for new production capacity and ADWEC's economic purchasing obligation are the principal means of regulating the costs of procuring water and electricity production.
- 1.46. Those direct costs over which ADWEC has control are subject to incentive regulation of the RPI-X variety. In ADWEC's case, indexation is by reference solely to UAE CPI. Figure 4 summarises the main elements of ADWEC's price control.

Figure 4: 1st Price Control Notified Values: ADWEC

| ADWEC Procurement Costs: | | |
|--------------------------|-------|--------|
| Notified Value | Units | Values |
| A_t | AED m | 7.814 |
| Xa_t | | 0.0 |

Economic regulation of the Abu Dhabi Company for Servicing Remote Areas (ADCSRA)

- 1.47. ADCSRA undertakes three main activities: the production of water from wellfields, the operation of the standby generation installed in hospitals and at other sites where security of electricity supply is particularly important, and the generation, distribution and supply of water and electricity to customers in remote areas. For completeness, the economic regulation of these activities is relevant to the present review following the reorganisation of ADCSRA outlined in paragraph 1.24.



- 1.48. Under Law No (2) of 1998, ADCSRA is exempt from the general requirement for all production capacity to be sold to ADWEC, the single buyer. Groundwater from wellfields is, therefore, sold by ADCSRA directly to the distribution companies and to the company's own customers.
- 1.49. Economic regulation of this activity takes the form of tariffs approved by the Bureau for well water supplies to ADCSRA's customers. The approved tariffs presently in place emerged following extensive discussions between the Bureau, ADCSRA and the distribution companies. The analysis of wellfield production costs proceeded by constructing the costs for a number of typical well types. These types varied according to location and the operational and control technology used. This approach avoided the need to examine the costs of all wellfields on an individual basis whilst recognising the main sources of difference in cost between different wellfields.
- 1.50. The Bureau then developed a number of different tariff schemes for wellfield water. These schemes aimed to give ADCSRA incentives to deliver a reliable supply of wellfield water without exposing the company to excessive profit risk, including from despatch decisions over which it has little direct control. At the same time, the tariff schemes were intended to give the distribution companies and other customers comfort that ADCSRA would be subject to a strong cost discipline. The present tariffs will be subject to review in 2001.
- 1.51. ADCSRA is also responsible for operation of the standby generation installed in hospitals and at other sites where security of electricity supply is particularly important. Economic regulation of this activity again takes the form of an approved schedule of tariffs for these services. The Bureau worked with ADCSRA to develop an economically sound basis for standby generation charges. The tariffs for this activity are subject to annual review.
- 1.52. The form of economic regulation for ADCSRA's third activity, the generation, distribution and supply of water and electricity to customers in remote areas, has not yet been determined. Discussions between the Bureau and ADCSRA are ongoing. In light of the changes to ADCSRA's operations, the Bureau may need to involve the distribution companies, ADDC in particular, when assessing the costs of generation, distribution and supply of water and electricity to customers in remote areas.



Review Process & Timetable

1.53. The Bureau proposes a process of review similar to that used when setting the initial price controls. Key milestones and their timing are as follows:

- This initial consultation paper signals the start of the price control reviews

initial thinking on those issues. Responses to issues raised in this paper are sought by 21 February 2001;
- The Bureau has asked the companies to complete price control submissions. These will include projections of demand for the period 2002 to 2006 and estimates of the costs each company expects to incur in meeting projected demands;
- The Bureau will meet with each company to discuss responses to this consultation paper and the information provided by the companies in their price control submission. The Bureau will then issue further consultation papers, one for each company, by June 2001. These second consultation papers will include draft price control proposals;
- The Bureau will consider responses to the second consultation papers and, if necessary, hold further meetings with the companies. The licences of each company may need to be modified for the new controls to take effect. These modifications require the consent of each company. If the required consent is not given, the matter refers to arbitration. Final proposals therefore need to be issued by September 2001 to allow sufficient time for arbitration and the necessary licence modifications.

Licence Obligations

1.54. Any person wishing to engage in a regulated activity requires authorisation from the Bureau. Authorisation can take the form of a licence granted by the Bureau or exemption from the requirement for a licence. It is through the conditions attached to licences and the enforcement of those conditions that the Bureau is able to influence the conduct of companies involved in the sector. The licence conditions applicable to Transco, ADWEC and the distribution companies are set out in Annex C.



Part 2. Issues for Consultation

Background

- 2.1 The first price controls were set against a background of considerable uncertainty. The sector had been extensively restructured and the new sector companies that replaced the Water and Electricity Department were adjusting to their responsibilities. The Bureau had only limited information on the costs of each sector activity. Information provided by the companies was uncertain and audited financial accounts were not available.
- 2.2 These factors had a bearing on important aspects of the initial controls. For example, the transmission and distribution price controls were set without reference to forecasts of capital expenditure for these businesses as no reliable forecasts of capital expenditure were available. As regards duration, the initial controls were set to continue for three years, whereas evidence suggests that incentives to improve efficiency tend to be stronger the longer the price control period. The Bureau recognises the importance of reducing technical and non-technical losses on the transmission and distribution systems, but was unable to provide a direct loss-reduction incentive in the initial controls due to incomplete metering of the systems.
- 2.3 The Bureau will therefore need to review all issues discussed when setting the initial controls and will consider whether a tightening of the controls is justified. If appropriate, the new controls will include additional measures to further strengthen efficiency incentives.

Scope of New Price Controls

- 2.4 The Bureau thought it appropriate that the initial controls should cover all revenue recovered from charges to customers, but noted the possibility that certain charges may in future be excluded from the controls.
- 2.5 The case for excluding services from the scope of a control is generally based on there being services which are unpredictable and therefore difficult to capture adequately in price control formulae. Services that are open to competition need not be subject to price control.



- 2.6 The Bureau understands that some companies will argue for revenue streams from certain services to be treated as unregulated revenue. Proposals to exclude a service from the scope of a control require careful consideration.
- 2.7 Regulated revenue recovers the costs of services essential to a licenced activity. If a service can be exposed to competition, the construction work associated with new connections for example, then there may be grounds for excluding revenue associated with that service from a control. As regards services that are not essential to a licenced activity, or to meet a licence obligation, the case for engaging in that activity would need to be made.
- 2.8 Removing services from the scope of a control raises concerns over cost allocation and potential cross subsidy, particularly where services are subject to competition. It would not be appropriate for the customers of a price-controlled service to subsidise customers of a service that is not subject to control.
- 2.9 revenue recovered from charges to customers.

Duration of the New Controls

- 2.10 The duration of a price control must strike a balance between providing incentives for efficiency and reducing exposure to unanticipated outcomes. There is evidence that a longer duration provides stronger incentives for companies to implement efficiency savings. On the other hand, a longer duration also increases the possibility of performance being significantly at variance with expectations at the time that a control is set.
- 2.11 The initial price controls were set to run for three years. This reflected the limited information available when setting the controls on which to base projections of future costs. The Bureau was also aware that the newly established companies had to adjust to their responsibilities in the new industry structure while meeting rapid demand growth.



2.12 Considerations such as these are more difficult to sustain when considering the duration of the new controls. The companies now have experience of the new sector structure. They have in some cases developed and have access to information systems and data that make assessments of present costs and projections of future costs less uncertain.

2.13 The Bureau's initial view is that the new controls should have a five-year duration.

Form of Control

2.14 When considering different forms of control, regulators have regard to how different approaches contribute to the objective of promoting economic efficiency, particularly in circumstances where competition is absent and the market will not achieve the efficiency aims unassisted. Annex D presents a summary of different forms of control and highlights their relative strengths and weaknesses in promoting allocative and productive efficiency.

2.15 The form of price control chosen strongly influences the allocation of risk between a regulated company and its customers. Broadly speaking, incentive forms of regulation such as 'RPI-X' seek to allocate risks where they are best managed.

2.16 The present price controls are, for the most part, of the 'RPI-X' type. This form of control is increasingly adopted world wide and is recognised as delivering the best long run combination of efficient prices and the required quality of service to customers.

2.17 Since the initial Abu Dhabi controls were set, developments in other markets reinforce the view that 'RPI-X' is the most appropriate form of control. For

both confirmed the superiority of RPI-X. In the USA, there is further evidence that RPI-X is replacing the rate of return approach as the preferred form of utility regulation for network businesses.

2.18 The Bureau's view is that an 'RPI-X' approach remains the preferred form of regulation for the Abu Dhabi companies.





Price Control Mechanisms

- 2.19 Paragraphs 1.37 to 1.46 describe the structure of the present controls under which Transco, ADWEC and the distribution companies operate. The price controls for the network businesses include revenue drivers that, when applied to the relevant units of outputs or customer numbers, determine the allowed revenue that can be recovered from charges to customers in each year of the control.
- 2.20 The revenue drivers serve a number of functions. They allow revenue to vary with changes in demand that might be expected to affect costs. In this regard, they can help to reduce profit volatility which in turn keeps the cost of capital for the businesses lower than it would otherwise be. The precise extent to which a business should be subject to profit volatility as a result of factors, such as demand growth, largely outside its control depends on the appropriate allocation of risk between that business and its customers. Where customers bear risk, they may be in a better position to manage it through insurance or other contractual arrangements.
- 2.21 The structure of ADWEC's control is somewhat simpler in that the allowed revenue associated with ADWEC's own costs is a fixed sum. Year on year this changes by CPI-X. The value of X in ADWEC's present control is set to 0 and allowed revenue therefore increases year on year in line with UAE CPI.
- 2.22 The Bureau will review the operation of the present price control mechanisms and consider whether changes are required for the new controls. In particular, the choice of revenue drivers, the case for increasing or decreasing the number of drivers in a control, and the proportion of revenue attributable to each driver. The Bureau invites views on these issues.



Financial Issues: Asset Valuation & Cost of Capital

Asset Valuation

- 2.23 The value ascribed to the assets of each company has a significant bearing on the level of price control revenue and unit prices to customers. When setting the initial controls, the Bureau considered three principal methods of asset valuation; accounting, market and economic, particularly Long-run Marginal Cost (LRMC). The Bureau inclined towards the use of accounting-based values on the basis that there is no market-based information on asset valuation presently available in Abu Dhabi, and LRMC approaches present significant practical difficulties. However, the Bureau considered whether the accounting based valuations should be adjusted to bring them in line with
- 2.24 The Bureau compared the asset values of Transco's electricity business with peer companies in other markets. The Bureau then compared gross asset value per unit of maximum demand with the capital expenditure cost per unit of increased maximum demand implied by projections of electricity business capital expenditure. These comparisons show unit of maximum demand as 19 per cent higher than the unit cost of the significant system expansion expected over the next five years.
- 2.25 These comparisons were strongly indicative of an over-assets on an accounting basis. In recognition of this, the Bureau applied a 15 corresponding reduction in depreciation, thus leaving asset lives unaffected. The analysis on which this adjustment was based used information on electricity asset valuation alone. The likelihood of over-valuation of electricity assets alone was regarded as remote and the same 15 per cent adjustment was applied to Transco's water assets.
- 2.26 The accounting valuations of the electricity distribution businesses were compared with those of British electricity distribution businesses. The Bureau also compared the gross asset value per unit of maximum demand of the Abu Dhabi companies with the capital expenditure cost per unit of increased demand implied by forecasts of capital expenditure.



2.27 These comparisons showed that the accounting valuations of the Abu Dhabi distribution businesses did not appear to be overstated. Finally, the Bureau compared the estimated Abu Dhabi costs of major capital items with costs for the same items at the Federal Ministry of Electricity and Water (MEW), and Dubai Electricity and Water Authority (DEWA). These comparisons suggested that prices paid by the former WED were significantly higher than elsewhere in the UAE.

2.28 Assessing the valuation of assets of the distribution businesses is extremely sensitive to the assumptions made about future costs. The Bureau did not consider the comparisons described above sufficiently robust enough to warrant an adjustment to accounting values.

2.29 decision not to adjust the assets of the distribution businesses at the time of the next price control review. The Bureau will therefore reappraise the value of assets of the network businesses to ensure that asset valuations remain appropriate or whether further adjustments are warranted.

Cost of Capital

2.30 The cost of capital is the rate of return at which investors need to be rewarded if they are to continue to finance a business. The cost of capital is usually calculated as a weighted-average of the cost of debt and equity finance. As well as providing a return on debt and equity, companies must also finance their tax liabilities and the cost of capital is adjusted, when necessary, to allow for taxation.

2.31 Different methods of estimating the cost of capital may produce different answers and it is appropriate to consider a range for the component elements of the cost of capital calculation. The Bureau uses the Capital Asset Pricing Model (CAPM) to estimate the cost of equity to the Abu Dhabi businesses. The cost of debt is found by adding a suitable corporate debt premium to a risk free rate. Annex E describes the approach used by the Bureau to estimate the cost of capital for the purposes of setting price controls.



2.32 The Bureau used a value of 6% to set the initial price-controls of Transco, ADWEC and the distribution businesses. A review of the component elements of the cost of capital calculations has confirmed that the 6 per cent value remains appropriate for the new controls. This value is intended to represent a post-tax return and has been calculated on the basis that companies will not face any taxation of profits or be able to offset interest expenses against tax.

UAE Capital Markets

2.33

on estimates of the cost of capital of network businesses in the UK, USA, and Australia. Equity markets in these countries are well developed and are subject to close supervision. Information issued to the markets by quoted companies must meet stringent standards of disclosure. Moreover, financial information has to be prepared in accordance with certain accounting standards that apply to all quoted companies. Trading is active with high ratios of turnover and liquidity, and there is wide diversity in respect of sector coverage. These factors provide a degree of confidence that statistical analyses of information from these markets, such as those used in cost of capital calculations, are reliable.

2.34 A number of respondents to the consultation on the initial price controls were of the view that local capital market information was available and would inform an assessment of the required cost of capital for the Abu Dhabi companies. In response to these comments, the Bureau has reviewed the development of capital markets in the region, the UAE in particular, and the availability and type of information they provide. A c report is available on request.

2.35 There have been equity markets in the Middle East for some time, but no official and regulated UAE stock market until March 2000. The unofficial indices comprise three sectors: banking, services, and insurance, with banking and services accounting for well over 90 per cent of market capitalisation. These sectors will, initially, be the main constituents of the official UAE stock market.



- 2.36 The Bureau compared indicators of size and liquidity of the UAE market with other markets in the Middle East and in the UK, Australia, and the USA. The value of UAE trades in 1999 expressed as a percentage of GDP was a little under 2 per cent. This was the lowest ratio of all Middle East markets in that year and was significantly below the ratios observed in the UK, Australia, and the USA, 92 per cent, 116 per cent, and 164 per cent, respectively.
- 2.37 The turnover ratio is a measure of liquidity. It expresses the value of shares traded as a percentage of average market capitalisation. The UAE turnover ratio in 1999 was just over 3 per cent, compared to 53 per cent, 52 per cent, and 106 per cent in the UK, Australia, and the USA respectively.
- 2.38 With regard to market size, the capitalisation of the UAE market in 1999 was just 55 per cent of GDP, compared to 173 per cent, 224 per cent, and 154 per cent in the UK, Australia, and the USA, respectively.
- 2.39 As the official UAE market develops the Bureau is confident that it will provide information relevant to an assessment of the required cost of capital of the Abu Dhabi businesses that are subject to price controls. However, the present coverage and liquidity of the UAE market is such that the Bureau is reluctant to reference its cost of capital calculations to it. The Bureau will monitor the development of the official UAE market and review the situation at the time of the next price control reviews.



Setting the Controls

2.40 The Bureau uses a net present value (NPV) framework to establish the level and profile of price control revenue. This is now a widely accepted way of determining the profile of price control revenue in the RPI-X approach.

2.41 The present value of revenue over the control period is set to equal the present value of cash operating costs and capital expenditure, and a return on the opening asset value minus the discounted closing value of assets at the end of the control period. The discount rate used in the present value calculation is the cost of capital. The calculation is summarised below:

$$\text{Revenue}_{PV} = \text{Opening AV} + \text{Opex}_{PV} + \text{Capex}_{PV} - \text{Closing AV}_{PV} \quad (2)$$

2.42 Expression (2) can be rearranged to show that the price control represents a discounted cash flow analysis:

$$\text{Opening AV} = \text{Revenue}_{PV} - \text{Opex}_{PV} - \text{Capex}_{PV} + \text{Closing AV}_{PV} \quad (3)$$

2.43 The opening asset value (Opening AV) is equal to the cash the assets generate ($\text{Revenue}_{PV} - \text{Opex}_{PV} - \text{Capex}_{PV}$) plus the present value of the terminal value of the assets (Closing AV_{PV}).

2.44 The initial price controls were set without regard to capital expenditure. This issue is discussed in detail in paragraphs 2.49 to 2.60 below where a worked example shows how setting forecast capital expenditure to zero is not fully reflected in the reduction of allowed revenue because of the relationship between capital expenditure and the closing value of assets.

2.45 Once the present value of revenue is established, the control itself can be sculpted in different ways to yield the same present value of revenue depending on the initial value of the notified values in the price control formulae and the subsequent value of X. The Bureau will want to assess the impact of different profiles of price control revenue on the financial accounts of a company, including its cash flows, capital structure and other financial indicators. The path of unit prices is also relevant to these calculations.



Assessing Future Operating Costs

- 2.46 It will be important to understand how the operating costs of each business have changed under the present price controls. Audited 1999 accounts for the ADWEA companies should be available early in 2001. These accounts and the cost information to be provided in the price control submissions will require close and careful scrutiny.
- 2.47 Operating costs may be influenced by many internal and external factors. External factors such as the geography and topography of the area served, weather, and the rate of demand growth will have an important bearing on the level of costs. Of internal factors, the corporatisation of the ADWEA companies and the introduction of more efficient management techniques will have had a bearing on the trend of costs since 1999, and will influence the future path of operating costs in the period covered by the new controls.
- 2.48 As part of the price control review process, the Bureau will discuss and where necessary challenge the assumptions underlying the companies' assessments of future operating costs. There may be scope for comparisons with similar businesses in other countries and the benchmarking techniques discussed in paragraphs 2.70 to 2.78 below will be useful to the assessment of operating costs.



Treatment of Capital Expenditure

- 2.49 The initial price controls were set without regard to capital expenditure. Actual capital expenditure during the period of the first control will, subject to the issues discussed in paragraphs 1.35 above, be rolled forward and together with an allowance for financing costs be included in the opening 2002 regulatory asset base (RAB).
- 2.50 This approach to capital expenditure was justified, in part, by the significant uncertainty associated with expected levels of capital expenditure on the electricity transmission and distribution systems over the period of the first control. Other than for 1999, no forecasts of water related capital expenditures were available.
- 2.51 There will be a degree of uncertainty associated with capital expenditure levels over any medium term forecast period. Consequently, the treatment of capital expenditure in a price control raises a number of important regulatory issues. Before discussing these issues the following section clarifies the Bureau's approach to capital expenditure and, in particular, the relationship between excluded capital expenditure and price control revenue.

Price Control Revenue and Capital Expenditure

- 2.52 The Bureau uses the NPV framework described in paragraphs 2.40 to 2.45 to determine price control revenue. There are usually three components of allowed costs; capital expenditure, operating costs, and an allowed return on the RAB.
- 2.53 The Bureau did not include capital expenditure when setting the initial controls and the allowed costs of the Abu Dhabi companies therefore comprised operating costs and the return on capital element only. When assessing the merits of this approach, the Bureau sought to satisfy itself that the proposed treatment would not result in an inappropriately low level of allowed revenue during the control period, and would not result in large movements in unit prices between one control and the next.



2.54 The Bureau was able to satisfy itself that neither of these outcomes was likely because of the relationship between the level of forecast capital expenditure and the effect of depreciating the RAB. As a starting point, expression (2) from paragraph 2.41 above can be rearranged as follows:

$$\text{Revenue}_{PV} = \text{Opex}_{PV} + \text{Capex}_{PV} + (\text{Opening AV} - \text{Closing AV}_{PV}) \quad (4)$$

2.55 Of interest to this discussion is the term (Opening AV - Closing AV_{PV}). If the discounted closing asset value is higher than the opening asset value, this will be negative and will reduce the present value of revenue. But if the discounted closing asset value is lower than the opening asset value the difference will be positive and will increase the present value of revenue. Setting capital expenditure to zero has a direct effect on the discounted closing asset value. A simple worked example will clarify this relationship.

2.56 Figure 5 shows two sets of calculations. Panel A shows the calculation of price control revenue including forecast capital expenditure of AED 30 million. Panel B shows the same calculation but with capital expenditure excluded. The upper section of each panel shows the calculation of opening and closing asset values, the lower panels show the calculation of price control revenue. To simplify the discussion, discounting and inflation are ignored in this hypothetical example.

Figure 5: Capital Expenditure & Price Control Revenue

| Asset Value | A: Capex Included | | | B: Capex Excluded | | |
|-----------------------------|--------------------------|--------|--------|--------------------------|--------|--------|
| AED Million | Year 1 | Year 2 | Year 3 | Year 1 | Year 2 | Year 3 |
| Opening Asset Value | 100 | 104 | 107 | 100 | 95 | 90 |
| Capex | 10 | 10 | 10 | 0 | 0 | 0 |
| OAV + Capex | 110 | 114 | 117 | 100 | 95 | 90 |
| Existing asset depreciation | 5 | 5 | 5 | 5 | 5 | 5 |
| New Capex depreciation | 1 | 2 | 3 | 0.0 | 0 | 0.0 |
| Closing Asset Value | 104 | 107 | 109 | 95 | 90 | 85 |

| Allowed Revenue | A: Capex Included | | | | B: Capex Excluded | | | |
|------------------------|--------------------------|--------|--------|--------|--------------------------|--------|--------|--------|
| AED Million | Year 1 | Year 2 | Year 3 | Totals | Year 1 | Year 2 | Year 3 | Totals |
| CAPEX | 10 | 10 | 10 | 30 | 0 | 0 | 0 | 0 |
| Opex | 20 | 20 | 20 | 60 | 20 | 20 | 20 | 60 |
| Return on Capital | | | | -9 | | | | 15 |
| Price Control Revenue | | | | 81 | | | | 75 |



- 2.57 The element of the RAB on which a return is required is found by subtracting the closing asset value in year three from the opening asset value in year one. From the upper section of panel A this is: $100 - 109 = -9$. The closing asset value is higher than the opening value **due to the addition of new capex in each year of the control**. The lower section of panel A shows the calculation of allowed revenue, which is the sum of capex plus operating costs **minus** the AED 9 million return on capital element. Total price control revenue is AED 81 million.
- 2.58 Panel B shows the same calculation but with forecast capital expenditure excluded. The closing asset value in year three is now lower than the opening value in year one, **because with no capex additions the depreciated value of assets reduces in each year of the control**. The element of the RAB consumed during the price control period on which a return is required is therefore: $100 - 85 = 15$. Allowed revenue is found by adding operating costs to the return on capital element to give total revenue of AED 75 million. The component elements of price control revenue including and excluding capex are summarised in Figure 6.

Figure 6: Component Elements of Price Control Revenue

| AED Million | Treatment of Capex | | Difference |
|-----------------------|--------------------|-----|------------|
| | In | Out | |
| CAPEX | 30 | 0 | -30 |
| Opex | 60 | 60 | 0 |
| Return on Capital | -9 | 15 | 24 |
| Price Control Revenue | 81 | 75 | -6 |

- 2.59 Excluding the AED 30 million forecast capital expenditure from the control results in a revenue reduction of just AED 6 million. The AED 30 million capex reduction is offset by the AED 24 million increase in the return on capital element.
- 2.60 For the new price controls, actual capital expenditure will be added to the RAB only if it meets certain criteria: first, that the expenditures were required to meet growth in customer demand or the relevant security standards. Second, the Bureau will benchmark and market test actual expenditure to establish that they were efficiently procured.



Treatment of Capital Expenditure in the New Controls

- 2.61 The capital expenditures of Transco and the distribution companies account for a significant proportion of the costs of their network businesses. This will continue to be the case for some time as the present rate of demand growth is forecast to continue over the medium term.
- 2.62 The companies have been asked to provide, as part of their price control submissions, forecasts of capital expenditure for their systems out to 2006. The Bureau has to decide whether the new price controls should be set using used for the initial controls should again be applied.
- 2.63 Capital investment for a network business can be divided into three categories:
- **Load-related** expenditure which is needed for the connection of new customers and for changes in the demand of existing customers;
 - **Non-load related** expenditure which is needed to refurbish or replace parts of the network which are no longer performing satisfactorily; and
 - **Non-operational** expenditure such as information technology, vehicles and so on.
- 2.64 Individual projects in each category should be subject to an appropriate investment appraisal. This is to ensure that the costs of a project are more than offset by the expected benefits, taking account of the timing of both costs and benefits. However, even where capital expenditure forecasts appear justified when setting a price control, regulators can face considerable difficulties when comparing forecasts with actual expenditures.
- 2.65 In cases where actual expenditure is below that used to set a price control, the regulator has to determine whether the difference is due to improved efficiency on the part of the company. It may be that the company has underspent its capital expenditure allowance, or substituted operating for capital expenditure. A lower level of expenditure may result in lower service standards that would not show up for several years, or reflect the deferral of capital expenditure that may need to be undertaken in the future.



- 2.66 These difficulties have led to closer monitoring of capital expenditures during a price control period. This sometimes takes the form of specified output targets for individual projects. In other cases regulators have set specific targets for standards of performance: if a company underspends on capital investment and the targets are not achieved an adjustment will be made to the allowed expenditure in the subsequent price control review.
- 2.67 An alternative approach is to set a price control without regard to forecasts of capital expenditure. Actual expenditure would be remunerated in a subsequent control, subject to meeting certain criteria.
- 2.68 While setting a price control without regard to forecast capital expenditure avoids the uncertainty associated with medium term forecasts, some have argued that it dilutes efficiency incentives. On the other hand, the approach ensures that customers do not pay for capital expenditure that may not be carried out, and before they have received the benefit of enhancements to the networks.
- 2.69 Both approaches to the treatment of capital expenditure in an RPI-X control
- new controls should be set without regard to forecasts of capital expenditure. Actual expenditure would be remunerated in the subsequent control, subject to meeting certain criteria.



Benchmarking Performance

- 2.70 The level of revenue allowed in a price control should be consistent with the expected costs of a well-managed and efficient business. Regulatory authorities therefore need to come to a view on a regulated company's efficiency, both in terms of operating costs and asset cost. This can be achieved by comparing a regulated company to suitable benchmarks that reflect efficient performance.
- 2.71 Benchmarking can be used to assess *productive efficiency* (is maximum output obtained from a given set of inputs?), *allocative efficiency* (are inputs used in proportion to their cost?) and *scale efficiency* (is the company operating at the optimal level of output?).
- 2.72 Benchmarking techniques range in form and complexity. When setting the initial controls, the Bureau made use of simple comparative assessments such as cost per unit of output. These comparisons proved useful when assessing productive efficiency but did not inform on allocative or scale efficiency.
- 2.73 When setting the initial controls, the Bureau indicated that it would look to extend the use of benchmarking by increasing the number of comparator companies examined, by refining the information on which the comparisons are based, and by adopting additional techniques with which to assess efficiency. Formal benchmarking techniques allow explicit recognition to be given to different geographic conditions and circumstances in which peer businesses operate, to differences in scale of operation, and to different capital labour ratios.
- 2.74 For the new controls, the Bureau will assess the efficiency of Transco and the distribution companies in two important respects. First, how efficient the Abu Dhabi businesses are *at present* compared to peer businesses. Second, what improvements in total factor productivity is it reasonable to expect over the period of the new controls?



- 2.75 Data envelopment analysis (DEA) will be used to compare the present efficiency of the electricity transmission and distribution businesses to similar businesses operating in other markets. DEA is a technique that uses units distributed, etc) to construct an efficiency frontier. Each business is then assessed in terms of its position relative to the frontier. Unfortunately, no comparator companies for water transmission and distribution are available. The Bureau will therefore look to use the results of the benchmarking analysis for the electricity businesses to inform on the efficiency of the water businesses.
- 2.76 To assess the scope for efficiency improvements over the period of the new control, the Bureau will make use of analyses by regulatory authorities in other markets concerning achieved and expected increases in the total factor productivity of network industries. It will be important to identify changes in efficiency attributable to changes in the scale and density of operation separately from changes in the trend rate of total factor productivity. Regression analysis has proved useful when disaggregating these effects. The Bureau will make use of research in this area and will, where possible, use information on the costs and outputs of the Abu Dhabi companies to perform its own regression analysis.
- 2.77 There is evidence that significant improvements in efficiency occur in the period following a major restructuring or privatisation initiative. Thereafter, a lower sustainable trend rate of efficiency improvement is observed. By the time the new price controls take effect, the Abu Dhabi companies will have been operating for three years.
- 2.78 The Bureau will consider carefully the degree to which the efficiency of the Abu Dhabi companies has improved since the restructuring. If substantial efficiency improvements are identified, it will be appropriate to focus assumptions concerning future efficiency improvements on trend rates observed in other network industries. On the other hand, it may be appropriate to allow for additional and significant catch up efficiencies in the new controls.



Treatment of Technical & Non-technical Losses

- 2.79 When setting the first price controls, the Bureau recognised that the controls should provide appropriate incentives for reducing both technical and non-technical losses. Non-technical losses arise from illegal connections. Technical losses reflect the investment companies make in their systems, the extent to which equipment is loaded at different times, and the geographic circumstances in which the systems operate.
- 2.80 The savings to customers from reduced losses will be the avoided costs of production, transmission and distribution, less any incentive payments to companies. In addition to these direct cost savings, reducing losses also provides wider and important environmental benefits.
- 2.81 The effectiveness of reducing transport losses through formulaic incentive mechanisms has been demonstrated by regulatory authorities in other markets. However, the lack of comprehensive and accurate metering on the Abu Dhabi water and electricity transmission systems was such that a formula based approach to losses was not possible for the first price controls. The Bureau understands that it will not be possible to incorporate such mechanisms in the new controls due to the continued lack of comprehensive and accurate metering. The Bureau is reluctant to accept this as, by the end of the new price control period (assuming the new controls operate for 5 years), the network businesses would have operated for eight years without such a mechanism.
- 2.82 Transco and the distribution companies have been asked to provide, as part of their price control submissions, a statement on the metering of entry points and exit points to their systems. These statements will be viewed in the light of each companies licence obligations and the requirements of the Metering and Data Exchange Code (MDEC).
- 2.83 Transco has a legal duty to develop a system for the settlement of payments due to and from the providers of water and electricity capacity and output. For Transco to meet its legal obligations the flows of electricity and water must be properly accounted for at the boundaries between the entities so that financial transactions which become due can be settled.



2.84

ensure a metering system is installed that is registered with Transco and which complies with the provisions of the MDEC. Compliance with the MDEC is a requirement of the distribution and supply licence.

2.85

As regards units entering or exiting the distribution systems, the distribution companies are required by the terms of their licences to offer terms for connection to their systems. All connection agreements include provisions regarding the installation of meters required to measure water and electricity entering or exiting the system.

2.86

In view of these obligations, and in the light of the apparent lack of progress made to improve the coverage and quality of metering, the Bureau will consider whether the new price controls should include new and specific incentives to improve metering.



Quality and Standards of Customer Service

- 2.87 Price controls give the company concerned an incentive to reduce costs. Cost reduction should not, however, be achieved at the expense of service quality. An important concomitant of any price control is, therefore, a set of service standards and indicators.
- 2.88 Transco is required by the terms of its licence to prepare standards with regard to security and standards of service, and to plan and develop the water and electricity transmission systems in accordance with those standards.
- 2.89 ADWEC is required by the terms of its licence to satisfy a generation security standard (GSS). The standard requires ADWEC to ensure that the supply of electricity to customers will not be discontinued for a total of more than 1 day in any period of 10 years. In accordance with a further licence obligation ADWEC has proposed a desalination security standard (DSS). The Bureau will discuss the proposed standard with ADWEC so that an appropriate DSS can be implemented as quickly as possible.
- 2.90 For the distribution companies, quality of service standards take a number of forms, including:
- Operational and planning standards for the distribution system;
 - Agreed criteria for measuring distribution system security, availability, and quality of service; and
 - Standards of performance, including standards where failure results in payment of compensation to the customer concerned.
- 2.91 The Bureau welcomes the constructive approach of the distribution companies as regards these standards. A number of issues related to the implementation of the standards need to be resolved, these are discussed in Part 3.



2.92 In setting the new price controls the Bureau will consider carefully the interaction between quality of service and costs. Where a clear benefit to customers can be identified as a result of improved quality of service, it may be appropriate to recognize increased costs in the price control. On the other hand, customers can also benefit from more efficient ways of working that may reduce total costs. There are many examples of improved methods of working that both lower cost and raise quality of service.



Part 3. Company Specific Issues

TRANSCO

Settlement

- 3.1 Transco is responsible for the operation and development of its water and electricity transmission systems, for scheduling and despatch of plant and for organising other functions necessary to maintain system stability.
- 3.2 Law Number (2) of 1998 places a duty on Transco to develop a system for the settlement of payments due to and from the providers of production capacity, delivered water and electricity units, and ancillary services. Transco is involved with others in the development of a comprehensive settlement system. This is a long-term project and implementation is some way off. To facilitate settlement of PWPA and BST transactions, Transco developed an interim system for settlement.
- 3.3 Orderly and timely settlement of transactions between the water and electricity businesses is important to the commercial operation of these businesses. In recognition of this, the Bureau is considering including a mechanism in Transco's price control to recover a revenue stream sufficient to cover the costs of the settlement function. This revenue would, however, be subject to meeting certain standards of service. The standards would need to reflect the settlement requirements of the Abu Dhabi businesses as regards quality and timely provision of data.
- 3.4 The detail of such a mechanism needs careful consideration but it would provide Transco with an incentive that it does not presently have to ensure systems are in place and data is available to facilitate timely settlement of financial transactions.



Transmission Use of Systems Charges

- 3.5 The Bureau's view when setting the initial price controls was that charges to customers for use of Transco's transmission systems should be based on maximum demand. This would send appropriate signals to customers about the economic cost of meeting their demands. Moreover, the cost of Transco's electricity system are affected by the power factors of their customers and charges should therefore be based on apparent power (kVA) rather than active power (kW).
- 3.6 Transmission use of system charges for 1999, 2000 and the prospective charge for 2001 reflect kW not kVA. The Bureau is disappointed that Transco has not calculated charges on the required basis as there is no obvious reason why this cannot be done. The Bureau will therefore ask for an undertaking from Transco that from 2002 electricity use of system charges will be based on apparent power (kVA) rather than active power (kW).

Metering & Losses

- 3.7 In 1999, Transco stated that it would take between 18 months and 2 years to improve the metering of its systems. Some progress has been made since 1999 to improve the coverage and accuracy of metering on the transmission systems is far from complete and that it will not be possible to incorporate a direct formulaic based incentive for loss reduction in the second price controls.
- 3.8 This is disappointing. Reducing losses remains an important objective and the Bureau will ask Transco to provide, as part of its price control submission, a statement clarifying the present configuration of metering of its water and electricity transmission systems. The statement would also identify the gaps where units are not presently metered and the arrangements that are or should be in place to rectify the shortcomings.
- 3.9 obligations, the Transmission Codes, and the Metering and Data Exchange Code.



3.10 The Bureau is considering what mechanisms other than formulaic based incentives could be used to strengthen incentives on Transco to manage technical and non-technical losses on its transmission systems. One approach would be an incentive mechanism similar to that used for metered water units in the price controls of the water distribution businesses. That mechanism implicitly assumes a significant increase in the number of water customers with meters. If the distribution companies fail to introduce metering to the extent assumed by the Bureau in setting the controls, then they stand to lose significant revenues. This approach could be applied in the transmission price controls and would act as a significant incentive on Transco to improve the metering and management of losses on its systems.



AADC & ADDC

Separate Price Controls for Distribution & Supply

- 3.11 The Bureau proposes to develop separate price control mechanisms for the distribution and supply activities. If implemented, the distribution companies would be subject to four price controls, one for each separate business. There are strong arguments in support of separate controls.
- 3.12 The terms of the distribution companies' licences require them to publish separate accounts for their water distribution and supply businesses and their electricity distribution and supply businesses. The present price controls identify revenue attributable to the water and electricity businesses as a whole, but do not identify revenue for the supply and distribution activities of those businesses. Separate price controls would therefore assist the companies meet their licence obligations regarding the preparation of separate accounts.
- 3.13 In a wider context, the water and electricity sector has been restructured so as to accommodate competition in the supply activity. Any person wishing to engage in the supply of electricity to premises can do so subject to the Bureau granting that person a licence.
- 3.14 To supply customers, a licenced supplier would purchase their customer's energy requirements from ADWEC under the terms of the BST. Use of system charges would be due for the transportation of energy across Transco's transmission systems. If the customer is connected to the distribution system, a distribution use of system charge would also apply. Large customers connected directly to the transmission system would not incur distribution use of system charges. These transactions require separate charging mechanisms for supply and distribution that are not presently available. Separate price controls would assist the preparation of these charges.
- 3.15 Moreover, the supply component of the final charge to customers would reflect competition between the new licensed supplier and ADDC or AADC. Competition is likely to exert downward pressure on costs to the benefit of customers.



- 3.16 The Bureau has provided the distribution companies with what it regards as an appropriate definition of the boundaries between distribution and supply;
- The water and electricity distribution businesses are responsible for all matters connected with the development, maintenance, and operation of the distribution networks. They provide connections to the network and deal with customer enquiries about all distribution related matters. The distribution businesses also operate and maintain all metering equipment and conduct all meter reading services;
 - The water and electricity supply businesses are responsible for customer billing and account collection and for maintaining customer records. The supply businesses purchase water and electricity from ADWEC for sale to customers and arrange for the products to be transported to customers by the distribution businesses. The supply businesses pay distribution and transmission use of system charges to the distribution businesses and Transco, and recover these charges from customers.
- 3.17 A large proportion of costs can be allocated to the distribution and supply activities on the basis of the definitions outlined above. However, certain costs are common to both activities, and common also to the water and electricity businesses. The allocation of common costs will require careful consideration. The Bureau understands that the distribution companies are working together to agree the basis of apportionment and allocation of common costs.
- 3.18 As regards price control mechanisms, the present distribution price controls include three revenue drivers. The customer number driver could form part of a supply price control, and the units distributed driver a part of the distribution price control. It would then be necessary to allocate the fixed term revenue driver between supply and distribution.
- 3.19 The Bureau is not proposing this as the basis for new controls, as it is appropriate to consider the full range of possible options. However, the discussion shows how separate controls could be derived from the existing price control mechanism.



Metering & Losses

- 3.20 Metering of units entering and leaving the water and electricity distribution systems is incomplete. It will not be possible to include in the new price controls a formulaic based incentive for the distribution companies to manage losses on their systems.
- 3.21 Reducing losses remains an important objective and the Bureau will ask the distribution companies to provide, as part of their price control submissions, a statement clarifying the present configuration of metering at entry and exit points of the water and electricity distribution systems. The statements would also identify the points where units are not presently metered, and the arrangements that are or should be in place to rectify the shortcomings.
- 3.22 licence obligations, the Distribution Code, the Metering and Data Exchange Code, and their connection agreements with Transco.

Quality & Standards of Service

- 3.23 The distribution companies are required by the terms of their licences to report regularly to the Bureau on their performance against an agreed set of standards. The Bureau set the standards after consultation with the companies. There are two types of standards:
- **Guaranteed Standards:** set service levels that must be met in each individual case. If the service falls below the guaranteed standard a payment is made to the customer affected; and
 - **Overall Standards:** cover areas of service where it is not appropriate to give individual guarantees, at least at present, but where customers in general have a right to expect from companies predetermined minimum levels of service.
- 3.24 The distribution companies have agreed to the standards set by the Bureau. However, not all guaranteed standards have been implemented. The Bureau will want to establish a timescale to ensure the full implementation of all guaranteed standards.



3.25 The distribution companies are required to undertake a review of their performance against the standards each year. The results of these reviews should be made available to customers. As yet no performance reviews have been completed. The Bureau will ask the distribution companies to confirm when the first such review will be undertaken.



ADWEC

Incentives to Manage PWPA & Fuel Costs

- 3.26 The consultation on ADWEC's initial price control considered how ADWEC might be given enhanced incentives to manage its PWPA and fuel purchases. One way to offer incentives to ADWEC would be to allow efficiency savings made in respect of these costs to be shared between ADWEC, the production companies, and customers.
- 3.27 The Bureau decided it was not practicable to include such incentives in ADWEC's initial control, but did not rule out the introduction of incentives in the future. It is appropriate to consider whether incentives to manage PWPA

Security Standards

- 3.28 A related issue considered when setting ADWEC's initial control was that ADWEC has no direct financial incentive to meet the generation and desalination security standards. The Bureau recognizes that ADWEC has inherited a supply-demand balance over which it had no previous control. In designing an incentive regime related to the generation and desalination security standards it would be appropriate to take this into account.
- 3.29 Nevertheless, a breach of the security standards would be a very serious
- The Bureau therefore proposed in the second ADWEC consultation paper that in cases where ADWEC fails to meet either of the security standards, the revenue under the price control by a maximum of AED 5 million. This proposal was not implemented, but the Bureau will consider whether it should
- 3.30 It is important that the inputs used to calculate reliability performance indices, as required by the GSS, properly reflect the reliability characteristics of units in operation. The Bureau will ask ADWEC to clarify the basis on which generation unit forced outage rates are calculated.



3.31 There are internationally accepted standards regarding the calculation of forced outage rates, and the Bureau wants to ensure that the methods used by ADWEC accord with these standards. Similar considerations apply to desalination unit forced outage rates as the DSS will need to reflect a probabilistic not deterministic measure of reliability.

Functional Analysis of Costs

3.32 ADWEC is responsible for a number of specific functions. While there is some overlap between them, the planning role requires different skills than the procurement and contracting function, and these are in turn distinct from the annual review and preparation of the Bulk Supply Tariffs.

3.33

the costs of each separate function. To inform the setting of the new control the Bureau has asked ADWEC to provide a breakdown of its costs by function. This will be used to meet each of its licence obligations.

Regulation & Supervision Bureau

January 2001



Annex A: Summary of Issues for Consultation

General Issues for Consultation

- A.1. **Scope of New Controls.**
should cover all revenue recovered from charges to customers.
- A.2. **Duration of New Controls.**
should have a five-year duration.
- A.3. **Form of Control.** The Bureau proposes to retain the RPI-X approach.
- A.4. **Price Control Mechanisms.** The Bureau will review each component of the present price control mechanisms, including the choice of revenue drivers in each control, the proportion of revenue attributable to each driver, and the weighting of local and foreign CPI indices.
- A.5. **Valuation of Assets.** When setting the initial controls the Bureau took as a starting point the value of assets in the 1998 Accounts. For Transco, the accounting valuations were adjusted to bring them in line with economic

the light of recent information and make further adjustments, if warranted.
- A.6. **Cost of Capital.** The Bureau used the Capital Asset Pricing Model (CAPM) to estimate the cost of equity for the Abu Dhabi businesses that are subject to price control. The Bureau has reviewed and updated its cost of capital calculations and proposes to retain a 6 per cent real weighted average cost of capital for the new price controls.
- A.7. **Treatment of Capital Expenditure.**
controls should be set without regard to forecasts of capital expenditure. Actual expenditure would be remunerated in the subsequent control, subject to meeting certain criteria.
- A.8. **Benchmarking.** Data envelopment analysis (DEA) will be used to compare the present efficiency of the electricity transmission and distribution businesses to similar businesses operating in other markets. Regression analysis will be used to assess the scope for trend increases in total factor productivity over the period of the new controls.
- A.9. **Metering and Losses.**
metering and to manage technical & non-technical losses on the transmission and distribution systems should be strengthened.
- A.10. **Security Standards and Quality of Service.** In setting the new price controls the Bureau will consider carefully the interaction between quality of service and costs.



Company Specific Issues for Consultation

Transco

- A.11. **Settlement.** price control that would allow, subject to meeting certain standards of service, a revenue stream sufficient to cover the costs of the settlement function.
- A.12. **Use of System Charges.** transmission system should be based on apparent power (kVA) rather than active power (kW).
- A.13. **Metering & Losses.** Metering of units entering and leaving the water and electricity transmission systems is incomplete. The Bureau proposes to provide Transco with stronger incentives to improve metering and to manage technical & non-technical losses on its systems.

AADC & ADDC

- A.14. **Distribution & Supply.** The Bureau proposes to develop separate price control mechanisms for the distribution and supply activities. If implemented, the distribution companies would be subject to four price controls, one for each of their separate businesses.
- A.15. **Metering & Losses.** Metering of units entering and leaving the water and electricity distribution systems is incomplete. The Bureau proposes to provide ADDC and AADC with stronger incentives to improve metering and to manage technical & non-technical losses on their systems.
- A.16. **Quality & Standards of Service.** The distribution companies are required to report regularly to the Bureau on their performance against an agreed set of standards. There are two types of standards: guaranteed standards and overall standards. The Bureau will ask the distribution companies to establish a timescale for the implementation of all guaranteed standards.

ADWEC

- A.17. **Incentives to Manage PWPA & Fuel Costs.** The Bureau is considering PWPA and fuel purchases.
- A.18. **Security Standards.** If ADWEC fails to meet either of the security standards, It price control by a maximum of AED 5 million.
- A.19. **Functional Analysis of Costs.** The Bureau has asked ADWEC to provide a breakdown of its costs by each function for which it has a licence obligation. each of its licence obligations.



Annex B: List of Bureau Publications

Consultation Papers

- B:1. First Consultation on the Water & Electricity Price Controls for Abu Dhabi Transmission & Despatch Company May 1999
- B:2. First Consultation on the Water & Electricity Price Controls for Abu Dhabi Distribution Company and Al Ain Distribution Company May 1999
- B:3. Second Consultation on the Water & Electricity Price Controls for Abu Dhabi Transmission & Despatch Company July 1999
- B:4. Second Consultation on the Water & Electricity Price Controls for Abu Dhabi Distribution Company and Al Ain Distribution Company August 1999
- B:5. First Consultation on the Price Control for Abu Dhabi Water and Electricity Company October 1999
- B:6. Second Consultation on the Price Controls for Abu Dhabi Water & Electricity Company December 1999.
- B:7. Consultation on Over & Under Relay Setting Derogation October 2000

Determinations & Other

- B:8. Electricity Performance Reporting December 1999
- B:9. The Water Quality Regulations - January 2000
- B:10. Measurement of Performance for the Water Distribution System - October 2000
- B:11. Earth Leakage protection Regulation (draft) - October 2000
- B:12. Incident Reporting & Investigation Reporting Regulation (draft) - December 2000

Annual Report

- B:13. Regulation & Supervision Bureau Annual Report - 1999



Annex C: Legal and Licence Obligations

Al Ain & Abu Dhabi Distribution Companies

- C.1. Article (39) of Law No (2) of 1998 requires the holder of a distribution licence to develop, maintain and operate efficient and economical water and electricity distribution systems. The licence contains a number of other obligations relevant to this duty. These include an obligation to prepare standards with regard to security and standards of service, and to plan and develop the water and electricity distribution systems in accordance with those standards.
- C.2. The distribution licence also sets out the parameters of the price controls which act to limit the revenue which the water and electricity businesses can recover through customer tariffs.
- C.3. Water and electricity tariffs are set by the distribution companies on the basis of pre-defined customer categories. Each customer is placed within one of these categories and supplied on the appropriate tariff. Larger customers (those with water consumption greater than 10,000 litres per day or electricity demand greater than 500 kW) may be supplied on an individual contract.
- C.4. Present water and electricity tariffs in the emirate embody a significant degree of cross-subsidy. The Abu Dhabi Water and Electricity Authority (ADWEA) may designate certain categories of customers to pay the full economic cost of supply. The difference between the price charged to a customer and the full economic cost represents the profit of the sector.
- C.5. The distribution companies have a duty to comply with any reasonable request for connection to the water and electricity distribution systems. Condition 21 of the distribution licence requires distribution companies to prepare a statement setting out the basis upon which charges for connection to their systems will be made.



TRANSCO

- C.6. Article (39) of Law No (2) of 1998 requires Transco as holder of a transmission licence to develop, maintain and operate efficient and economical water and electricity transmission systems. Transco's licence contains a number of other obligations. These include an obligation to prepare standards with regard to security and standards of service and to plan and develop the water and electricity transmission systems in accordance with those standards.
- C.7. Transco's licence also sets out the parameters of the price controls which act to limit the revenue which the water and electricity transmission businesses can recover through water and electricity transmission charges. The customers of the water and electricity transmission systems are the licensed distribution operators and operators of production facilities. Under the terms of its licence Transco can charge licensed distribution operators for connection to and use of its water and electricity transmission systems. Transco can also recover the costs of connecting water and electricity production units to its transmission systems.
- C.8. Transco has a duty to comply with any reasonable request for connection to its water and electricity transmission systems. This duty extends to requests to connect facilities for water storage and desalination and electricity generation, and systems for water and electricity distribution and supply. Condition 15 of the transmission licence requires Transco to prepare a statement setting out the basis upon which the charges for use of system and connection to Transco's transmission systems will be made.



ADWEC

C.9. Articles 30 to 38 of Law No (2) of 1998 contain ADW

-term availability of sufficient water and electricity production capacity at all times, and to economically purchase such capacity and fuel to meet demand in the emirate of Abu Dhabi. To perform its duties in the emirate of Abu Dhabi, ADWEC has a legal obligation to:

- Secure and contract for the purchase of sufficient production capacity to satisfy all reasonable water and electricity demand (Article 30);
- Contract for the purchase of all water and electricity output from licensed production operators (Article 31);
- Ensure long-term security of water and electricity supply by determining annually, in respect of each year and the next five years, the requirement for new or additional electricity generation, water desalination and water storage capacities (Article 32);
- Procure and supply fuel to each provider of production capacity (Article 33);
- Purchase economically when contracting for capacity, fuel, and ancillary services (Article 34);
- Invite tenders for the provision of new or additional production capacity or for the contract of existing production capacity (Article 35);
- Develop and apply evaluation criteria for such tenders (Article 35);
- Enter into payment agreements (PWPAs) with providers of available production capacity and delivered water/electricity output, and suppliers of ancillary services (Article 36);
- Supply licensed distribution companies with sufficient water and electricity to meet all reasonable demand in the emirate of Abu Dhabi (Article 37); and
-

Regulation and Supervision Bureau (Article 38).

C.10. ctical affect through Conditions in its licence. For example, Conditions 17, 18 and 19 require ADWEC to meet generation and desalination security planning standards, to prepare annually a statement showing a seven-year projection of water/electricity demand and



capacity requirements, and to cooperate with licensed operators in assessing future demands for water and electricity. These conditions enforce articles 30, 32 and 37 of Law No. 2.

C.11. Conditions 14, 15 and 16 require ADWEC to purchase economically when contracting for capacity, ancillary services and fuel. These Conditions relate to

C.12. ADWEC is also obliged by its licence to enter into Power and Water Purchase Agreements (PWPA) with each of the G/D companies. The PWPAs set out the terms of payments to the G/D companies for available production capacity, delivered electricity and/or water output and ancillary services.

C.13. ADWEC is responsible for procuring the natural gas required by licensed producers of electricity and water. ADWEC does not charge the production companies for the natural gas used, but provides it free under the terms of energy conversion agreements. Incentive mechanisms in the energy conversion agreements allow for bonus and/or penalty payments to the production companies depending on whether fuel use at individual stations improves or deteriorates relative to a benchmark.

C.14. ADWEC is also required to produce a Bulk Supply Tariff (BST) for sales of water and electricity to the distribution companies (Condition 12). The BST comprises, for both power and water, energy/output charges and a demand charge. The energy/output charges reflect the (short term) marginal cost of providing units of water and electricity at different times of day and in different months. Demand charges reflect the cost of providing the generation and desalination capacity required to meet demand. Total BST charges in 1999 are estimated at AED 2.2 billion, of which AED 1.5 billion is for electricity and AED 0.7 billion for water.

C.15.

control places a ceiling on the aggregate level of revenue recoverable in each

customers. The price control mechanism is set out in Part 4 of the licence (Schedule Charge Restriction Conditions).





Annex D: Form of Control: Approaches to Economic Regulation

D.1. The overriding objective of economic regulation is to promote economic efficiency. Economic efficiency requires *productive efficiency*: where maximum output is obtained from a given set of inputs, *allocative efficiency*: where inputs are used in proportion to their cost, and the price of goods and services are cost reflective: and *dynamic efficiency*: where productive and allocative efficiency are maintained over time. The following paragraphs assess different approaches to economic regulation in terms of their efficiency properties.

RPI-X Price Control

- D.2. An RPI-X control constrains average price or revenue to increase by no more than a specified level (X) relative to the rate of inflation as measured by an appropriate price index. An RPI-X control reflects anticipated future operating and capital expenditure, and is set to provide an adequate return to those financing the business consistent with efficient performance. This form of control is extensively used in UK utility regulation and is increasingly the preferred form of regulation in the US, Australia and other countries.
- D.3. The RPI-X form of control provides strong incentives to productive efficiency insofar as companies keep the gains from greater efficiency or suffer the losses of inefficiency during the period in which the control applies. Critics of the RPI-X approach claim that gains made by a company during the period of a control are sometimes at the expense of allocative efficiency.
- D.4. Customers can benefit from efficiency improvements as the control in one period can be set to reflect efficiency improvements regarded as achievable in that period and as achieved improvements in efficiency are taken into account when setting the control in subsequent periods.



- D.5. The precise formulation of an RPI-X control may differ according to circumstances. The revenue yield version of the control specifies that average revenue per unit (kW/MG of maximum demand or kWh/gallon of units transmitted) should not exceed RPI-X. An alternative formulation, known as a tariff basket approach, specifies that a weighted average of the prices of different products or services should not exceed RPI-X. Both approaches allow the licensee to adjust the structure of tariffs subject to meeting other statutory and licence obligations.

Rate of Return Regulation

- D.6. One alternative to an RPI-X price control is rate of return regulation under which prices are adjusted to reflect movements in allowed costs and a specified return on capital. Rate of return has the advantage of less extreme variations in profit or loss and ensures a more rapid adjustment of prices to ensure allocative efficiency. However, experience of this type of control suggests that there may also be less incentive to operate and invest efficiently which can result in higher prices to customers in the longer run.

Sliding Scale Regulation

- D.7. A further alternative to an RPI-X control is sliding scale regulation. This mechanism attempts to preserve the incentive properties of RPI-X while ensuring a closer link between prices and profit year on year. When profit moves outside certain pre-specified limits, prices are adjusted downwards or upwards compared to the level implicit in the RPI-X component of the control. Experience of sliding scale regulation in the US and the results of independent research suggest that the disadvantages of the mechanism outweigh the potential benefits.
- D.8. A further approach, and one closely related to sliding scale, is a control on profit. A major difficulty with a direct control on profit is the need to specify what allowed profit should be, how divergences from it should be identified in practice and how customers and those financing the business should apportion profits and losses which diverge from the allowed rate.

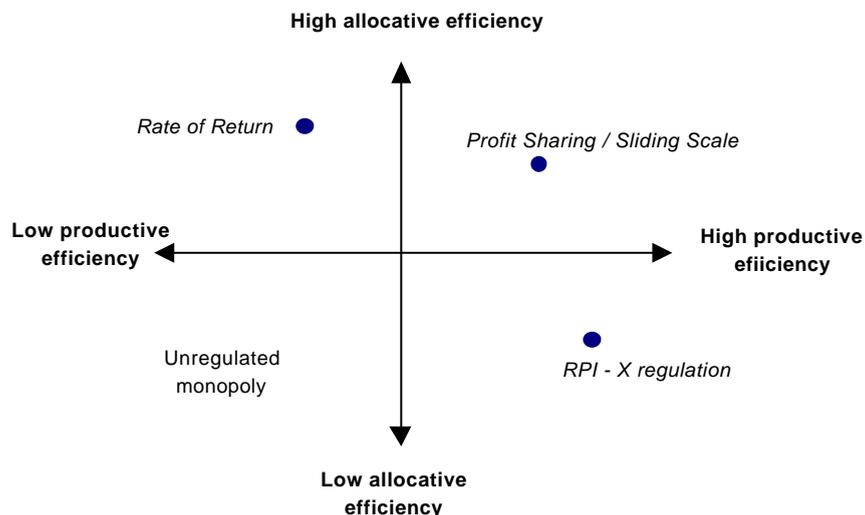


D.9. There might be considerable scope for subjective judgement as to how an observed level of profit or loss ought to be adjusted or interpreted in the light of unexpected events. While this has historically been the predominant type of price control in the US electricity industry, other forms of control are increasingly being adopted. There is evidence that profit-sharing measures may reduce incentives to productivity efficiency or might reduce regulatory stability. Such controls also pose considerable measurement problems.

Efficiency Properties of Different Approaches to Regulation

D.10. Figure 7 shows the different approaches discussed above. The matrix shows productive efficiency on the horizontal axis and allocative efficiency on the vertical. RPI-X is regarded as having high productive efficiency properties, but scores less well in terms of allocative efficiency and is therefore placed in the bottom right quadrant. Rate of return is placed in the top left quadrant as it is regarded as scoring highly in terms of allocative efficiency but less well in terms of productive efficiency.

Figure 7: Efficiency Properties of Regulatory Approaches



D.11. Proponents of the sliding scale and profit sharing approaches claim these have strong productive and allocative efficiency properties. However, there is little evidence to support these claims as both approaches have been shown to weaken incentives for productive efficiency.



Annex E: Cost of Capital Calculations

Basic Approach

- E.1. The method used to estimate the weighted average cost of capital (WACC) is the Capital Asset Pricing Model (CAPM). This model is the dominant approach used in calculating the cost of capital for individual businesses. Utility regulators typically use it in the determination of the weighted average cost of capital (WACC) for regulated businesses and it is widely used by financial analysts in evaluating conventional businesses.
- E.2. The CAPM considers the two main sources of finance used in most businesses: debt and equity. Separate estimates are made of the cost of these two sources of finance and they are then weighted by their relative proportions in the business to produce the overall WACC.
- E.3. The table below shows lower and upper estimates of the components of CAPM and the WACC.

Table A.1 Weighted Average Cost of Capital

| | <u>Lower</u> | <u>Upper</u> |
|---|--------------------|-------------------|
| Risk free rate (%) | 3 | 4 |
| Debt premium (%) | 1 | 2 |
| Equity risk premium | 3.5 | 5 |
| Equity beta | 0.6 | 0.8 |
| Debt proportion (%) | 50 | 70 |
| Cost of debt | 4 | 6 |
| Cost of equity | 5.1 | 8 |
| Weighted average cost of capital | <u>4.55</u> | <u>6.6</u> |

Source: Bureau

- E.4. The remainder of this annex discusses the components of CAPM.



The Components of the CAPM

Risk Free Rate

- E.5. This represents the return available from a completely riskless form of investment, that is one whose cashflows are fixed and that carries no risk of default. Typically, bonds issued by the UK or US government are taken as the most suitable risk-free investment. An additional advantage of using bonds issued by these governments is that both issue index-linked securities, that is bonds that, to all intents and purposes, guarantee a real rate of return unaffected by inflation.
- E.6. The UK government has a comparatively long history of issuing index-linked bonds and their return has tended to vary between three and four per cent. US index-linked securities have been available for only a couple of years and there is therefore a much shorter pricing history. However, these bonds have been issued with par rates of return of either 3.375% or 3.625% indicating little difference from the returns available on UK index-linked bonds. **For present purposes a range of 3 to 4 is assumed for the risk free rate.**

Debt Premium

- E.7. The risk-free rate is not an appropriate measure of the cost of debt for businesses with uncertain cashflows and default risk. The debt premium measures the additional return required over and above the risk-free rate by a given business. There is little information about an appropriate debt premium for businesses in Abu Dhabi. However, Moody's rates the long-term debt of the UAE at A2. Analysis of data from the US Federal Reserve shows that over the past 28 years, American utilities with an A rating have yielded an average 1.6% over 10 year Treasury bonds. **The analysis presented in Table A1 has, in consequence, used a range of 1% to 2% for the debt premium of.** It is worth noting that this compares with a range of 0.3% to 0.8% used by the UK competition authorities in the assessment of the price control of Northern Ireland electricity's transmission and distribution business.



Equity Risk Premium

- E.8. This parameter measures the extra return required on average for investment in equities compared to the risk-free rate. Historically, this has been the most contentious component of the CAPM. However, in recent years a consensus has begun to emerge around significantly lower values for the equity risk premium than had previously been considered. This parameter also raises the question of the applicability of values derived from UK and US analysis to the Abu Dhabi situation. There is little information available regarding required returns in the UAE but it is at least arguable that the return required by water and electricity distribution businesses in Abu Dhabi need not be materially different from that required by comparable businesses in the UK. The regulatory regime developed for Abu Dhabi has drawn deliberately on best practice in the UK and elsewhere to minimise the level of unnecessary risk to which the businesses might be exposed. **Accordingly, a range of between 3.5 and 5 is assumed for the equity premium.**

Equity Beta

- E.9. The equity measures the riskiness of a given investment relative to the average level of risk in the market. A beta of one indicates that a company is perceived as having average risk, a lower figure suggests lower than average risk. Utilities are generally regarded as comparatively low risk. US rate of return regulated utilities have reported betas as low as 0.2 for sustained periods. Betas on UK price regulated utilities have tended to be higher, in the range 0.4 to 1. **For present purposes a range of 0.6 to 0.8 is consistent with the view taken by regulators in recent price control reviews.**

Debt / Equity Proportion

- E.10. Regulated network businesses have relatively stable cashflows and are therefore well suited to a high level of gearing. It has been the experience in the UK that gearing levels have risen over time: `providers of capital are content with higher levels of gearing for utilities` Ofwat October 1998. For its present review of water and sewerage prices, Ofwat has focused on a gearing level between 50% and 60%. **For the purposes of the price control calculations a proportion of debt of between 50% and 70% is assumed.**



The Weighted Average Cost of Capital

E.11. A strong consensus has developed in the UK around a pre-tax cost of capital of 7%. The water regulator, Ofwat, has indicated a range for the post-tax cost of capital of 4% to 5.5%, with a central value of 5.25% to be used in setting price limits. The Bureau proposes to use a value of 6% for price-setting purposes. This value is intended to represent a post-tax return and has been calculated on the basis that companies will not face any taxation of profits or be able to offset interest expenses against tax.