PN. ACP-087
113777

Submitted To:
USAID
Office of
Transition Initiatives

FINAL REPORT
Technical Assistance for Improving the Management of NEPA

Submitted By:

NEXANT INC
A BECHTEL TECHNOLOGY AND CONSULTING COMPANY

23865-228-096-0001

JULY 2000

A

Contents

Section **Page**

Section **Page**

Figure **Page**

Table

Section 1
Introduction

Nexant, Inc., under its contract with USAID, has been asked to provide assistance to the National Electric Power Authority (NEPA) and the Bureau of Public Enterprise (BPE) to conduct a diagnostic study of NEPA's current management situation and make recommendations for management processes to improve the utility's performance. This engagement has been funded by the USAID Office of Transition Initiatives.

The project commenced in late April with a 1-month in-country assessment, during which extensive meetings were conducted with key NEPA managers and other key stakeholders. In May, an interim report was produced and presented to NEPA and BPE, based on the April meetings, a review of company reports and information, and the project team's own situation assessment. The interim report focused on identifying a wide range of key management issues and problems and identifying alternative solutions; it was a diagnostic assessment. Building on the interim report, this final report focuses on specific solutions and associated implementation steps that we believe are of immediate significance to NEPA during this transition period.

1.1 BACKGROUND

NEPA is currently operating in a crisis environment due to a history of significant management, financial, and operational problems. This situation created several major operational problems earlier this year. As a result, a nine-person management board was established to guide the company through this critical transition period. The board was given the mandate to improve power supply, restructure the company, and prepare it for eventual privatization. To stabilize the company, most decision-making has been short term out of necessity. The operating conditions confronted by the management board include:

- Very poor plant availability, resulting in frequent load shedding
- Non-technical losses of 30-40 percent
- Inefficient billing and revenue collection, with as little as 42% of transmitted energy being received as actual revenue
- Ineffective organizational and management practices that encourage ad hoc decision making
- Poor accountability and work practices

Accordingly, at the direction of the managing board, NEPA managers have developed an action plan and corporate blueprint for the next 20 months that:

- Develops a rehabilitation plan for generation, transmission, and distribution
- Identifies how to improve the marketing and revenue operation
- Estimates the financial requirements of the program
- Proposes a more decentralized organizational structure

The success of the plan depends on a number of factors, namely:

- Approval of funds by the National Assembly
- Achievement of revenue projections
- Effective management and coordination of the various programs
- Effective line execution of each program
- No other major system problems occurring

Thus, even if the action plan is successful, the outlook for NEPA remains problematical at best. It is within this corporate and operating environment that the project team undertook this assignment. The action plan formed a key element of the information resources used by the project team.

1.2 OBJECTIVES AND SCOPE OF THE ASSIGNMENT

The project has two principal objectives:

- Identify, diagnose, and prioritize NEPA's current management issues
- Identify, diagnose, and prioritize management initiatives for the transition period before formal restructuring and privatization commences

The results of the project are intended to serve as a primary reference for NEPA's restructuring and commercialization. They are intended for use by NEPA management, government decision-makers, and possible strategic investors with interest in NEPA. The overall goal of the project is to develop recommendations for management initiatives that can be implemented in the near term to improve the utility's performance in key functional areas.

Given the context of the current situation described above, we narrowed our focus for actionable recommendations to those that could be implemented over the next 20 months and produce permanent improvements. ***We did not focus on management processes that would not survive permanent restructuring and privatization.***

We examined the management, organizational, business and information processes in the following functional areas:

- Corporate governance, management, and organization
- Transmission and dispatch
- Distribution and marketing
- Finance and accounting
- Information management technology
- Special projects and rehabilitation

1.3 AREAS OF FOCUS

As shown in Figure 1-1, we adopted a three-pronged approach to focus our efforts. This approach targeted the most critical areas of apparent concern to NEPA management, based on our assessment of the situation. Under each area, based on our diagnostic assessment, we focused on specific sub-areas for management improvement, as shown in Figure 1-1. The interim report sets out a wide range of recommendations for each of these sub-areas, and this

2

final report addresses several of the key recommendations that we believe are of the most immediate concern to NEPA. Accordingly, the balance of this report is presents specific recommendations and plans as follows:

- Section 2 focuses on improving power supply
- Section 3 focuses on organizational improvement
- Section 4 focuses on improving revenue generation

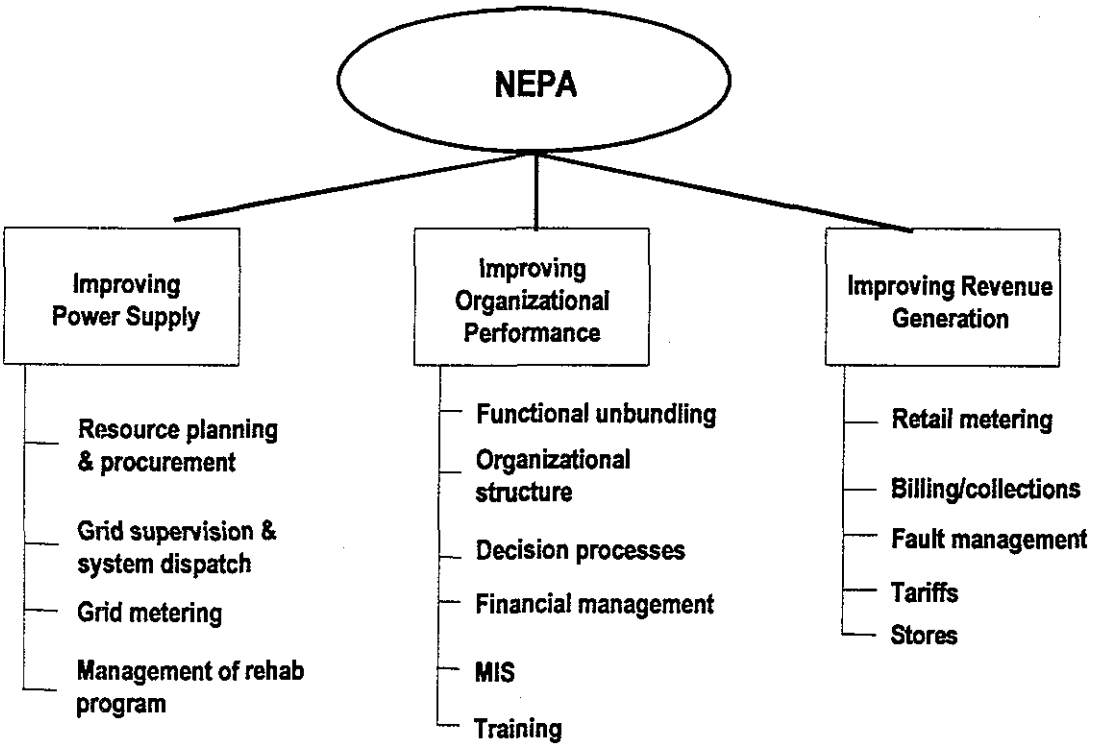


Figure 1-1 Areas for Management Improvement

Section 2
Improving Power Supply

Section 2
Improving Power Supply

2.1 INTRODUCTION

The action plan for uninterrupted power supply by December 2001 lays out an ambitious program to restore inoperable generating plants, procure new generating resources, and upgrade the transmission grid system. Attention is now focused on how best to achieve the goals established in the plan. The Nexant team investigated ongoing programs and work practices at NEPA with the aim of providing suggestions for expediting progress to achieve the NEPA board's targets for improving power supply. A wide range of alternative solutions was presented in an interim report submitted in May.

Based on the interim report and feedback from NEPA, the Nexant team narrowed its focus to the following programs:

- Planning for generation and transmission system expansion
- Generation procurement practices
- Initiatives to provide a commercial framework to facilitate non-governmental investment in generation
- Management of the rehabilitation, operations and maintenance of NEPA generating plants
- Grid supervision, dispatch, and metering systems

2.2 RESOURCE PLANNING AND PROCUREMENT

The Nexant team reviewed the resource planning and procurement activities at NEPA, with the objective of identifying any opportunities to implement international best practices. In general, the NEPA board is not well equipped to manage planning and procurement activities and has an urgent need for outside technical assistance. The need for technical assistance is not surprising considering that NEPA has been slow in adopting modern management techniques used by the electricity industry elsewhere. Making best use of outside experts offers Nigeria the opportunity of bypassing the learning curve and immediately adopting industry best practices.

The following actions are recommended to improve resource planning and procurement:

- Retain a consultant to provide planning support to optimize the implementation of the 2000-2001 action plan
- Establish resource procurement agency to supervise the ongoing emergency power program (EPP) and independent power producer (IPP) program, with technical assistance from an experienced international consultant
- Hire an international advisor to develop a commercial framework and financing package to attract investors to the EPP and IPP programs

The following sections outline the scopes-of-work to implement the recommended actions.

2.2.1 Technical Assistance for NEPA Power System Planning

2.2.1.1 Activity Description

The consultant will provide power system planning and scheduling assistance to NEPA during the implementation of NEPA's action plan to achieve uninterrupted power supply by December 2001. Based on action plan goals, the consultant will develop a systematic approach, a system planning schedule, implementation advice, and contingency plans for fast-track restoration and expansion of utility facilities. Technical assistance will focus on the following initiatives of NEPA's technical board:

- Emergency generation rehabilitation program to restore inoperable power stations.
- EPP to add short-term power generators to bridge the gap until new long-term sources of power are procured.
- IPP program to tap the competitive international market for build-operate-transfer (BOT) power stations.
- Transmission system restoration and expansion program.

Planning assistance will help ensure that NEPA meets its goals for cost-efficient and timely development of new resources and retirement of worn-out facilities. The consultant will implement established economic modeling techniques for power system planning using computer-based tools to develop an indicative power sector development plan that is practical and cost-effective both in the short and long term.

2.2.1.2 Background

The current status of the NEPA board's supply-side program in the action plan is as follows:

- *EPP*—the Bureau of Public Enterprises (BPE) has issued a call for expressions of interest from developers to install 300 to 450 MW of new generation on an expedited basis. The original EOI attracted no fewer than 37 power development companies, including major industry players such as GE and Marubeni. BPE expects to issue the RFP in mid-July. Assuming the selection and negotiation process is expedited, it may be possible to bring resources on line by the first half of next year.
- *Generation rehabilitation program*—the generation rehabilitation program will repair and return to service up to 2,000 MW of currently inoperable generating units. Agreements have already been signed with rehabilitation contractors for most of the repair work, and letters of credit were opened at foreign banks to provide assurance to contractors that cash would be available for getting paid. However, some of the original contracts contained irregularities of one form or another that might impact the success of the rehabilitation program. The NEPA board is investigating the circumstances for contracts covering a significant portion of the rehabilitation work, and has entered into renegotiations with most incumbent contractors. To date, the rehabilitation program has not returned any generation to service. However, work is under way at four of the seven power stations.
- *IPP projects*—the BPE expects to hire an international advisor to start work by mid-July on a 12-month assignment to establish a legal/regulatory framework for the power sector that will encourage IPPs. In the meantime, new generating resources will be acquired through the EPP program rather than issuing a tender for more IPPs.

However, the GON is proceeding with negotiations with already established pioneer IPPs such as Enron and Mobil. It is likely that one or more of the pioneer IPPs will sign a negotiated one-off power purchase agreement with GON in the coming months. The first competitive tender for IPPs could be held as early as summer 2001. The basic planning work to integrate new IPPs into the system must begin soon to ensure that the groundbreaking IPP tender will be an impressive success, establishing the foundation for a new era of competitive generation in Nigeria.

- *Transmission grid expansion program*—NEPA's transmission grid system has deteriorated over the past 10 years due to neglect, and few new facilities have come on line. As a result, the capability of the grid system has not kept pace with demand and shifting regional demographics. In urban centers, there is huge pent-up demand for service off the grid system that threatens to swamp the capacity of the transmission system when the power supply improves. Remote load centers typically are served by inadequate radial lines, since most of the looping schemes that were planned on paper since the 1980s were never built. Even some key urban load centers, such as Abuja, are served radially. Facilities are deteriorating and outdated, and information systems are nonexistent. The ongoing problems with the grid system could sabotage the gains of the generation development program if power cannot be transmitted to the load centers. An update of the grid system expansion plan is urgently required.

More detailed planning is needed for optimal integration of the NEPA board's supply-side initiatives. Some of the resource additions that must be undertaken for the sake of expediency, such as the rehabilitation of aging power plants and the integration of small-scale, barge-mounted plants, will complicate the challenge of achieving the least-cost mix of generating resources in the long run. Alternative strategies should be evaluated for cost-efficiency, budget impact, timeliness, operational impact, and system reliability, so that NEPA will have ready-set contingency plans in case of unforeseen events—such as changing expectations for facility rehabilitation projects or schedule delays.

2.2.1.3 Scope of Work

The consultant will work side-by-side with NEPA staff and other NEPA consultants over the duration of the action plan program through year 2001. The consultant will provide the services of a part-time resident advisor at NEPA headquarters, supported by technical advisors as needed over the course of the project. The resident advisor will monitor the development of the generation and transmission systems and provide solutions for day-to-day planning issues. If required, the advisor will act as NEPA's engineering representative in discussions with contractors and prospective suppliers. In addition, the advisor will serve on interdisciplinary teams for tendering and negotiating new generation and transmission projects.

The resident advisor will lead a consulting team to verify the indicative resource plan provided in the action plan, and advise the NEPA board on any required incremental changes. The consultant will assist the board in managing the action plan program to meet the board's criteria for productivity, cost-effectiveness, and timeliness. The consultant will provide the following specific services:

- *Load research*—conduct a systematic survey of existing electricity end-uses in Nigeria, and analyze the prospects for future electrification.
- *Demand forecast*—develop and implement a demand forecasting methodology that takes advantage of end-use survey data, and provide separate demand forecasts for each identifiable customer class.
- *Aging facilities evaluation*—work with NEPA's rehabilitation consultants and NEPA power station managers to assess the remaining lives and operating limitations of existing plants. If required, the consultant will analyze plant operations and maintenance records and seek out recommendations from vendors on optimizing the remaining service duty for the generating plants.
- *Generation and transmission facility additions schedule*—advise NEPA on an optimized generic schedule for resource additions, both in the short and the long term. The schedule will match supply to demand according to appropriate targets for system reliability and cost-efficiency. The consultant will develop reliability and cost-efficiency targets consistent with best international planning practices.
- *Indicative resource plan and contingency plans*—using the action plan as the starting point, the consultant will provide NEPA with ongoing advice on how to continually adjust the supply-side resource program under changing conditions, so as to achieve the goals of the action plan in a timely and cost-efficient manner. The consultant will prepare a base-case least-cost indicative resource plan for the 10-year timeframe using production simulation and transmission planning techniques. In addition, the consultant will provide high-case and low-case indicative resource plans differentiated according to capital budget availability. Once the basic planning infrastructure is put in place, the consultant will leverage this planning capability to conduct economic screening of new resource alternatives as they are proposed.
- *Guidelines for resource procurement*—develop parameters for new resource tenders. The consultant will specify the amount, timing and required operating attributes for generating capacity additions, develop a system for evaluating location tradeoffs for competing resource alternatives, and advise on the scope for engineering specifications in tenders.
- *Capital budget*—provide base-, high-, and low-case capital budget projections for generation and transmission plants in the short and long term.
- *Pricing*—use the results of the indicative resource plan to suggest cost-reflective pricing for the bulk supply of electricity to distribution divisions and for transmission grid services. The consultant will advise on internal transfer pricing between NEPA divisions, and transmission use-of-system charges for IPP agreements.
- *Training*—provide on-the-job training for a core team of Nigerians in all aspects of system planning and resource procurement. The consultant will arrange for vendor-supplied training on commercial software products used for planning.
- *Planning tools*—provide software and hardware for demand forecasting, generation reliability, production simulation, load flow, grid stability, project management, and scheduling, etc. If required, the consultant will develop computer-based methods for pricing. And the consultant will take the lead to evaluate, select, procure, and implement software and hardware tools.

2.2.1.4 Staffing

The project team will consist of four senior consultants and two mid-level consultants to serve in the following roles:

- *Team leader*—the team leader will manage the project on a day-to-day basis, supervise the work of technical experts, and serve as point of contact for NEPA, USAID, and other GON agencies and international development institutions.
- *Senior consultant, demand forecasting*—the senior demand-side expert will lead load research activities, develop demand forecast modeling, supervise the forecasting study, and provide on-the-job training to Nigerian counterparts.
- *Mid-level consultant, demand forecasting*—the mid-level demand-side expert will support the senior consultant on all load research and demand forecasting tasks, with primary responsibility for conducting technical studies.
- *Senior consultant, power systems planning*—the power systems planning expert will screen and select appropriate PC-based planning tools and implement planning software for the power system in collaboration with Nigerian counterparts. The planning expert will supervise production of the following deliverables: the generating capacity requirements forecast, the indicative resource plan, the capital budget, operating guidelines for IPP tenders, and training for Nigerian counterparts.
- *Senior consultant, transmission system planning*—the transmission systems planning expert will screen, select, and implement planning software and serve as lead analyst for the transmission system expansion plan. Other deliverables will include schematic diagrams, grid system use-of-service tariff, transmission service guidelines for IPP tenders, and training for Nigerian counterparts.
- *Mid-level consultant, power systems planning*—the mid-level power systems consultant will provide technical support for generation and transmission planning tasks.

2.2.1.5 Schedule

Technical assistance should begin as soon as possible. The action plan program is already under way, BPE's emergency power tender is set to be issued soon, and the generation rehabilitation program has broken ground for some projects with others under active negotiation with contractors. Technical assistance should run through the duration of the action plan program to enable the consultant to provide a continuous planning presence over the critical target period for achieving uninterrupted power supply by January 2002.

The following table shows a preliminary work plan for each expert for field and home office time, with fieldwork in black and home office time in gray:

Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Team Leader																
Senior Demand Forecasting																
Mid-Level Demand Forecasting																
Senior Power Systems Planning																
Senior Transmission Planning																
Mid-Level Power Planning																

9

2.2.2 Technical Assistance for Setting up the Power Procurement Function

2.2.2.1 Activity Description

A qualified consultant with international experience should be retained to set up the power procurement agency and advise Nigerian counterparts on best practices for market-based tendering for generation and transmission additions. Initially, the consultant would serve as the acting head of the power procurement agency, working with key stakeholders to develop procurement policies, set up the organization, develop work processes, lead the tender process, and negotiate with competing contractors. In time, the consultant would recruit and train Nigerians to take over the key roles in the procurement agency. Thereafter, the consultant would serve as an advisor to the agency while Nigerian experts gradually assume all responsibility for the workings of the organization.

2.2.2.2 Background

Nigeria has no institutional experience with market-based power procurement. In a makeshift institutional arrangement, BPE will manage the groundbreaking competitive power procurement for IPPs under the emergency power program. BPE's recent experience with tenders for privatizing enterprises such as cement companies and telecommunications franchises makes the organization a logical default choice for managing the EPP tender.

However, international experience suggests that the power procurement function should reside within a separate power procurement agency, a division of the regulatory body, or a division established in the corporate center of either a utility holding company or a transmission company (Transco). An organization dedicated solely to the power procurement function is advisable because of the unique nature of the activity, intensity of the effort, and need for specialized skills and in-depth power sector understanding.

The tender package for the EPP has been developed by an international consulting engineer with special knowledge of power procurement practices, in association with an international law firm that has advised on many power procurements worldwide. This collaborative approach between a Nigerian agency and international power procurement advisors is appropriate until Nigerian institutions build up a track record of successful tendering for large-scale independent power projects.

Collaborations with outside international advisors should be intensified to help Nigeria gear up for future IPPs. The technical assistance effort will ensure that a Nigerian core team for power procurement is established using proven best practices for staffing, procedures, and tendering. Bringing in the outside know-how will help Nigeria to institute best practices very quickly, compared to the learning curve needed to start from scratch. Participation of disinterested international advisors will provide IPP developers with added assurance that Nigeria's power procurement program is fair and transparent. At this early stage in Nigeria's competitive power market development, it is essential that foreign investors perceive a commitment on the part of the GON to overcome the past history of procurement mismanagement in the power sector.

2.2.2.3 Scope of Work

The consultant will conduct the following activities:

- Recommend staffing plan and institutional arrangement for the power procurement agency. Develop job descriptions for staff positions, and advise on candidate selection.
- Develop and implement a training program for the staff of the power procurement agency.
- Develop procedures for day-to-day operations in compliance with market rules established by the regulator.
- Implement required hardware, software, telecommunications, and other basic business systems.
- Develop procedures for interagency coordination.
- Identify the amount and timing for generation and transmission tenders, in collaboration with other consultants and NEPA planning staff.
- Recommend tender package terms and conditions for pricing, performance incentives, fuel supply, security, legal requirements, etc. Develop a standard power purchase agreement for use in tenders. Work with Nigerian stakeholders to reach consensus on a standardized IPP tender package.
- Prepare technical specifications for tender packages for generation and transmission additions.
- Develop procedures for conducting tenders in compliance with market rules established by the regulator.
- Collaborate with Nigerian counterparts on conducting tenders and negotiating agreements with contractors. Participate on selection panels and negotiating teams as required.
- Ensure contractor compliance with agreed in-service schedules and other terms and conditions, and pursue any required remedies for contractor non-compliance.
- Develop organizational procedures for tracking progress of contractors, monitoring performance, and issuing periodic status reports to the regulator.
- Develop guidelines for managing relationships with contractors.
- Develop systems and procedures for the interface with the national control center. Work with contractors and national control center to manage pre-schedules and hourly operations, and resolve disputes.

2.2.2.4 Staffing

The project team will consist of four senior international consultants and a local administrative specialist to serve in the following roles:

- *Project manager*—the project manager will handle day-to-day operations of the power procurement agency, supervise the work of technical experts, and serve as point of contact for the regulator (if appointed), BPE, NEPA, MP&S, Ministry of Finance, and other stakeholders. The project manager should have a strong background in power contracting, procurement procedures, and organization. Initially, the project manager will serve as the resident acting director of the power

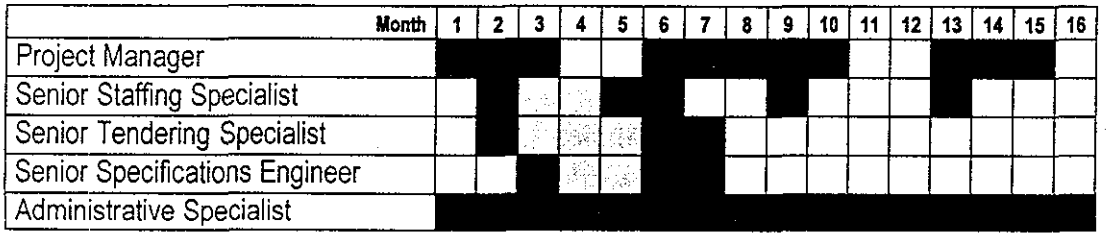
procurement agency. After a local successor is appointed, the project manager will transition into the role of principal advisor to the new director.

- *Senior consultant, organization, staffing and procedures*—the senior staffing specialist will develop the organization plan, provide job descriptions, manage the staffing process, develop organizational procedures, and design training programs.
- *Senior consultant, tendering*—the tendering advisor will lead the development and implementation of tenders, and provide targeted on-the-job training for Nigerian counterparts to take over the tender process.
- *Senior engineer, tender specification*—the tender specialist will conduct technical evaluations, design the tender packages, and advise on technical issues during contract negotiation.
- *Administrative specialist*—the administrative specialist will support the consultants on tasks involving staffing, training, procurement, management, and operations.

2.2.2.5 Schedule

Technical assistance should begin as soon as possible, since the EPP program is already under way and other key initiatives for IPP and rehabilitate-operate-transfer (ROT) contracting are being formulated. Technical assistance should run through the successful tendering of the first IPP, which could happen as early as fourth quarter 2001. Under this work plan, the consultant would provide continuous support to Nigerian decision-makers during the critical period when the first power purchase agreements are being signed.

The following table shows a preliminary work plan for each expert for field and home office time, with fieldwork in black and home office time in gray:



2.2.3 Technical Assistance for Commercial Framework for Power Sector Investors

2.2.3.1 Activity Description

An experienced international consultant will provide a commercial framework for EPP and IPP development and assist GON to negotiate a financing package to be made available to potential investors. If required, the consultant will advise GON on setting up an agency with the mandate to promote IPP investment in the power sector and BOT investments in other key sectors such as transport and water. The planning assistance will help ensure that GON meets its goals for attracting private investment into the power sector.

2.2.3.2 Background

GON has set a policy objective to mobilize external investment and operating expertise by recruiting independent power producers to enter the Nigerian market and sell into the integrated grid system. Under the IPP arrangement, the contractor invests in the construction

project, completes the work, operates and maintains the plant, and is repaid for his investment and operating costs on the basis of pre-negotiated prices over the term of the agreement.

The following roadblocks have so far discouraged pioneer IPPs that have tried to establish projects in Nigeria:

- *Lack of institutional responsibility.* It is difficult for an IPP developer to navigate the institutions in Nigeria because the delegation of authority among agencies is unclear, and the IPP legal/regulatory framework is nonexistent. The institutional framework for IPP development should be standardized to the extent possible. It may be worthwhile to establish a liaison agency that provides a "one-stop shop" for IPPs such as a BOT center. This agency in turn would coordinate with the federal legislature, MP&S, Ministry of Finance, state governments, etc.
- *Underdeveloped incentives framework.* The legal basis for GON incentives to IPP developers in areas such as taxation, security of assets, repatriation of profits, etc., is underdeveloped. For example, at one stage of the Enron negotiations it was determined that special tax exemptions in the agreement were unconstitutional and would have to be renegotiated. Special provisions by the GON to attract IPPs need to be reviewed, analyzed, and standardized if advisable.
- *Inadequate financial guarantees.* Nigeria must find a way to provide adequate financial guarantees to IPPs to attract them to the newly emerging competitive generation market, but so far no formula has emerged. Concepts include government guarantees, escrow accounts that collect the receipts from NEPA end use customers, and oil-for-electricity swaps that have the potential to mobilize electricity sector investment by oil companies operating in Nigeria.
- *Shortage of investment capital.* NEPA has been steadily decapitalized over the past 10 years. Government investment has been negligible during this period, and the company's own internally generated revenue has been paltry, leaving little reserve for capital investment. NEPA hopes that GON will restart the flow of investment—at least to the extent of funding the action plan. However, the prospects for major, long-term government investment are dwindling, causing attention to turn to IPPs and strategic investors. However, these new players face the same dilemma as does NEPA when they seek investment financing in Nigeria. GON has made no systematic attempt to stimulate commerce by identifying sources of financing that could help attract IPPs to Nigeria. Paradoxically, there has been heavy investment by the Nigerian private sector in off-grid generating equipment but no ready means or incentives for private sector investment in the integrated grid system.

An experienced international consultant is needed to develop and implement a commercial framework for power sector investments to overcome the pitfalls of mobilizing private investment in the power sector. It is likely that a qualified consultant could be found within the investment banking community.

The final scope-of-work for the commercial advisor must be carefully designed to complement the work of BPE's advisors for the power sector legal/regulatory framework and sector restructuring/liberalization. The important distinction is that the role of the commercial advisor will be to *promote* private investment in generation, whereas BPE's scope is: (1) to provide the enabling framework for a competitive power market, and (2) to privatize NEPA.

BPE's limited scope to provide an enabling environment for investment in the power sector is not enough to mobilize vigorous competition; the GON must take the initiative to reach out to investors. Under current circumstances, the Nigerian electricity sector is attracting two categories of international IPP developers—those that specialize in high-risk, high-reward one-off deals and the international oil companies with operations in Nigeria. From the perspective of market efficiency, it would be beneficial for GON to develop alternatives to attract a broader cross-section of IPPs.

2.2.4 Scope of Work

The consultant would conduct the following activities:

- Address policy, legal, regulatory, and administrative constraints that impede IPP implementation, in conjunction with BPE's anticipated legal/regulatory consultant for power sector restructuring.
- Identify initiatives for the GON to attract investment in the generation sector.
- Conduct an interagency study to standardize GON incentives for IPP developers to the extent possible in areas such as taxation, security of assets, repatriation of profits, federal and state financing guarantees, etc.
- Work with NNPC to structure an appropriate fuel supply policy for IPPs.
- Investigate financing options for IPP developments. If possible, negotiate a financing package that can be made available to prequalified IPPs interested in the Nigerian power market. Possible sources of finance include:
  - Equity investment of the IPP developer
  - Nigeria federal and state treasuries
  - NEPA tariff revenues
  - Trade development bank loans—e.g., U.S. ExIm Bank
  - Foreign and domestic strategic investors
  - Public share offerings
  - Bond offerings
  - Commercial bank loans
  - International development bank loans
- Develop prototype capital structure for IPP deals specifying investment ceiling and floor percentages for GON or its agencies, strategic domestic investors, strategic foreign investors, international banks, and other constituency groups. If indicated, provide a prescription for the capital structure for IPP deals that addresses the interests of all key stakeholders.
- Work with domestic and foreign investors and IPP developers to design a set of terms and conditions to attract the investment community. The consultant should investigate the needs of different categories of potential IPP developers. In particular, the consultant should provide prototype commercial structures for the following potential IPP ventures:

  - Traditional power purchase agreement involving payments guaranteed by GON over a fixed term
  - Nontraditional electricity-for-oil swap with international oil companies, whereby the GON grants rights to a higher take of the oil in exchange for power deliveries from IPPs established by the oil companies
- Establish criteria for prequalifying IPP bidders.
- Develop a concept for an agency to take primary responsibility for promoting investment in the power sector as well as other key sectors such as transport and water. Provide advice on staffing and operations for the new agency. The agency would have the following mandate to:
  - Enhance the institutional and professional development of the BOT project units created in implementing agencies for various economic sectors
  - Address policy, legal, regulatory, and administrative constraints that impede BOT implementation
  - Develop and implement a comprehensive strategy to aggressively promote and market Nigeria's BOT projects worldwide
  - Enhance access to international capital markets

2.2.4.1 Staffing

The project team will consist of two senior finance consultants, a mid-level project finance consultant and a senior legal advisor to serve in the following roles:

- *Team leader*—the team leader will manage the project on a day-to-day basis, supervise the work of technical experts and serve as point of contact for BPE, NEPA, MP&S, Ministry of Finance, other GON agencies and foreign investors and stakeholders. The team leader should have a strong background in global project finance for a prominent commercial investment bank with West African operating experience.
- *Senior project finance specialist*—the senior project finance specialist will lead technical studies to develop an optimal IPP commercial framework suited to the Nigerian situation, and propose and build consensus with GON agencies and private stakeholders on terms and conditions to provide an appropriate IPP financing framework.
- *Mid-level project finance specialist*—the mid-level project finance specialist will support the senior consultant with primary responsibility for conducting technical studies.
- *Senior legal advisor*—the senior legal advisor will investigate and advise on legal aspects of proposed commercial arrangements, such as taxation, property and land rights, repatriation of profits, security guarantees, etc. The advisor will suggest language for use in agreements, laws, and regulations supporting the proposed commercial framework.

2.2.4.2 *Schedule*

Technical assistance should begin as soon as possible, since the EPP program is already under way and other key initiatives for IPP and ROT contracting are being formulated. BPE's emergency power tender is set to be issued in mid-July, but without the benefit of the groundwork contemplated in this scope-of-work. Although the commercial advisor will be coming late to the process, it still may be possible for the advisor to help with commercial issues that are bound to arise in the EPP program. Technical assistance should run through the successful tendering of the first IPP, which could happen as early as fourth quarter 2001. Under this work plan, the consultant would provide continuous support to Nigerian decision-makers during the critical period when pioneer private investment will be flowing.

The following table shows a preliminary work plan for each expert for field and home office time, with fieldwork in black and home office time in gray:

Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Team Leader																
Senior Project Finance Specialist																
Mid-Level Project Finance Specialist																
Senior Legal Advisor																

2.3 ALTERNATIVES FOR MANAGING THE REHABILITATION, OPERATION, AND MAINTENANCE OF NEPA GENERATION

Outsourcing the management of NEPA's existing generating plants has the potential to mobilize human and investment resources to improve system reliability during the pre-privatization period. However, the incremental benefits of new management initiatives must be carefully weighed against the expediency of maintaining the status quo since the plants are scheduled for privatization in a few years.

2.3.1 Contracting Options

NEPA has the following options for managing the rehabilitation, operation, and maintenance of its generating plants:

- *Alternative 1* – Status quo: contractors perform rehabilitation work under turnkey engineer-procure-construct (EPC) contracts, and NEPA operates and maintains the power plants. The primary advantage of this approach is that with timing critical, the status quo may be expedient because NEPA management and staff are accustomed to operating this way. Under the new NEPA Board, there is the prospect that NEPA can turnaround its history of poor performance through better management even if the utility preserves existing practices. Preserving centralized control of the generating plants makes it relatively easy to administer broad management programs and to operate the integrated system.
- *Alternative 2* – Contractors perform rehabilitation work under EPC contracts (status quo), and NEPA establishes autonomous business units for operating and maintaining its power plants. This approach requires a formal system of internal transfer pricing and performance incentives between corporate center and the business units. The transfer pricing mechanism enforces greater accountability for achieved operating results within NEPA O&M divisions. The principal advantages are that it incentivises the business units to achieve management's objectives, it preserves centralized control

of the system for efficient integrated short-term planning and operations, and it is relatively easy to administer.

- *Alternative 3* – Contractors perform rehabilitation work under EPC contracts (status quo), and contractors provide O&M services under separate agreements. The O&M services contract requires a formal system of pricing, operating provisions and performance incentives that must be negotiated between NEPA and the O&M contractor. The introduction of competition for the O&M contracts has the potential to mobilize private initiative at a fair price, assuming there is no shortage of competent firms willing to set up business operations at NEPA plants. On the down side, this approach would take a significant amount of time and expense to implement and the benefits would be marginal since the plants are scheduled for privatization in a few years time. The O&M contracting alternative does provide flexibility with respect to privatization as the contracts' terms and conditions can be tailored to the timeframe for privatization.
- *Alternative 4* – For each plant, a single contractor performs rehabilitation work and operates and maintains the facility on an ongoing basis until a pre-agreed end date when the plant is transferred back to the GON. This approach requires that NEPA and the contractor negotiate a rehabilitate-operate-transfer (ROT) contract. Payment is on the basis of cost-plus or a pre-negotiated price schedule with fixed and variable components. The contract provides a formal system of operating provisions, targets and performance incentives. ROT contracting will mobilize private investment; however, this will require the development of appropriate tendering procedures that will require time to develop. The principle advantages of ROT contracting over O&M services contracting are: 1) assigning the same contractor to rehabilitate, operate and maintain the plant reinforces accountability for the rehabilitation project, because the contractor has to live with the results; and 2) an ROT tender is likely to mobilize a deeper group of competing contractors than an O&M services tender. A principal disadvantage of ROT contracting is that it may impact the privatization process by entrenching the ROT contractors due to the commercial requirements of their contract. Another disadvantage is that there may be a potential decrease in operating flexibility of NEPA dispatch.

2.3.2 Pricing

Internal or external contracting for management of the generating plants would require a formal system of transfer pricing between the corporate center and the contractor. The payment to the contractor would conform to one or the other of the following basic pricing models:

- *Payment based on energy delivered.* Relating the payment to energy delivered is generally recommended for third party contracting as it provides a strong incentive to produce. There are several options for pricing energy delivered, ranging from variable cost to system marginal cost. Fixing an energy price in excess of actual variable cost provides an incentive for the contractor to deliver as much energy as possible, which is especially important considering the current situation of chronic energy shortage.
- *Payment unrelated to energy delivered.* Payment to the contractor can be based on some other verifiable measure of service other than energy delivered, such as out-of-pocket costs for approved work activities performed, plus a negotiated allowance for

profit. If the payment is related to actual cost divorced from whether or not the plant actually produces, then production incentives can be provided through a separate rewards system based on achieved results. This system requires performance targets and periodic monitoring of the contractor. The approach is commonly used for transfer pricing in the case where the O&M contractor is a business unit of an integrated utility company.

Negotiated pricing for energy delivered may be the most practical basis for payments to third-party O&M contractors for NEPA plants. Negotiated prices can be determined with reference to historic costs or standard costs for similar plants. Marginal cost pricing, which is used in many countries to provide a rational economic basis for operations and maintenance, is not an option under the current circumstances since the system is not operated according to economic dispatch principles. (Alternatively, the avoided cost of customer outages is perhaps a more relevant index for pricing in the Nigerian context, since the generation system is always in shortage.)

A simple example of a pricing formula that could be used in ROT and O&M services contracts is shown below. The price has two components: a variable component based on the energy delivered in the payment period; and a fixed component, with provision to reduce the fixed payment if the actual energy delivery in the period does not meet a minimum threshold.

$$R_t = p_t * X_t + MIN (K_t , K_t * X_t / X_{t,min})$$

where

R_t = revenue to the O&M contractor in period t
p_t = price per MWh of generation
X_t = plant output in MWh
$X_{t,min}$ = minimum required generation in MWh
K_t = payment for fixed cost

2.3.3 Operating Rules

The O&M services contractor operates according to the following general rules, which complement the pricing regime:

- The contractor is obligated to generate for a minimum number of MWh per month or quarter according to periodic schedules agreed between the contractor and system dispatch. The contractor incurs a penalty in the event the energy delivery does not meet the minimum threshold.
- Energy delivered in excess of the minimum is at the discretion of the contractor, except under system emergency conditions.
- Maintenance is planned and conducted by the contractor according to agreed outage schedules.
- Forced outage schedules are communicated by the contractor to system dispatch on a best efforts basis.

Any of the operating rules has the potential to end up in dispute between the host utility and the O&M contractor unless carefully stipulated in the agreement. In general, rules can be formulated such that the integrated system operates in a smoothly coordinated fashion.

However, it is advisable that some or all of the generating resources that provide system regulation, such as hydro units and units with black-start capability, should remain under the ready control of system dispatch. This may preclude third-party O&M contracts for these plants.

The Nigerian system is small enough that the operation of any one power station has the potential to affect the operation of all the other stations. If a significant portion of the generation will be placed under third-party control through O&M contracts, then it is advisable to conduct a study of the impact on the dispatch of the integrated system. Such system operations considerations may place a practical limitation on the potential for third party station operators.

Performance during system emergencies must be carefully stipulated, especially considering the frequency of such emergencies under current circumstances. The following are key considerations for O&M service agreements to achieve operating results during system emergencies:

- If a NEPA business unit is responsible for O&M, then performance during system emergencies can be mandated by the corporate center according to established operating practices.
- If an outside contractor provides O&M services, then a formal set of rules for performance during system emergencies must be agreed on in advance. Such rules can range from loosely stipulated "best efforts" to a rigid set of incentives and penalties. An example of an incentive would be where a contractor might be paid a premium price for restarting units and delivering energy during system emergencies.

2.3.4 Pros and Cons of ROT and O&M Services Contracting

The ROT framework offers the potential to mobilize external investment and operating expertise in the power plants undergoing rehabilitation. The payment structure eases the near-term financial burden on the federal treasury compared to the traditional turnkey payment approach, and places more responsibility on the contractor for successful ongoing operations. However, none of the NEPA plants appears to be an obvious candidate for ROT. In summary:

- Considering the hydro plants, Shiroro and Jebba require minor repairs that can be accomplished without resorting to ROT, which might delay repairs and complicate the eventual privatization. Some of the units at Kainji require major repairs. ABB has been awarded the rehabilitation contract and letters of credit are already established. These preparations would have to be disentangled to start over with ROT.
- The Afam and Sapele thermal stations are old and generally in poor condition. ROT is unlikely to attract much investor interest when the existing units are marginal propositions for continuing operations, unless a developer is eyeing the site for future expansion. After their remaining lives are exhausted, these stations may be targets for IPP developers to locate new plants. Already some contractors have shown interest in these sites as locations for emergency power under the EPP program. However the GON should carefully weigh the possibility that entrenching private interests at these plants may complicate the future privatization scenario.

- At the Delta thermal power station, a major rehabilitation contract is already awarded and under way. Therefore, it may be too late for ROT.
- For the Egbin thermal power station, a traditional EPC contract was recently awarded to Marubeni and, considering the history of the contract award, it is unlikely to be opened up again. The scope for ROT could be discussed privately with Marubeni.

Although ROT contracts offer the possibility of mobilizing private initiative and investment, there is reason for caution. Before proceeding with this approach, the following considerations should be factored into decision-making:

- Traditional turnkey rehabilitation contracts with the original developers of the power plants may be more expeditious when compared with a potentially protracted ROT tender process.
- Some rehabilitation contractors are not in the O&M business. ROT contracts will appeal to a limited pool of contractors.
- Considering NEPA's poor credit rating, a contractor may be reluctant to enter into a deal to finance a rehabilitation project at its own expense and accept reimbursement on an installment plan over a fixed number of years.
- Already signed traditional turnkey rehabilitation contracts covering most of the current rehabilitation program would have to be fundamentally reworked or scrapped altogether.
- Third-party agreements transfer operational control out of the hands of NEPA system dispatch. This has the potential to impact smooth coordination of system operations, especially considering that there are only seven plants in the system, few of which are capable of black start in the event of system collapse. An outage at any one plant can trigger the need to adjust the operating regimes for the other plants on short notice, and it is easier for the operators to manage the process if NEPA controls all the plants.

There may be some potential for O&M contracts divorced from the rehabilitation work. However it may not be an easy matter to enter into an O&M contract for the following reasons:

- Contractors may be concerned about getting paid, considering NEPA's record in funding its own O&M program.
- The pool of international firms that offer power plant O&M services is limited, and few of these have operations in Africa.
- Contractors may be unwilling to assume the administrative burden of setting up O&M service divisions in Nigeria when a parastatal with NEPA's reputation would be the new division's main client.
- Taking on an O&M contract under the current circumstances (i.e., around-the-clock load shedding) would create significant pressure for 100% availability

In summary, at the current time, the GON should be cautious before proceeding with ROT and O&M contracts. Committing the time and resources to a potentially protracted process of tendering and negotiations is not warranted at this time, absent compelling evidence that new

forms of contracting will provide significant improvements in the overall performance of the power system.

Short of implementing drastic new initiatives to remove the plants from NEPA control, GON should consider instituting autonomous business units within NEPA for operating and maintaining the power plants in accordance with internal transfer pricing and management incentives that encourage improved performance. The business unit approach is the next best alternative to harnessing private initiative, and it provides a more easily implemented transition mechanism between NEPA administrative control and privatization.

2.3.5 Next Steps

2.3.5.1 Assess Feasibility of Outsourcing Plant Management

A fast-track analysis of the feasibility of ROT and O&M services contracting should be conducted by NEPA in coordination with a consultant having expertise in power contracting, transfer pricing, and tendering. The goal of the study would be to choose the optimal form of contracting for each of NEPA's seven operable generating plants. The study would be a subjective exercise to evaluate the following factors for each power plant:

- Assess history of NEPA's O&M performance, and expectation for future performance.
- Survey likely contractor interest in the various contracting alternatives, in particular incumbent contractors.
- Evaluate the potential administrative burden on prospective contractors that would have to set up new business divisions in Nigeria.
- Identify any complications for future privatization of assets if control of the plants would be transferred to private parties.
- Review existing rehabilitation contracts, assess ease of disentangling from signed agreements to institute alternative contractual approaches, and assess impact of changes on generation in-service dates.
- Assess net benefits of nontraditional contract framework compared with the status quo. This evaluation will be complicated by the need to sort out whether the poor availability recorded by NEPA's generating plants in recent years is attributable more to mismanagement or to lack of resources.
- Assess any additional administrative burden of renegotiating contracts, conducting tenders, training staff, etc.
- Evaluate pros and cons for contracting on an individual plant basis versus grouping plants together. It may work out that contractors can realize economies of scale under an O&M contract for multiple plants.

The product of the study would be a prescription for the management of each plant—that is, whether the status quo should be maintained or changed. The next phase, if needed, would be to develop an approach to tendering any required new contracts recommended in the study.

2.3.5.2 *Procure Technical Assistance to Institute New Contracts*

Tenders for ROT and O&M services contracting should be developed by an independent consulting engineer with expertise in power plant operations and maintenance, power contracting, and tendering. The terms and conditions in the tenders should be based on a survey of the preferences of potential contractors, in particular incumbent contractors that may be willing to consider new contractual arrangements. Ideally, the same consultant that develops the tender packages would manage the tender process and, subsequently, the consultant would work with the Nigerian implementing agency to conclude deals quickly.

2.4 GRID SUPERVISION, DISPATCH, AND METERING

2.4.1 Current Situation

The interim report reviewed and assessed the current situation at NEPA with respect to grid supervision, dispatch, and metering. The key findings from that report were:

- The existing control center at National Control Center (NCC) in Oshogbo is obsolete. NCC lacks computer-based energy management system (EMS) tools for essential daily real-time operating functions such as dispatch and scheduling, state estimation, power flow, fault monitoring, and analysis.
- System control and data acquisition (SCADA) functions to help supplement real-time operations are not functional. SCADA cannot support any monitoring or remote controlling functions. Monitoring and control actions are being done manually by calling on operators over the phone line, getting hourly or half hourly readings, and passing control instructions.
- The Supplemental National Control Center (SNCC) in Shiroro has a computer-based SCADA and a basic EMS that are being installed by SIEMENS. However, SCADA data at SCC in Shiroro will not be available at NCC. SCADA at Shiroro will cover the 330kV grid and some of the 132kV grid. SCADA system at SCC in Shiroro is expected to be functional within 2 months and will have supervisory capability only. Control capability does not exist due to a lack of required and/or nonfunctional automation equipment at substations.
- The existing telecommunications infrastructure is not reliable, fully functional, nor sufficient for required data communication. The overhead fiber optic network is only 10% complete, and is forecast to be finalized by the second quarter of 2001. The existing PLC is not reliable and only partially functional. Furthermore, it does not cover all of the 132 kV grid and any of 33 kV substations.
- The staff lack essential training targeted for modern EMS and SCADA functions and operations.

Exhibit 2-1 provides a profile of the existing SCADA system.

As a result of the problems listed above, there is no real-time information available to the dispatchers at NCC. Furthermore, lack of any EMS tools and training for emergencies is a major obstacle for operating the NEPA grid in a viable and secure fashion. As a result, NCC cannot provide prohibitive, corrective, and restorative actions to avoid total system collapses. This is borne out by the two prolonged blackouts in 2000 (March 10th and 13th, 2000, both longer than 24 hours), and another two in 1999. There may be higher system collapse

probability when supply increases and grid gets overloaded. Possible real-time system violations, such as overflows on the radial single lines, double lines/single towers (e.g. Abuja lines) are not tracked or recognized, either. Overall, these stand in the way of effective operational, corrective, and emergency procedures.

These recommendations are deemed as necessary to be implemented during the transition, and prior to the restructuring and privatization of NEPA. These recommendations are made taking into account the limited resources that are available to NEPA in the interim period, and are considered as crucial for the power sector restructuring, usage of transmission, and development of wheeling tariffs. Furthermore, they are an integral part of the basic requirements needed to keep a power grid operating safely and viably.

The balance of this section addresses specific recommendations that NEPA should act upon in the near term. These are as follows:

- Develop an EMS implementation plan
- Install the critical EMS tools at NCC
- Put in place the crucial operational and emergency procedures for NCC and SNCC
- Provide the crucial SCADA functions at NCC and address the issues outlined
- Install proper grid metering incrementally

Each of the above is addressed in the following sections. If implemented, they may also help eliminate problems that cause inappropriate load shedding due to lack of real-time information and that prohibit available generation from rehabilitation being effectively used. In addition, they would enhance system maintenance and avoid inaccuracies in grid planning.

2.4.2 EMS Implementation Plan

An implementation plan for EMS upgrades needs to be put into place to effectively coordinate all the relevant efforts in this area. The main objective of the plan would be that grid supervision and dispatching would be unconditionally functional within a certain period of time. It would in effect ensure that the NEPA's efforts in areas such as SCADA, EMS, and grid metering develop in a coherent manner to make the individual and overall systems work.

In addition, the implementation plan would identify the upgrade requirements of the basic SCADA and EMS capabilities at NCC in Oshogbo, the required interfaces and protocols to function effectively with SNCC in Shiroro. It would highlight all the SCADA and EMS functions that NCC needs for secure operation of NEPA's transmission network and generation plants and ensure that NCC would be able to carry out its dispatch and operating responsibilities in a reliable manner. The plan would also develop the core specifications for the required hardware and software. The plan would need to ensure a modular and expandable design so that it can be applied at future regional control centers that may be set up around the country such as at Benin and Lagos.

More specifically, the implementation plan would include a review of the current existing SCADA and EMS capabilities and infrastructure for four main areas: network, hardware, software, and staff. The review would include the systems being installed at the SNCC in Shiroro, the RTUs that are being installed around the NEPA grid, the fiber optic system being

built, and any compatible SCADA hardware at the 330/132 kV and 132/33 kV substations and the generation plants. It would also include existing automated generation control capabilities at the generation plants. It would set a schedule to install at NCC the basic capabilities that already exist at SNCC. The plan would also include an interface and integration design for SCADA and EMS systems at NCC, and outline a phase-by-phase implementation for network, hardware, software, and staff.

The implementation plan would need to identify the substations and generation plants that require hardware and software installment (upgrade) that will make EMS functions and operations viable at NCC and SNCC as well. It would need to develop design specifications and requirements for these with telecommunications media addressed, and provide alternatives for telecommunications infrastructure to these facilities if needed.

In addition, it would include design and develop specifications for an EMS database. The database would include historical data, network base case representations, backups. It should be an object-oriented relational database that maintains all relationship information among various pieces of equipment. The database should also provide SQL2 capabilities for queries, reports and interfaces to external information management systems. Finally, it would address extensive user training systems, functions, programs that are required to be put in place for effective usage of the EMS tools.

2.4.3 Critical EMS Tools for NEPA

Modern EMSs have several functions and components. The following listed tools form an integral part of EMS tools at modern control centers:

- Pre-network analysis tools:
  - SCADA interface
  - Measurement error processor
  - Network topology processor
- Network analysis tools
  - Model update
  - State estimator
  - Network parameter adaptation
  - Security analysis
  - Dispatcher power flow
  - Short circuit calculation
  - Penalty factor calculation
  - Optimal power Flow
  - Voltage Collapse analysis
  - Equipment outage scheduler
- Generation control and scheduling tools
  - Automatic generation control

  - Load forecast
  - Security-constrained economic dispatch
  - Interchange scheduling
  - Unit commitment
  - Hydro unit scheduling
  - Hydro-thermal coordination
  - Production costing
- Fault processing tools
  - Alarm processing
  - Fault location
  - Fault isolation and system restoration
- Operator training simulators
  - System modeling and operation tools
  - Instructor and trainee subsystems

Of the EMS tools listed above, the following are considered crucial for deployment at NCC in Oshogbo; these are the *minimum* essential tools that NCC needs:

- SCADA interface
- Measurement error processor
- Network topology processor
- Model update
- State estimator
- Security analysis
- Dispatcher power flow
- Short circuit calculation
- Automatic generation control
- Load forecast
- Unit commitment
- Hydro unit scheduling
- Alarm processing
- Fault location
- Fault isolation and system restoration
- Instructor and trainee subsystems

2.4.4 Crucial Operational and Emergency Procedures for NCC

There are several operational and emergency procedures that need to be put in place for safe and viable operations of a power grid. These real-time control action routines such as real-time transmission/dispatch practices, load shedding, and fault detection, location, monitoring and tracking are crucial for grid dispatching. Other offline studies such as peak, off-peak, etc., base case formulations, voltage collapse analysis and prevention procedures, and system analysis practices are also an integral part of grid analysis. The *minimum* required procedures for NEPA are described below.

2.4.4.1 Operation Procedures for Generating Stations

The generating stations (GSs) should have the obligation to inform each other, as promptly as possible, of any circumstance including, but not limited to, abnormal temperatures, storms, floods, earthquakes, and equipment depletions that may be reasonably likely to adversely affect the operation or reliability of the NEPA grid, or the integrity or capability of the generation facilities. They should also inform each other as promptly as possible of any incident or situation (including, but not limited to, equipment outages affecting generation, overloads, over/under-voltages, or alarm indications) which, in the case of a GS, is reasonably likely to threaten the capability or reliability of the generating unit. Generating unit operating limits need be communicated to the NCC and will be updated at any time such limits change.

Normal Operations

GSs should have the capability of remaining in constant communication with the NCC. Except as noted otherwise, or requested by NCC, GSs should adhere to all schedules, maintaining normal frequency and voltage. All turbine-generators should be capable of providing immediate response to abnormal frequency. In theory, governors should be set to provide a user-defined (usually 5%) droop characteristic and be fully responsive to preset frequency excursions. Load limit devices (i.e., unit/governor blocks) should be set at a point enabling full available load (i.e., without substantial operator intervention) of each unit to allow for maximum governor action at low frequency.

Emergency Operations—Low Frequency

All GSs. All GSs will have low-frequency alarms that are preset. If the system frequency should decay to the preset frequency limit—or if automatic generation controls (AGCs) should trip or suspend—GSs should be ready to maximize all generation currently synchronized to the system. The GS should make the NCC aware of the frequency excursion.

Units that were on AGC prior to the frequency excursion should be returned to AGC. If unable to reset AGC (due to frequency that is too low or other problems), the load should be raised until the unit AGC resets or until the unit reaches full available load without exceeding nominal frequency.

If frequency continues to decay, with no immediate recovery, the unit(s) should be separated from the system and, if feasible, the GSs should attempt to carry the auxiliary load. Under NCC direction, the GSs should be ready to restart the unit(s) and/or prepare to resynchronize to the system.

Stations With Quick-Start Generation. If the system frequency decays to the first preset limit, the GS should initiate a start on all idle and available quick-start generation. A start should be initiated prior to contact with the NCC regardless of the frequency at the time of start initiation.

Emergency Operations—System Shutdown

All GSs. In the event of a complete or partial system shutdown, as evidenced by zero voltage on the facilities, the GS should advise the NCC. All available generating units will be made ready for startup, and startup will be initiated as soon as auxiliary power requirements can be met.

Stations With Black-Start Generation. All black-start capable generating units will be started to supply auxiliary power to other generating units at the same GS.

2.4.4.2 HVAC Transmission Operation Procedure

This procedure is designed to describe the operating rules to be used in real-time operation and dispatch of the NEPA high-voltage AC (HVAC) transmission system. It would establish guidelines for communicating operating and switching information between NCC, SNCC, and any other future supplemental control center. It would also incorporate responsibilities for any operating and clearance procedures currently in place.

2.4.4.3 Emergency Manual Load Shedding Procedure

This procedure would establish criteria for implementation of NEPA's emergency manual load shedding. It would provide guidelines for emergency manual load shedding activities that need to be coordinated by the NCC, SNCC, and any other future supplemental control center.

The NCC would utilize existing manual load shedding procedures to match the load demand with the available resources; allowing the frequency and voltage to recover, minimizing additional generation loss, and preventing a total system collapse.

2.4.4.4 Procedure for Scheduled and Forced Outages

The scheduled and forced outage procedure would provide guidelines for coordinating scheduled maintenance, repair, and construction of new facilities or generating units. The procedure would also cover forced facility outages. The NCC would coordinate maintenance as far in advance as possible to allow it to maintain system reliability and minimize the amount and effect of load shedding.

2.4.4.5 Real-Time Over-Generation Procedure

The purpose of this procedure would be to outline the actions to be taken by NCC personnel in managing over-generation during real-time operations. Ideally, this procedure should not be limited to minimum load conditions, but should instead apply to over-generation conditions arising from the difference between forecasted demand versus total available generation.

2.4.4.6 System Restoration Procedure

This operating procedure would establish priorities, and guide the restoration of the NEPA grid in the event of a wide-scale system shutdown. It would also serve as a directive to all supplemental control centers and local area centers. This procedure would also provide guidelines for restoration activities coordinated from the NCC. It would be used as a guide for locating power sources and routing power through the electrical system as necessary, specifically to thermal generating station unit auxiliaries.

2.4.4.7 Security Coordinator Procedure

This procedure would outline various remedial actions the NCC and supplemental control centers would use to proactively coordinate activities in subregions on a real-time basis, allowing the centers to observe and mitigate potential problems as well as react to system emergencies as they develop.

2.4.4.8 Under-Frequency Load Shedding Procedure

This procedure would describe the under-frequency load shedding that may occur during a major system disturbance and address the restoration of the system, including the load that was shed. This procedure would also provide guidelines for restoration activities directed by the NCC and coordinate those activities with those of the supplemental control centers.

2.4.4.9 Voltage and VAR Control Procedure

The purpose of the voltage and VAR control procedure would be to outline the NCC procedures for maintaining acceptable voltage levels and VAR flows on the NEPA grid. The NCC would accomplish this by using all available voltage support equipment such that the operation of the grid would meet or exceed minimum operating reliability criteria.

2.4.5 Crucial SCADA Functions, Guidelines, and Issues

2.4.5.1 Basic SCADA Functionality

The following general design and operating requirements are deemed crucial for both successful implementation of SCADA and EMS functions and tools:

- The substation control system (SCS) should consist of substation monitoring and communication functions. It should enable local station control via PC by means of a human machine interface (HMI) and control software package, which should contain an extensive range of SCADA functions.
- The SCS should be suitable for operation and maintenance of the complete substation including future extensions. The product components should be suitable for efficient and reliable operation and maintenance support of outdoor or indoor substations for distribution and transmission.
- The systems should be of the state-of-the art for operation under electrical conditions present in high-voltage substations, follow the latest engineering practice, ensure long term compatibility requirements and continuity of equipment supply and the SCS safety of the operating staff.

The ideal SCADA design would have the following functions:

- Data acquisition and disturbance data collection

- Alarm/event processing
- Sequence-of-events
- Mapboard
- Supervisory control
- Sequential switching
- Load shedding capability
- Energy accounting
- A relational database for historical and what-if scenario management

Specific SCS functionality and boundary conditions should be adapted to the requirements related to the particular voltage level and the specific substation layout. The project-specific drawings that are needed are:

- Overall single line diagram
- General system architecture
- Location of substation buildings
- Control and operation principles

2.4.5.2 Design Guidelines

The system design would follow the following general rules:

- The system should be designed so that personnel without any background in microprocessor-based technology can operate the system easily after they have been provided with some basic training.
- System control via PC should be mouse-operated and include the following HMI functions:
  - Acquisition and plausibility check of switch-gear status
  - Display of actual measured values
  - Display of events
  - Display of alarms
  - Display of trends
  - System self-supervision
  - Hard copy printing
- Maintenance, modification, or extension of components should not cause a shutoff of the whole station control system. Self-monitoring of single components, modules and communication should be incorporated to increase the availability and the reliability of the equipment and minimize maintenance.
- The design should have flexibility and scalability.
- The system concept should be adaptable to various system requirements depending on the actual substation, depending on size, voltage levels, importance, and configuration complexity.

2.4.5.3 System Hardware

The system hardware would be designed for two levels—station and bay. Hardware components for each level are described below.

Station Level

- *Main computer*—the main computer is the center of this system, responsible for data processing as well as storage of all the data collected from field devices via RTU. Two main computers should be provided as hot standby redundant system, failure of anyone should not affect the operation and the functionality of the whole system.
- *MMI workstations*—MMI workstation is the device where SCS interact with operators, all station/data display presentation as well as operator inputs are done through MMI workstations. Two MMI workstations should be provided, each should have at least two CRTs to allow operator having enough room to monitor the system status.
- *Front-end computers (FEs)*—an FE is the communications server of the system, responsible for collect data from RTU and other peripheral devices, such as printers and the GPS receiver. Front-end computers should have redundant capability so that failure of any one FE should not affect the operation and the functionality of the whole system
- *Printers*—an event printer should be connected to the operator station. Events should be printed out spontaneously as they arrive into the operator station. Each event should be reported on one line that should contain:
  - The event date and time
  - The name of the event object
  - A descriptive text
  - The state or value of the object

Bay Level

- *RTU*—enough RTUs should be provided to collect the I/O signals defended in this specification. RTUs should be able to effectively send and received information to the SCS through an FE. Failure of an FE or main computer should not cause any data loss. RTUs should have the capability to locally print out messages in the event that the communications channel between an RTU and an FE fails. This is to ensure no data will be lost even if the RTU buffer is overflowed during a protracted communications failure.

2.4.5.4 Monitored Data

The following data should be monitored:

- Status data
  - 330 kV /132 kV substation CB, DS, ES status, etc.
  - 330 kV /132 kV substation miscellaneous status inputs (e.g., gas pressure alarm, etc.)
  - Auxiliary transformers supplying the power to plant facility.

- Status from relay control panel (e.g., relay trip indication, use/lock status, auxiliary equipment status, etc.)
- Status from substation local control panels (gas pressure, L/R select switch, compressor status, etc.)
- Status from RMC panel (operator control commands, L/R select switch, etc.)

- Analog measurements
  - 330 kV/ 132 kV substation bay measurements, V, A, kW, kWh, etc.
  - Other analog information available, such as transformer oil temperature, winding temperature, etc.

2.4.5.5 System Software

SCADA software should have the following, at the very minimum:

- The software package should be structured according to the SCS architecture and strictly divided by level. Station extensions should be accomplished with minimal effort. Maintenance, modification, or feeder component extensions should not shut down those parts of the system not affected by the system adaptation.
- The graphical user interface (GUI) package for the operator station should include the main SCS functions and should be independent of project-specific hardware and operating systems. It should also include tools for picture editing, engineering, and system configuration. GUIs should be easy to use, maintain, and adapt according to specific user requirements. They should contain libraries with standard functions and applications.

The following guidelines should be followed for system functions

- Status supervision
  - Position of each switchgear component (e.g., circuit breaker, isolator, earthing switch, transformer tap changer etc.) should permanently be supervised.
  - Every detected change of position should be immediately visible on the screen in the single-line diagram, recorded in the event list, and produced as a hard copy printout.
  - Alarms should be initiated when spontaneous position changes have taken place.
  - The position of each device should be indicated by two binary auxiliary switches, which are opposite each other in normally closed (N.C.) and normally open (N.O.) position.
  - An alarm should be initiated if these position indications are inconsistent or indicate an excessive a running time of the operating mechanism to change position.
- Interlocking check
  - The interlocking function provides a convenience tools for the operators before or after they execute the control command through RMC control panel.
  - The system should be able to inform operators whether the desired control request is accepted or rejected using an interlocking scheme provided by NEPA. If a

request is rejected, the system should be able to give operators the reason for rejection.

  - An override function should be provided to bypass the interlocking function via a key or password, in the event of maintenance or emergency situations.

- Time synchronization
  - The time within the SCS should be set from the station HMI or from an external GPS clock synchronization unit. The time should then be distributed to the control/protection devices via the optical bus.
- GUI functions
  - The operator station GUI should provide basic functions for supervision and control of the substation.
  - The operator should give commands to the switchgear on the screen via mouse clicks on softkeys.
  - The GUI should provide the operator with access to alarm and event displayed on the screen. In addition, a hardcopy printout of alarms or events should be maintained in an event log.
  - An acoustic alarm should indicate abnormalities and all unacknowledged alarms should be accessible from any screen selected by the operator. The following standard pictures should be available from the GUI:
    - Single line diagram showing the switching status and measured values
    - Control dialogues
    - Measurement dialogues
    - Blocking dialogues
    - Alarm list, station/bay oriented
    - Event list, station/bay oriented
    - System status
  - The substation process status should be displayed in the station single line diagram, in terms of actual values of currents, voltages, frequency, active and reactive powers, circuit breaker positions, isolators, and transformer tap changers.
  - The SCS system should be comprehensively self-monitored to immediately indicate faults to the operator possibly before they develop into serious situations. Faults should be recorded in a system supervision display. This display should cover the status of the entire substation including all switchgear, communications links, and printers at the station level, etc.

2.4.5.6 Basic Reporting

Reports should provide time related followups of measured values and calculated values. The data displayed should comprise:

- *Required trend reports*—daily, monthly, semiannually, and yearly—mean and peak.
- *Required historical reports*—daily, weekly, monthly, yearly.

- *Online reports*—it should be possible to select displayed values from the online database in the process display. For example, scrolling between days should be possible. Unsure values should be indicated. It should be possible to select the time period for which specific data is kept in memory. Daily reports should be stored at least 60 days. Monthly reports should stored at least 12 months.
- *Event list*—this list should contain events, which are important for substation control and monitoring. The time for each event must be displayed. At any time, the operator should be able to call up the chronological event list on the monitor for the entire substation or selected sections.

Fault Reporting

Faults and errors occurring in the substation should be listed in an alarm list and should be immediately transmitted to the control center. The alarm list should substitute a conventional alarm tableau, and should constitute an evaluation of all station alarms. It should contain unacknowledged alarms and persisting faults. Date and time of occurrence should be indicated.

- The operator should be able to acknowledge alarms, which should be either audible or only displayed on the monitor. Acknowledged alarms should be marked on the list. Faults that appear and disappear without being acknowledged should be specially presented in a separate list for fleeting alarms.
- When selecting an object such as a circuit breaker or isolator in the single line diagram, the associated bay picture should be displayed first. In the selected object picture, all attributes—such as type of blocking, authority, errors, etc.—should be displayed.

Miscellaneous Reporting Issues

- All the RTUs should have an internal clock that accepts the periodic time synchronization command sent from the host computer. The RTU should time-tag the event at the time of occurrence and when RTU received the change. Time tagged information should than be sent back to the host computer for display on the alarm/event display and produced as a printout from the alarm/event logger.
- The SCADA system should dynamically update the color of the busbar and lines to indicate the energize condition of the electrical network. Dynamic means every time a CB or DS changes its status (ON or OFF), the color of the bus and feeder should be reevaluated and updated automatically.
- The activation of the process pictures of each object (bays, apparatus, etc.) should be restricted to specific user authorization groups. Users could be given access rights to each group of objects—display only, normal operation (e.g., open/close apparatus), restricted operation (e.g., bypassed interlock), or system administrator.

2.4.5.7 Configuration Tools and User Documents

The following characteristics are desirable for configuration tools:

- Various functionalities should be customized by easy-to-use interactive configuration tools.

- Configuration tools should include visual presentation of the object, adaptations needed in the process database, and adaptations of the communications configuration data.
- The database should be editable on-line, with no need to shut down the system when changing parameters. Standard online forms should be used to edit the database, and no special computer knowledge should be needed to perform modifications.

The following documentation provided for the system should be consistent, CAD-supported, and of similar look/feel:

- List of drawings
- Control room layout
- Assembly drawing
- Single line diagram
- List of apparatus
- Test specification for factory acceptance test (FAT)
- List of signals
- Operator's manual
- Product manuals

2.4.5.8 General Guidelines

In general, the following guidelines should be used to evaluate vendor proposals to ensure that NEPA's SCADA system is modular, flexible, and scalable at a later date when additional funds become available:

- Communications should:
  - Be preferably a fiber optics network
  - Have hub/router with UPS at each switching point
  - Provide support for future distribution automation (DA) communications strategies—polling, report by exception, peer-to-peer, and multiuse.
- The control center should have:
  - A SCADA historian
  - Enterprise information distribution capability via webserver
  - Immediate alarm dispatch capability
  - Ability to locate control centers anywhere with easy transfer of controls to alternate/backup control centers.
- Operations strategies should be flexible enough to accommodate the following:
  - High-speed fault isolation via smart relays (IED)
  - Peer-to-peer where necessary
  - Fault location and rapid restoration via DA
  - Remote changing of relay settings and protection strategies when necessary

- Monitoring peer-to-peer relays and controlling their strategies
- Centrally managed operations strategies—relays are last protective fallback

2.4.5.9 System Testing and Vendor Selection

It is imperative that NEPA would strictly follow the following system testing and vendor selection rules to ensure timely completion of SCADA projects:

- The supplier should submit a test specification for factory acceptance test (FAT) and commissioning tests of the station automation system for approval.
- The FAT should conclude the SCS manufacturing phase. Its purpose is to ensure that the contractor has interpreted the specified requirements correctly and that the system has been checked to the extent the user requires.
- A system should be delivered to a site only after it has been thoroughly tested and its specified performance has been verified under simulated site conditions. If the FAT encompasses only certain portions of the system for practical reasons, it should include at least one of each and every type of device in the delivered system.
- If the complete system consists of parts from various suppliers or if some parts are already installed on site, the FAT should be limited to subsystem tests. In such a case, the complete system test should be performed onsite together with the site acceptance test (SCST).
- Bids should only be accepted from experienced and technically capable manufacturers of substation control systems for electricity transmission and distribution applications.
- Only those manufacturers with experience in delivering the full scope of station automation systems and services should be considered. Their experience must be substantiated by installations in service for at least 2 years under similar environmental conditions.
- To assess the vendor's experience, the vendor should present the following with the bid:
  - Technical description of SCS
  - Catalogues and brochures of equipment and devices offered
  - Reference list
- The vendor should warrant long-term maintenance and availability of spare parts. Moreover, a guarantee should be submitted for availability of spare parts during the lifetime of the SCS (at least10 years).

2.4.6 Required Characteristics of Grid Metering

Grid metering is an integral part of grid supervision and operations. It supplements SCADA monitoring capabilities of a modern control center and provides essential information for calculating transmission congestion and formulating transmission wheeling tariffs. However, site visits to various NEPA facilities during this project revealed some inappropriate equipment for capturing all the required flow, injection, and voltage data. Meters to be installed for future grid metering should have the following minimum characteristics:

- Instantaneous values to be monitored:

  - Active power—delivered and received (kW, net, sum)
  - Reactive power—delivered and received (kVAR, net, sum)
  - Apparent power—delivered and received (kVA, net, sum)
  - Power factor—delivered and received (pf)
  - Phase voltage (V)
  - Phase current (A)
  - Phase frequency (Hz)
- Desirable demand features
  - Active power—delivered and received (kW, net, sum)
  - Reactive power—delivered and received (kVAR, net, sum)
  - Apparent power—delivered and received (kVA, net, sum)
  - Power factor—delivered and received (pf)
  - Peak demand storage and display (several different ones if possible)
  - Coincident demands for each selection
  - Cumulative demand for all demand registers
  - Continuous cumulative demand for all registers
  - Self read on demand reset
  - Programmable demand register selection
- Desirable self-diagnosis capabilities
  - RAM check
  - Display segment check
  - Number of power outages
  - Number of potential losses
  - Number of days without input
  - Number of days since reset
- It is essential that the new meters to be SCADA compatible so that the meters can be connected to the SCADA in the future
- Grid meters should be chosen with adequate care given to future applications that would be required in the competitive power market. These applications include, but not limited to:
  - Real-time pricing
  - Load curtailment
  - Transmission system operator metering, etc.
- For some of the applications mentioned above, the meters may have to be used to measure bidirectional energy as it flows to and from generation facilities in the future competitive market.

It is essential to have comprehensive metering at the 330 kV and 132 kV voltage levels. As funds become available, the 33 kV network and substations should be properly equipped for grid monitoring as well. Priority should be given to high generation and load centers for better real-time operations and revenue collection purposes. If possible, the following systematic approach should be taken to identify locations for additional grid metering:

- *Step 1*—forecast the load growth at the grid nodes
- *Step 2*—incorporate the potential generation stations into the load flow model
- *Step 3*—incorporate potential transmission expansion projects into the load flow model
- *Step 4*—form the baseload flow cases for the next 5 years, using the first three steps
- *Step 5*—run load flow simulations for summer and winter peak for all base cases
- *Step 6*—identify the important flow gates, congested paths, possible violations on the NEPA transmission and subtransmission grid.
- *Step 7*—monitor the nodes adjacent to the line sections above in terms of flows, injections, and voltages.
- *Step 8*—survey the available compatible metering at these nodes
- *Step 9*—complete grid metering coverage by incremental installation, upgrade or replacement of meters
- *Step 10*—repeat same scheme for intra-zonal congestion if smaller system models can be simulated for regional grids

Finally, the ultimate success of grid supervision, dispatching and metering depends on reliable telecommunications infrastructure with sufficient redundancy and backup. Otherwise, the investments in new EMS and SCADA will not serve their purpose, and the current operating conditions at the NCC and SNCC will not improve.

Exhibit 2-1
SCADA

There are two SCADA Systems in Nigeria: the SIEMENS Spectrum and the DASA System. Spectrum is computer-based system while the DASA is electromechanical. The mode of data communication in SIEMENS SCADA System is point-to-point, while the DASA System is star-in-line.

Presently, the DASA SCADA system is mostly used for system monitoring because the SIEMENS SPECTRUM SCADA has not been fully equipped with personnel. The operators get information from the mimic board in the National Control Center, Oshogbo, by looking at the various displays to ascertain system stability and system analysis. The sources of data are from the station relays through the transducers. Data items are reported via the power line carrier.

The SIEMENS SCADA system uses the same configuration and hardware with the EMS. The existing lines are purely for voice communication in the National Control Centers. Frequency ranges used for data and voice are:

- 300-2000 Hz Voice Only
- 300-2400 Hz
- 2000-3400 Hz Data (DASA SCADA, Telemetry, Telex)
- 2400-3400 Hz
- 300-3400 Hz SIEMENS SCADA

Station instruments that work together to achieve the final data/voice output are:

- Wave trap
- Line matching unit
- Capacitive voltage transformer
- Coaxial wire
- Remote terminal unit
- Communication unit (channels & modems)
- Master station

Limitations of existing SCADA system include:

- DASA SCADA:
  - Uncomputerized data storage and retrieval
  - Aging communication infrastructure
  - Obsolete equipment and non availability of spares
- SPECTRUM SCADA:
  - Aging communication infrastructure
  - Non-availability of enough lines from the National carrier

Section 3
Improving Organizational Performance

Section 3
Improving Organizational Performance

NEPA's current condition indicates an urgent need for reform and revitalization. Numerous opportunities for improving NEPA's organizational performance were identified in the interim report. We have concentrated on those that could be most cost-effective and best implemented within the restructuring transition period—during the unbundling process and prior to privatization. The main organizational issues addressed in this report are:

- Organizational structure reform
- Management information systems
- Information technology
- Financial management
- Functional unbundling
- Human resources development
- Management decision-making improvements

3.1 ORGANIZATIONAL STRUCTURE REFORM

3.1.1 Introduction

NEPA's organizational structure must be capable of functioning as effectively as possible during the transition period leading up to restructuring and privatization. This is an obligation to NEPA's stakeholders. By improving customer service and corporate financial viability, the value and marketability of the business streams marked for eventual privatization will be enhanced.

Clearly, the process of unbundling will impose a number of required changes in NEPA's organizational structure, but the basic rule must be to avoid radical fixes on things that will soon change. In other words, organizational change should be kept to a minimum until new management and ownership have time to introduce the new structures and systems that they want to put in place. However, for a number of reasons, it is possible that some parts of NEPA may not be privatized for several years. Therefore, NEPA must strive for more efficient operation over a potentially sustained transition period. Accordingly, Nexant has identified a number of interim organizational structure reforms that would be cost-effective and supportive of the restructuring initiative.

The prime driver for organizational change is the need to increase the autonomy and accountability of each of the three functional divisions—generation, transmission, and distribution. This raises important questions about the allocation of staff, assets, budgets, and funds necessary for divisional self-sufficiency.

At the same time, a number of support services will still be required at the corporate level. There are also some corporate-wide functions that do not currently exist but that should be introduced to coordinate and control plans and programs for corporate consistency, affordability, and economies of scale, and to provide the necessary strategic support to senior management during this challenging transition period. Exhibit 3-1 summarizes the main

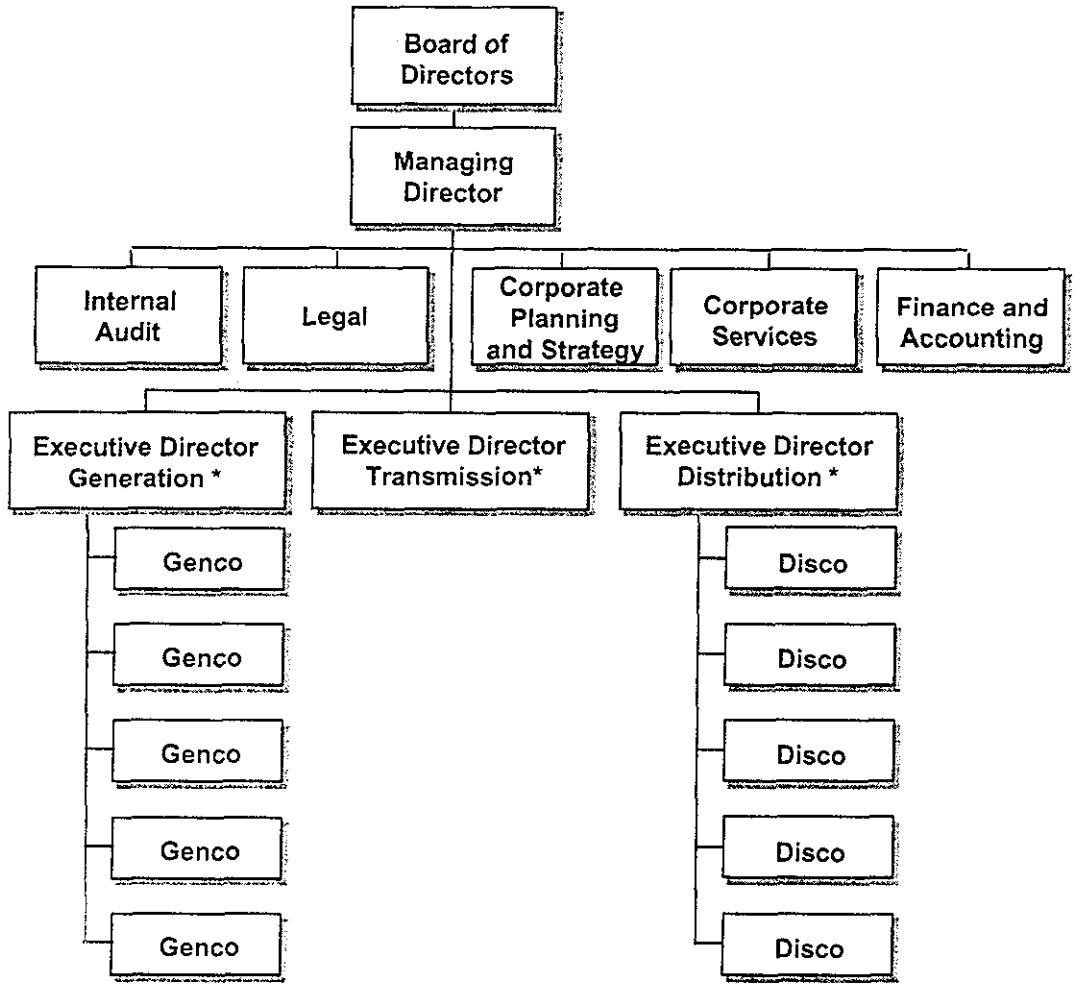
corporate-level functions that will remain during the transition phase, together with suggestions and options on where lead responsibility should reside, and what sort of participation will be required to provide necessary inputs.

It is also apparent that NEPA is overstaffed in many areas, particularly in middle management and low-graded staff. This is not a problem that can be solved overnight, but some initial steps can be taken now to help management to begin addressing the question of staffing and productivity in a rational manner. This will be discussed in more detail in Section 3.6, Human Resource Development.

3.1.2 Key Recommendations

The proposed interim organizational structure for NEPA is shown in Figure 3-1. This structure includes:

- *An ongoing NEPA board* that will be required throughout the transition phase, which may last several years. It is suggested that the board could consist of a chairman; six executive directors—the NEPA CEO, the heads of the generation, transmission and distribution divisions, and the heads of corporate finance and accounting and corporate planning and strategy; four non-executive directors consisting of representatives from the Ministries of Power and Steel and Finance; and two directors drawn from the business community.
- *A full-time managing director,* who will report to the NEPA board as CEO.
- *Appropriate executive directors,* to be appointed as soon as possible to head the generation, transmission, and distribution divisions. During the transition period they will report to the managing director.
- *An executive committee*, to be chaired by the managing director. The other members would consist of the executive directors of generation, transmission, and distribution, and the heads of corporate finance and accounting, corporate services, corporate planning and strategy, and legal. Generally, the executive committee should meet weekly or as often as required.
- *Selected corporate-wide support and coordination functions* that need to report directly to the CEO and serve the three divisions during the transition period. As shown in the proposed structure, they include internal audit, legal, corporate services, and finance and accounting.



* Will also have their own F&A, I&T, and HR capability

Figure 3-1 Proposed NEPA Interim Organization Structure

3.1.3 Additional Specific Recommendations

Following full unbundling and privatization, NEPA's current organization will eventually be replaced by a structure that includes one or more generation companies (GENCOs), a single transmission company (TRANSCO), and several distribution companies (DISCOs). When this happens, each entity will stand alone and will require its own capability in internal audit, legal, corporate services, and finance and accounting functions. Therefore, during the transition period, there should be a gradual process of identifying corporate-level personnel who will ultimately be required by each of the line divisions. We recommend that:

- A small multidisciplinary corporate planning and strategy group be established for the transition period, with a technical representative from each of the generation, transmission and distribution divisions. The group would have economic and financial skills, report directly to the CEO, and serve the three entities. It could perform system planning and spearhead special projects, such as strategic planning and developing the corporate business plan, as well as establishing key performance indicators, targets, and an MIS-based monitoring system. Some of these activities could be outsourced to

42

consulting firms, but would still require management oversight. More details on recommendations for the corporate planning and strategy group follow in the following subsection.

- A group be tasked with the responsibility of managing the IPP program. This group could be positioned in the TRANSCO or within the corporate planning and strategy unit, or be established as a special committee. Consulting support and training in IPP program management is recommended.
- IT capability in NEPA be strengthened, even during the transition phase. Since the need is company-wide, IT should be positioned in the corporate services group. This recommendation is discussed in detail in Section 3.4.
- Rural electrification planning and implementation should be the responsibility of the corresponding department in the distribution division. A corporate-level task force should be established to negotiate funding of any rural electrification schemes with the GON and state governments. This could be spearheaded by the corporate planning and strategy group.
- Transition phase tariff design and analysis should be positioned at the corporate level, either in corporate planning and strategy or in finance and accounting. Once the three divisions have become fully unbundled, each will require its own tariff group.
- A complete and independent review of staffing needs should be commissioned. This review is discussed in more detail in Section 3.6.

3.1.3.1 Corporate Planning and Strategy

It is recommended that a small, multidisciplinary staff group be formed, with capability in economics, tariffs, financial planning and analysis, system planning, and project and consulting management. Consulting assistance should be sought to develop and launch the group and to train counterparts to take over responsibilities. The suggested organizational structure is shown in Figure 3-2.

The corporate planning and strategy group must have, and must be seen to have, a corporate-wide perspective. The group should therefore report directly to the NEPA managing director rather than to one of the line divisions. To have the required company-wide credibility, it needs the full support of senior management, the executive committee, and the line organization. This goal can be achieved by: (1) drawing staff from each major division and from finance and accounting, and (2) ensuring that the group has sufficient depth of experience in engineering, accounting, and economics.

Corporate planning can provide advice and services to senior management on a wide range of functions, including:

- Strategic planning (including preparing the corporate business plan)
- Economic forecasting and analysis
- Tariff analysis and design
- Financial analysis and planning
- System planning
- Impact analyses (environmental and socioeconomic)

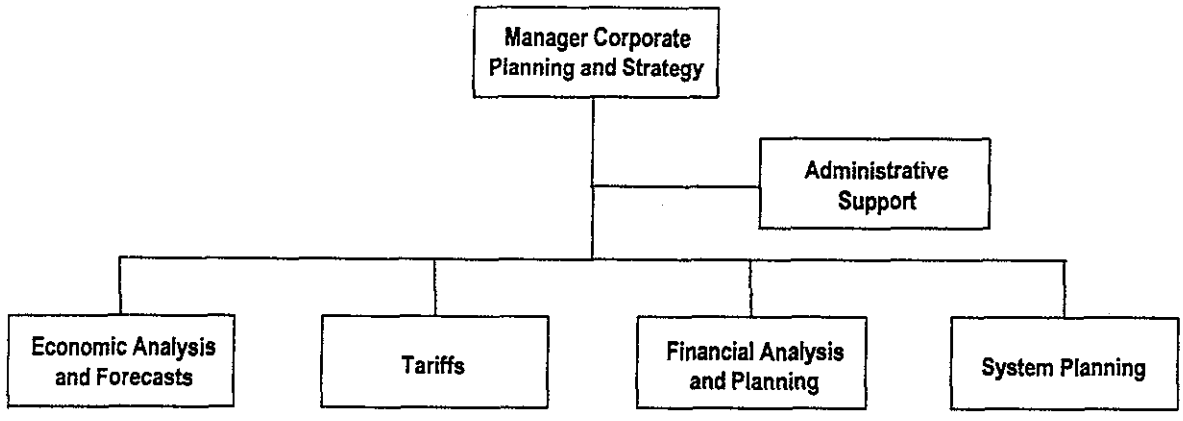


Figure 3-2 Suggested Organizational Structure for the Corporate Planning and Strategy Group

During the transition period, NEPA senior management will have a host of urgent matters to contend with in addition to their normal operational responsibilities. If appropriate and capable staff are allocated to corporate planning, it can share some of this burden by assuming responsibility for coordinating a number of special projects—including, for example:

- Action plan implementation
- Line organization budget and funds allocation
- Management information system design and implementation
- IT system strengthening
- Job description process
- Rural electrification funding
- IPP negotiations
- Fuel supplier negotiations
- Government and investor/financier liaison

Table 3-1 summarizes the main tasks that will be involved in introducing the recommended corporate planning and strategy group.

It should be noted that utility experience in other countries has shown that participation in a corporate planning group provides excellent training for the next generation of senior utility managers. Not only does it help them build the necessary corporate-wide contacts for the future, but also it gives them a broad, pragmatic, and multidisciplinary perspective on the challenges facing utilities today.

While the corporate planning group can provide a useful focal point for a variety of special projects, in many cases it will be necessary for them to establish committees or task forces or call on outside consulting expertise.

Table 3-1
Corporate Planning and Strategy Group Implementation

Task Number	Task Description	Scope of Work
1	Select the CP&S Manager	If necessary, bring in a corporate planning expert who can set up the group and prepare a counterpart to take over responsibility.
2	Define CP&S basic responsibilities	The CP&S role must be integrated fully with and complement the rest of the restructured NEPA organization, while minimizing any overlap and duplication of responsibilities.
3	Identify any special projects to be assigned initially	The bulleted outline above identifies some of the problems facing NEPA with which CP&S could assist.
4	Select and assemble the CP&S team	Ensure corporate-wide divisional representation with backgrounds in engineering, economics, and accounting/finance.
5	Develop the CP&S work plan for the transition period	▪ In consultation with senior management, specify the proposed deliverables, timing, and manpower allocation to complete. ▪ Set a program for regular briefings of the managing director and/ or the executive committee
6	Start CP&S operation	Implement the work plan.

3.1.3.2 Financial Management Organization

There are three aspects to restructuring the financial management function. Firstly, to develop the organizational structure; secondly, to identify responsibilities within the new organizational structure; and thirdly, to determine processes within the new organizational structure.

Financial Organizational Structure

The recommended structure for financial management is shown in Figure 3-3.

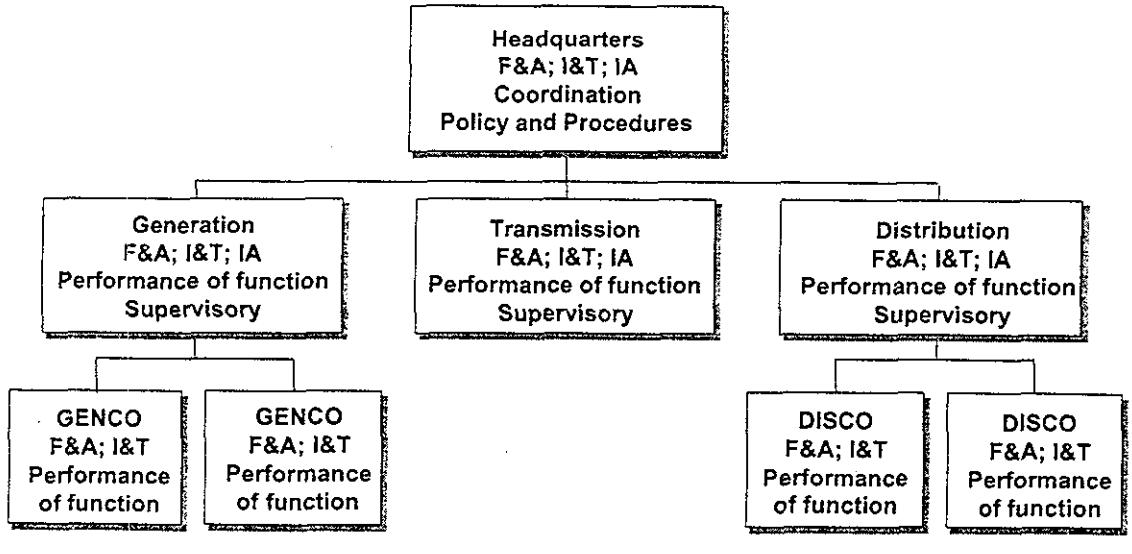


Figure 3-3 Recommended Financial Management Organizational Structure

45

This organizational structure includes:

- Headquarters-based finance and accounting, investment and treasury, and internal audit, functioning primarily in a supervisory and coordination role, but also performing functions that are best administered at this level.
- Divisional finance and accounting, investment and treasury, and internal audit, performing these functions at each division and supervising the operating units.
- Operating unit finance and accounting and investment and treasury.

Responsibilities

The responsibilities of the finance and accounting, investment and treasury and internal audit departments after organizational restructuring are shown in Tables 3-2 through 3-4.

Table 3-2
Headquarters Responsibilities

Finance and Accounting	Investment and Treasury	Internal Audit
▪ Headquarters accounting ▪ Headquarters reporting ▪ Divisional consolidation ▪ Revenue allocations ▪ Loss allocations ▪ Budget determination ▪ Budget monitoring ▪ Insurance ▪ Coordination, supervision, and advice to divisions	▪ Headquarters treasury, including raising of new funds and debt servicing ▪ Centralized treasury ▪ Company forex ▪ Investment appraisal ▪ Investment management ▪ Corporate investment ▪ Superannuation	▪ Policies and procedures ▪ Headquarters internal auditing ▪ Headquarter prepayment auditing ▪ Coordination, supervision, and control

Table 3-3
Divisional Level Responsibilities (Generation, Transmission, Distribution)

Finance and Accounting	Investment and Treasury	Internal Audit
▪ Divisional accounting ▪ Divisional reporting ▪ Operating unit consolidation ▪ Submission of returns to headquarters ▪ Budget determination ▪ Budgeting monitoring ▪ Coordination, supervision, and advice to outstations	▪ Divisional treasury ▪ Headquarter return submittals	▪ Execution of internal audits at divisional and operating unit levels ▪ Prepayment auditing

Table 3-4
Operating Unit Responsibilities

Finance and Accounting	Investment and Treasury	Internal Audit
▪ Operating unit accounting ▪ Operating unit reporting ▪ Divisional return submittals ▪ Budget determination ▪ Budgeting monitoring	▪ Operating unit treasury ▪ Headquarter and divisional return submittals	

Processes

The processes within finance and accounting, investment and treasury, and internal audit after the organizational restructuring are outlined below.

Finance and Accounting

- Accounting will begin at the lowest hierarchy level, with internal revenue and debundled costs being accounted for at the operating unit level.
- Trial balances and reports, including budgets, from the operating units will be consolidated monthly at the divisional level, to facilitate divisional performance analysis.
- Trial balances and reports—including budgets—from the divisions will be consolidated monthly at headquarters, to facilitate company-wide performance analysis.

Investment and Treasury

- Operating units and divisions will be responsible for managing imprests in line with budget; approving budgeted expenditures; requesting funds for capital investment projects; and reporting treasury activities to divisions and headquarters.
- Headquarters will be responsible for raising new loans; servicing existing loans; foreign exchange; setting imprests; approving requests for capital expenditure; approving special requests where funds are available; and other corporate activities.

Internal Audit

- Divisional internal audit will be responsible for planning and executing internal audits at the divisional and operating unit levels; reporting internal audit findings to headquarters; and prepayment auditing.
- Headquarters internal audit will be responsible for administering the internal audit process; ensuring adequate auditing policies and procedures; planning and performing internal audits at headquarters; and prepayment auditing.
- Internal audit will report to the managing director.

3.1.4 Potential Impacts

If implemented, the overall effect of the proposed organization structure reforms will be:

- Undertakings that are more marketable

- Undertakings that are more clearly demarcated and self-supporting
- Corporate flexibility to cope with transition
- Greater divisional autonomy and accountability
- A streamlined and flattened structure
- Greater productivity and efficiency
- Improved capability to respond quickly and effectively to corporate needs

3.2 MANAGEMENT INFORMATION SYSTEMS

3.2.1 Introduction

The availability of sufficient current and reliable information is an essential requirement for effective management of any enterprise. However, at present, the amount, type, timeliness, and accuracy of information that is available to NEPA's managers and decision-makers is often deficient.

For example, there is no formalized system of key performance indicators. Regular monitoring and reporting of actual performance to senior management is minimal. Few, if any, performance targets are set at either the corporate, divisional, or departmental levels, and no process exists for operational corrections in response to target deviations. Given minimal internal communications and weak IT support for MIS, productivity is generally low and management often ineffective.

3.2.2 Specific Recommendations

The role of spearheading the introduction of the MIS could be assigned to a task force with representatives from each of the divisions and chaired by the corporate planning and strategy group, with consulting support if required.

Actual performance must be monitored regularly and performance compared with the targets. Where there is a significant variance an explanation must be provided.

Responsible management must review the performance reports and, if approved, suggest and implement corrective measures to achieve targets.

Table 3-5 summarizes the main tasks that will be involved in introducing the recommended interim MIS. If required, MIS could be implemented in-house by corporate planning and strategy, or by a consulting firm with experience in setting up MIS in developing utilities.

3.2.3 Potential Impacts

The introduction of MIS provides a basis for rapid correction of unsatisfactory performance and can be a useful tool for encouraging a more commercial, business-like approach to work. Additional potential impacts include:

- Greater accountability
- Better understanding of results that are expected from business units and individuals
- Faster identification of potential problems

- Improved productivity
- Service improvements
- Financial benefits

Table 3-5
Management Information System Implementation

Task Number	Task Description	Scope of Work
1	Identify required performance indicators	▪ Recommend performance indicators required to effectively track performance at the overall corporate level and for each division, department, and business unit. ▪ Give the system the flexibility to cope with outsourcing and privatization.
2	Develop a performance monitoring and reporting system	In consultation with the MIS task force, design a system to monitor and report on actual performance. The system must be capable of integration with the improved IT system. The database must be capable of access to show the historic trend for selected indicators. Database management and access control software should be selected. For each indicator, establish a system to specify: ▪ Frequency of actual performance measurement ▪ Person(s) measuring performance ▪ Reporting formats ▪ Report recipients and report distribution schedules ▪ Methods for addressing deviations from targets
3	Benchmarking	Undertake a benchmarking exercise for key performance indicators, comparing NEPA's performance with utilities in other developing countries.
4	Set performance targets	Set agreed short- and medium-term performance targets in consultation with the staff who will perform the work.
5	Training	Design and implement a workshop training program to explain the new system to all employees. Select staff to run the system and collect and report the data, and train them to perform their duties.
6	Implement MIS	Initiate the system and make adjustments as required to maximize its effectiveness and value, in cooperation with the MIS task force.

3.3 INFORMATION TECHNOLOGY

3.3.1 Introduction

NEPA has a limited computer and network infrastructure and some in-house developed applications. Departments and groups have taken different directions in terms of software, hardware, protocol, application development, etc. There is no IT master plan, and IT infrastructure is substandard. There are several information islands, and there is no interface between corporate IS and engineering/operation information systems, such as SCADA, in distribution zones and districts. A number of IS/IT inefficiencies and incompatibilities exist. Overall, major upgrades are required to fulfill operational requirements.

Management staff, both NEPA headquarters and the regional transmission and distribution centers lack commercial computer-based tools and targeted training for essential information systems. Systems covering technical functions—such as EMS, grid operations and planning, SCADA, as well as financial functions such as billing, budgeting, investment planning, financial projections, and potential IPP procurement procedures—are only minimally computer-based, if at all. It is essential that these functions be updated to international standards to attract international investment in the power sector. Implementing modern information tools and establishing know-how are also essential, as is the need to provide management training to enable NEPA personnel to manage the substantial investments required.

IT staff have not kept abreast of state-of-the-art technologies. Moreover, there has been little external technical support, training, etc., for basic IT activities. Extensive training needs to be provided to both technical and management personnel to increase the IT awareness within the company.

3.3.2 Specific Recommendations

A comprehensive IT master plan needs to be put in place to effectively support the restructuring effort. The master plan would ensure that NEPA's potential independent business lines develop their information systems coherently, in synchronization with business strategies and power system operations. It would also link the existing information islands into a functionally integrated and efficient system. The network, hardware, and software would be upgraded systematically, reducing initial capital and maintenance costs.

The IT master plan should become NEPA's roadmap for integrated IS strategies. These strategies should enhance corporate-wide information systems and provide a seamless interface with electric power operation such as load dispatching. The strategies should also ensure successful implementation of computerized enterprise resource management, as well as an IS evolution that is consistent with NEPA's general business objectives and power system operations.

The final IT master plan should comprehensively address IS implementation, development, and evolution issues pertaining to the power industry's new competitive and privatized environment. Master plan activities will include developing an IT strategy, determining a model for resource management, and well-defined plans to overlook the implementation, and deployment and evolution of infrastructure, hardware, and software for utility information systems.

A company-wide IT task force needs to be established immediately. NEPA should appoint a senior staff member (for example, the manager of the IT group) to coordinate and take overall responsibility for the successful implementation of the master plan. The designated person should also form a coordinating committee chaired by senior staff from NEPA to facilitate the implementation. At least one senior staff member from each business line should be accountable for adequate supervision, monitoring, feedback, and counterpart staffing.

The task force would be responsible for:

- Analysis and diagnosis of existing IT systems and resource management programs.

- Reviewing the current IT infrastructure and organization, organizational structure, and any relevant recommendations outlined by previous studies.
- Coordinating meetings with the relevant IT staff at NEPA to further define the needs, requirements, deficiencies, and needed improvements.
- Examining and determining network, facility, and infrastructure upgrade options.
- Developing IT strategies with the help of internationally recognized IT experts.
- Providing an extensive technical training program. The workshops will promote IT as well as providing up-to-date information on emerging information technologies.
- Exploring commercial practices, work tools, relationships between key entities and information flow for:
  - Implementing functional and accounting unbundling of generation, transmission/dispatch, and distribution
  - Business planning for the generation business unit at EVN, and competitive mechanisms for acquiring new supply- and demand-side resources
  - Budget forecasting process—methodology, information flow, responsibilities
  - Tariff setting process using economic principles, including retail tariffs and pricing for unbundled generation, transmission/dispatch and distribution services
  - Software tools for finance, accounting, and investment planning using integrated resource planning principles
  - Regulation of cost and performance for transmission/dispatch and distribution functions
- Assisting NEPA in planning system infrastructure, and acquiring appropriate software.
- Assisting NEPA in implementing a central corporate WAN. A conceptual WAN example is shown in Figure 3-4.

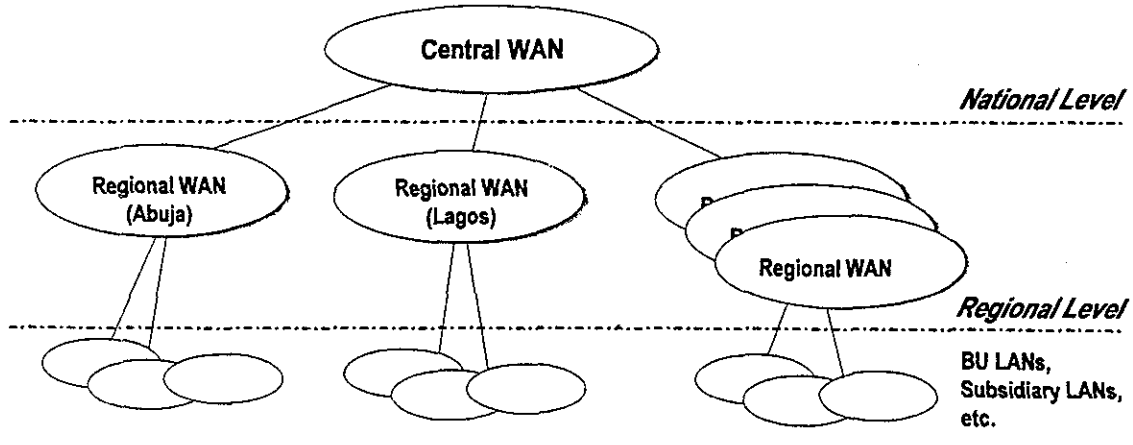


Figure 3-4 Conceptual WAN

51

The central WAN would be located at NEPA's headquarters and would consolidate information from regional networks. Regional networks would be situated respectively in important regional centers Nigeria such as Lagos, Shiroro, etc. Local LANs of large business units, future subsidiaries, would be connected via a connection with the nearest regional WAN. LANs of business units that are far from the regional LAN could be treated as intermediate points on the second level. Consequently, the number of regional WAN port connections would be smaller, and the bandwidth required for connecting regional WANs and business unit LANs simpler.

Table 3-6 summarizes the main tasks involved in implementing the recommended interim IT system. This could be used as the framework for terms of reference for a consulting assignment.

Table 3-6
IT System Implementation

Task Number	Task Description	Scope of Work
1	Produce IT master plan	Develop a master plan to support the restructuring efforts ▪ Develop feasible plans to meet NEPA'sshort-, mid-, and long-term needs for information systems ▪ Outline an implementation structure to interface the critical existing software and hardware with the recommended and new systems ▪ Investigate interface between corporate information systems and technical information systems, such as SCADA at load dispatching centers ▪ Develop system architecture, and design specifications and requirements for the main IS components ▪ Design an online integrated system with relational database management systems that is synchronous and linked with all business units. Ensure data integrity and multilevel accessibility to provide information security ▪ Outline a phase-by-phase implementation for four main areas: network, hardware, software, and staff ▪ Outline major efforts required for the implementation and integration of the recommended hardware and software ▪ Outline the organizational structure for network, hardware, software and system support ▪ Outline the fundamental information systems that will support applications such as resource management planning ▪ Estimate system costs
2	Identify outsourcing opportunities	Identify which IT services could be handled more efficiently or economically by outsourcing. Recommend next steps and estimate outsourcing costs
3	Support the IT task force in system implementation	▪ Plan system infrastructure and acquire appropriate software ▪ Establish a central corporate WAN ▪ Identify databases required ▪ Define databases ▪ Establish data collection and updating systems
4	Staff training	Develop and deliver an IT training program, including periodic workshops and seminars for appropriate IT staff and related management

52

3.4 FINANCIAL MANAGEMENT

3.4.1 Specific Recommendations

The financial management groups—finance and accounting; investment and treasury, and internal audit—service the needs of the entire NEPA organization. However, given the organizational changes recommended in this report, the financial management needs of a reorganized NEPA differ from the old organization, and the structure, responsibilities, and activities of the financial management groups must also change to reflect this.

Our recommendations are focused on realigning the financial management function to the needs of the new organization, while preserving existing systems as much as possible, so as to leverage experience and minimize disruption and costs. New systems are not recommended for the transition period, as any systems implemented now are likely to be replaced after privatization. Our recommendations are to:

- Restructure the organization and responsibilities of finance and accounting, investment and treasury, and internal audit so that they serve the needs of the new NEPA organization (covered under Section 3.2).
- Undertake a process of *cost unbundling*, so that the divisions account for assets, liabilities, and operating costs.
- Develop and implement systems by which *revenues are allocated* to the divisions, so that the profitability of the divisions and operating units can be determined. This is to be implemented in phases, and timing of the phases is dependant on coverage of energy metering within the electricity network.
- Undertake changes to the *budgeting process*, such that scarce resources are allocated to priority areas.

3.4.1.1 Cost Unbundling

Restructuring NEPA into generation, transmission, and distribution divisions, as a precursor to possible privatization, effectively divisionalizes both the operating and management functions of NEPA. In part, effective management of each division will depend on management knowing the division's financial performance. However, the existing accounting system is incapable of providing this information, as evidenced by:

- Operational costs that are aggregated on a company-wide basis, not divisionally.
- Common costs that are accounted for at headquarters.
- Certain assets and liabilities—and their associated income and revenue—that are accounted for on a company-wide basis.

It is therefore necessary to re-engineer the financial accounting system so that costs are accounted for on a divisional—as opposed to a company-wide—basis, thereby allowing production costs for generation, transmission, and distribution to be determined. This re-engineering involves two steps:

- Re-engineering the financial management function, establishing new responsibilities, and introducing new processes; as documented in Section 3.1.2.2.

- Unbundling costs—the process of allocating costs, assets, and liabilities to divisions or operating units.

The ordering and actions to accomplish this are as follows are shown in Table 3-7.

Table 3-7
Financial Accounting System Re-Engineering

Task Order	Task Description	Actions
1	Plan reorganization of F&A, I&T, and IA groups	F&A general manager to set up a committee, comprising either suitably qualified NEPA staff, new recruits, or external consultants, reporting to the general managers of F&A, I&T and IA, and tasked with the following: ▪ Updating policies and procedures to reflect the new organizational structure, responsibilities, and processes ▪ Developing a program to train staff in the changes to the organization, responsibilities, and processes ▪ Determining the date at which the new organization becomes effective ▪ Determining the staffing requirements at headquarters, divisions, and operating units that will discharge the responsibilities and manage processes ▪ Assigning / recruiting staff to headquarters, newly created divisions, and operating units so as to meet the staffing requirements ▪ Developing a reorganization transition plan to manage the transition from the old to new organizations
1	Plan the cost unbundling	F&A general manager to set up a committee, comprising either suitably qualified NEPA staff, new recruits, or external consultants, reporting to the general manager of F&A and tasked with the following: ▪ Determining how costs, assets, and liabilities are to be unbundled (see guidelines in Exhibit 3-2), and what new accounting processes are required ▪ Updating policies and procedures to reflect changes in accounting processes ▪ Developing a program to train staff in the changes to the accounting processes ▪ Determining the date on which new accounting processes becomes effective ▪ Developing a cost unbundling transition plan to manage the transition from the old to new accounting processes
2	Implement the training programs	▪ Implement the reorganization training program ▪ Implement the accounting process training program
3	Implement reorganization	▪ Implement the reorganization transition plan by the predetermined date
4	Implement cost unbundling	▪ Implement the cost unbundling transition plan at the predetermined date

The committee examining the cost unbundling will need to determine how headquarter costs, assets, and liabilities are to be unbundled to the divisions or operating units, and the valuation of the assets and liabilities unbundled. The determination will depend on factors including the type of cost, asset, or liability; whether the cost, asset, or liability is owned at headquarters, division or operating unit; and whether the cost, asset, or liability is accounted for by one entity, but allocated to another entity. Guidelines on the suggested treatment of costs, assets, and liabilities are attached as Exhibit 3-2.

3.4.1.2 Revenue Allocation

Once implemented, the previously outlined process of cost unbundling will allow management of the newly created divisions to determine their service costs. It is also important for divisions to be able to determine their profitability, which requires that revenues attributable to each division be determined beforehand.

However, NEPA's existing accounting system cannot provide the information needed, as revenues accrue only to distribution and, consequently, profitability is impossible to determine other than for NEPA as a whole:

- Non-distribution entities do not accrue any revenue.
- Distribution entities accrue revenue attributable to distribution activities, as well as generation and transmission activities.

It is therefore necessary to implement a system that allocates revenue to each of the divisions. Unfortunately, until there is complete energy metering of the interfaces between generation and transmission, transmission and distribution, and distribution and the customer, implementation of a delivery-based revenue allocation system will have to be done in phases, initially using a method for determining and allocating revenues not based on energy delivered.

Phase 1—Non-Energy Delivery Basis

Phase 1 assumes that energy metering coverage is incomplete. Internal revenues are therefore allocated on a non-energy delivered basis. For example, the basis for computing revenue may be:

- For generation, the energy generated.
- For transmission, the energy generated less an amount for technical losses.
- For distribution, the energy sold to customers, less the determined revenues for generation and transmission.

It is important to note that revenue does not equal cash. For NEPA as a whole, less than half of the electricity generated is paid for by customers. The balance is attributed to technical and non-technical losses. Therefore, for accounts to reconcile, and to determine and allocate revenue to each of the divisions, losses need to determined and allocated as well. Table 3-8 lists the steps to be taken during Phase 1, the processes to be used, and their related action items.

Phase 2 – Energy Delivery Basis

Phase 2 assumes that energy metering coverage is complete. Internal revenues can therefore be delivered on an energy delivered basis.

When a comprehensive system of energy meters has been installed, Phase 2 can be implemented. In Phase 2, energy is computed on the basis of energy sold:

- For generation, the energy delivered to the transmission network.
- For transmission, the energy delivered to the distribution network.
- For distribution, the energy delivered to customers.

It will be necessary to establish energy tariff rates to compute revenue from energy delivered. Table 3-9 lists the steps to be taken during Phase 2, the processes to be used, and their related action items.

Table 3-8
Phase 1—Non-Energy Delivery Basis

Step	Process	Action
1	Creation of a revenue allocation group	F&A general manager to set up a committee reporting to him, comprising either suitably qualified NEPA staff, new recruits, or external consultants, and tasked with: ▪ Determining how revenues and losses are to be allocated to each of the divisions under Phase 1. ▪ Developing policies and procedures to manage the revenue allocation process under Phase 1. ▪ Determining the staffing requirements to discharge the responsibilities and manage the processes. ▪ Assigning / recruiting staff to meet the staffing requirements. ▪ Developing a program to train staff in the revenue allocation process under Phase 1. ▪ Implementing the training program.
2	F&A revenue allocation group to determine the revenue for NEPA, on a monthly basis	Revenues for NEPA to be determined in accordance with Phase 1 policy and procedures.
3	Revenues and losses for each of the divisions to be determined by the F&A revenue allocation group on a monthly basis, so that net revenues (i.e., revenues less losses) is equal to the revenue as computed in step 2 for NEPA as a whole	Revenues and losses for the divisions to be determined in accordance with Phase 1 policy and procedures.
4	Revenues and losses transferred to divisions by inter-group debit / credit note	Revenues and losses to be transferred to divisions in accordance with phase 1 policy and procedures

56

Table 3-9
Phase 2—Energy Delivery Basis

Step	Process	Action
1	Re-engineer the revenue allocation group from Phase 1 to Phase 2	F&A general manager to set up a committee reporting to him, consisting of either suitably qualified NEPA staff, new recruits, or external consultants, and tasked with: ▪ Determining how revenues and losses are to be allocated to each of the divisions under Phase 2. ▪ Developing policies and procedures to manage the revenue allocation process under Phase 2. ▪ Determining the staffing requirements to discharge the responsibilities and manage the processes. ▪ Assigning / recruiting staff to meet the staffing requirements. ▪ Developing a program to train the staff in the revenue allocation process under Phase 2. ▪ Developing a transition plan to manage the transition from Phase 1 to Phase 2. ▪ Implementing the training program.
2	F&A revenue allocation group to determine the revenue for NEPA, on a monthly basis	Revenues for NEPA to be determined in accordance with Phase 2 policy and procedures.
3	Revenues and losses for each of the divisions to be determined by the F&A revenue allocation group on a monthly basis, such that net revenues (i.e., revenues less losses) is equal to the revenue as computed in step 2 for NEPA as a whole	Revenues and losses for the divisions to be determined in accordance with Phase 2 policy and procedures.
4	Revenues and losses transferred to divisions by inter-group debit / credit note	Revenues and losses to be transferred to divisions in accordance with Phase 2 policy and procedures.

It will be necessary to establish energy tariff rates to compute revenue from energy delivered. Table 3-9 lists the steps to be taken during Phase 2, the processes to be used, and their related action items.

Table 3-8
Phase 1—Non-Energy Delivery Basis

Step	Process	Action
1	Creation of a revenue allocation group	F&A general manager to set up a committee reporting to him, comprising either suitably qualified NEPA staff, new recruits, or external consultants, and tasked with: ▪ Determining how revenues and losses are to be allocated to each of the divisions under Phase 1. ▪ Developing policies and procedures to manage the revenue allocation process under Phase 1. ▪ Determining the staffing requirements to discharge the responsibilities and manage the processes. ▪ Assigning / recruiting staff to meet the staffing requirements. ▪ Developing a program to train staff in the revenue allocation process under Phase 1. ▪ Implementing the training program.
2	F&A revenue allocation group to determine the revenue for NEPA, on a monthly basis	Revenues for NEPA to be determined in accordance with Phase 1 policy and procedures.
3	Revenues and losses for each of the divisions to be determined by the F&A revenue allocation group on a monthly basis, so that net revenues (i.e., revenues less losses) is equal to the revenue as computed in step 2 for NEPA as a whole	Revenues and losses for the divisions to be determined in accordance with Phase 1 policy and procedures.
4	Revenues and losses transferred to divisions by inter-group debit / credit note	Revenues and losses to be transferred to divisions in accordance with phase 1 policy and procedures

Table 3-9
Phase 2—Energy Delivery Basis

Step	Process	Action
1	Re-engineer the revenue allocation group from Phase 1 to Phase 2	F&A general manager to set up a committee reporting to him, consisting of either suitably qualified NEPA staff, new recruits, or external consultants, and tasked with: ▪ Determining how revenues and losses are to be allocated to each of the divisions under Phase 2. ▪ Developing policies and procedures to manage the revenue allocation process under Phase 2. ▪ Determining the staffing requirements to discharge the responsibilities and manage the processes. ▪ Assigning / recruiting staff to meet the staffing requirements. ▪ Developing a program to train the staff in the revenue allocation process under Phase 2. ▪ Developing a transition plan to manage the transition from Phase 1 to Phase 2. ▪ Implementing the training program.
2	F&A revenue allocation group to determine the revenue for NEPA, on a monthly basis	Revenues for NEPA to be determined in accordance with Phase 2 policy and procedures.
3	Revenues and losses for each of the divisions to be determined by the F&A revenue allocation group on a monthly basis, such that net revenues (i.e., revenues less losses) is equal to the revenue as computed in step 2 for NEPA as a whole	Revenues and losses for the divisions to be determined in accordance with Phase 2 policy and procedures.
4	Revenues and losses transferred to divisions by inter-group debit / credit note	Revenues and losses to be transferred to divisions in accordance with Phase 2 policy and procedures.

3.4.1.3 *Budgeting*

For there to be effective management of NEPA's operations—by headquarters management for the company as a whole, by divisional management for generation, transmission and distribution, and by operating unit management for each operating unit—reliable, controlled, and monitored operating and capital budgeting systems must be in place.

However, as currently implemented, there are weaknesses in NEPA's budgeting systems, leading to suboptimal budgetary allocations as identified in Table 3-10.

Table 3-10
Weaknesses and Effects of Current Budgetary Process

Weakness	Effect
Lack of standardized approach to budgeting.	Inconsistencies in the preparation of budgets between operating units.
Bottom-up approach to budgeting.	Lack of coordination between the functional groups (i.e., generation, transmission and distribution)
Lack of a standardized approach in evaluating proposed capital projects.	Approval of inappropriate capital projects.
Unrealistic and / or poorly forecast budgets.	Inadequate funding when budgets are not met.
Weak budgetary control.	Inadequate funding as a result of unauthorized overspending.

It is not intended to recommend implementation of a new budgeting system in the transition period, as new budgeting systems are likely to be implemented following privatization. Instead, the recommendations focus on addressing the non-system problems that give rise to the weaknesses within the system, as follows:

- Improving the standardization of the budget determination process.
- Improving the coordination of the budget determination process.
- Improving the allocation of budgets.

It is therefore necessary to re-engineer these recommendations into the existing budgetary processes:

- While it is envisaged that the budget determination process will essentially remain unchanged—with budgets being prepared by operating units based on existing policies and procedures—the process will be brought in line with the new organizational structure being recommended, and budgets consolidated by both divisions and headquarters.
- Headquarters finance and accounting will be responsible for coordinating the budget determination phase, so that divisional budgets are consistent.
- A newly created group, the corporate planning budget allocation group, is to be responsible for allocating the completed budget between divisions and operating units, based on the priorities of the organization.

To this end it is recommended that the finance and accounting general manager set up a budget committee that reports to him, comprising either suitably qualified NEPA staff, new recruits, or external consultants, with the task assignments outlined in Table 3-11.

Table 3-11
Budget Committee Tasks

Task order	Task Description	Actions
1	Develop a methodology to standardize the determination of the budgets.	▪ The budget committee needs to determine by whom and how the: – Operating and capital budgets are to be prepared – Operating and capital budgets are to be modified – Operating and capital budgets are to be approved ▪ The budget committee needs to develop a set of policies and procedures from the above. ▪ The budget committee needs to distribute the policies and procedures to all parties involved with the budget determination process.
2	Develop a methodology to coordinate the budget determination process.	▪ The budget committee needs to develop a process to coordinate the budget determination process so that budgets are consistent throughout the organization. ▪ The budget committee needs to develop a set of policies and procedures based on the coordinated budget determination process. ▪ The budget committee needs to distribute the policies and procedures to all parties involved with the budget determination process.
3	Develop a methodology to allocate the budgets.	▪ The budget committee needs to develop a process to allocate the determined budgets to divisions and operating centers based on the priorities of the organization. ▪ The budget committee needs to develop a set of allocation policies and procedures.
4	Create a budget allocation group in headquarters corporate planning.	The budget committee needs to: ▪ Determine staffing requirements for the budget allocation group that will discharge the responsibilities and manage the processes. ▪ Assign / recruit staff to the budget allocation group, to meet the staffing requirement. ▪ Develop a program to train staff in policies and procedures, responsibilities, and processes.
5	Implement the training programs.	Implement the budget training program.

3.4.2 Potential Impacts

Our recommendations involve rethinking the financial management function that will be needed to serve the needs of a newly restructured NEPA. These recommendations change the focus of the financial management function to a divisional level, rather than a company level. Once the recommendations are implemented, costs and revenues—which previously could only be accounted for on a company basis—will be accounted for at the divisional and operating unit level. Divisional profitability—which cannot be accurately assessed today—will be calculated and used by the management of the new divisions to run their business, and by shareholders to hold management responsible for performance.

3.5 FUNCTIONAL UNBUNDLING

3.5.1 Introduction

Unbundling is the essential first step towards decentralization, restructuring, and privatization, and some of the important decisions in this regard have already been taken. But in embarking on this path, the restructuring objectives must be realistic and achievable. It will also be important to ensure that any initiatives started in the transition period do not create new barriers to power sector restructuring.

Clearly, one of the primary objectives of unbundling a vertically integrated national power utility is to push accountability down to functional divisions. However, in NEPA, accountability will not be achieved until existing divisions start to operate as individual profit/cost centers. Before this is possible, a major program is required to allocate assets, liabilities, costs, revenues, staff, budgets, and responsibilities between profit centers. And systems are required to measure and pay for transactions between the profit centers. In addition, a number of legislative steps are required to support the unbundling process. Financial management measures in support of unbundling are discussed in Section 3.4.

3.5.2 Staffing of Unbundled Business Units

As of March 17, 2000, NEPA's total staff was 37,583, as shown in Figure 3-5. In addition, 42% are junior staff, 50% senior staff, 6% middle management, and 2% senior management. Figure 3-6 demonstrates that 70% of the staff is currently employed in distribution and marketing and 21% in generation and transmission.

Figure 3-7 illustrates the probable employee split that will result if current personnel are allocated to the four major cost centers after unbundling. This calculation is based roughly on the work employees are doing at present. It can be seen that 1% will be at the corporate level reporting to the managing director, 15% will be in generation, 9% in transmission and 75% in distribution. As a result of this exercise, several general conclusions can be reached:

- It is apparent that current NEPA staffing levels are high and that, on average, staff productivity is low.
- In particular, the distribution function is highly overstaffed relative to its productivity.
- The numbers and capabilities of employees in transmission appear to be better aligned.
- There is a high proportion of relatively unskilled staff.
- There is a shortage of experienced professionals, management planners, and skilled tradespeople.
- The unbundling and restructuring process creates an opportunity to begin correcting some of these staffing concerns.
- The issue to be addressed: how much—and where—to improve before privatization?

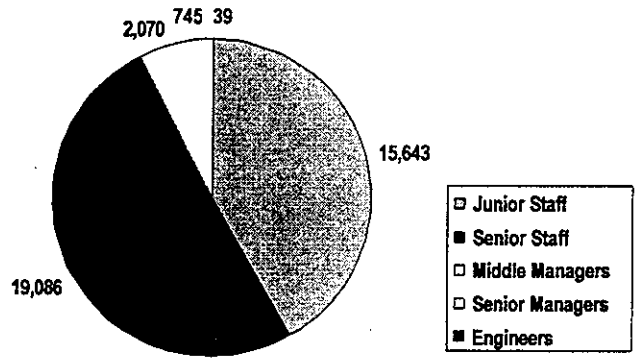


Figure 3-5 Current Distribution of Staff in NEPA by Category

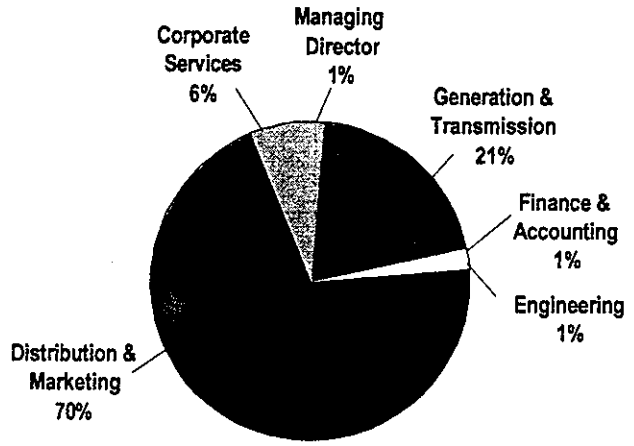


Figure 3-6 Current Staff Allocation in NEPA by Sector

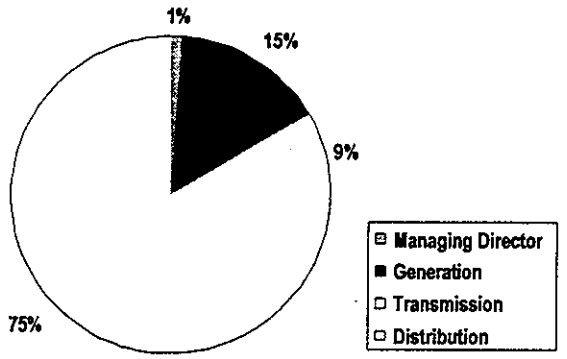


Figure 3-7 Unmodified Staff Allocation Following Restructuring

It is apparent that an independent study of staffing requirements following unbundling could be of considerable assistance to the restructuring process. Items to be covered could include those outlined in Table 3-12.

Table 3-12
Staffing Requirements Study

Task Number	Task Description	Scope of Work
1	Analysis of current staffing.	▪ Summarize staffing by department/plant/district, numbers, age distribution, education, skill levels, categories/grades. ▪ Recommend the requirements for developing an appropriate employee database. ▪ Identify areas of overstaffing and weakness.
2	Development of staffing indices and comparison with other utilities.	▪ Develop a series of staff ratios for NEPA, such as generating plant staff/MW and distribution and marketing staff/customer. ▪ Calculate the indices for the various departments, generating plants and districts served. ▪ Conduct benchmarking with comparable and successful utilities in major developing countries. ▪ Discuss barriers to improvement. ▪ Set realistic and achievable targets for the future. ▪ Identify requirements for achieving those targets.
3	Analysis of outsourcing opportunities.	▪ Identify activities that could be conducted more economically and efficiently by outsourcing. ▪ Calculate the costs and benefits of outsourcing. ▪ Identify barriers to outsourcing and make recommendations on implementation.
4	Recommend post-unbundling staffing levels.	▪ Recommend post-unbundling staffing levels and skill requirements— based on the analysis of current staffing in Task 1, and taking into account the proposed organizational structure changes due to unbundling, and the output of Tasks 2 and 3. ▪ Identify staffing change implications by comparing the above item to a simple transfer of current staffing to the new structure, and discuss the barriers to change. ▪ Recommend which changes should be implemented during the transition period and which should be left to the new owners after privatization.
5	Transition staffing plan.	▪ Develop a plan for making the transition from current staffing to the recommended post-unbundling staffing.

If desired, this study could easily be combined with the recommended introduction of the NEPA-wide job descriptions, which might otherwise have to be coordinated in-house by the corporate planning and strategy group in cooperation with human resources.

3.5.3 Specific Recommendations

- Establish a task force or committee, with responsibility for implementing the NEPA unbundling process. This could be assigned to the executive committee or to a separate group led by the managing director.

64

- Implement the action plan proposal to divide NEPA initially into three main functional divisions—generation, transmission, and distribution. Further unbundling will be possible later as a precursor to privatization.
- Commission the independent study of staffing requirements outlined in Table 3-12, and consider whether to combine it with the introduction of job descriptions.
- Ensure that each of the three functional divisions is represented on the NEPA board. During the transition phase the three functional divisions should not have independent boards of their own, as this might become a barrier to subsequent unbundling or privatization.
- Transform each entity into a separate profit center, with the necessary accounting, budget, and transaction support systems.
- Phase-in payment for power delivered from generation to transmission and from transmission to distribution in a series of steps:
  - Initially, a central budget allocation and funds transfer process will continue in place
  - The goal will be to move to a regulated single buyer national grid operator. Under this model, power flows will be measured and payment made on the basis of previously agreed terms
  - In the long-term, post-privatization, there might be a shift to a competitive power pool if desired

3.5.4 Potential Impacts

- Division of NEPA into more manageable and marketable components
- Creation of rational cost and profit centers
- Increased accountability and authority for the line organization
- Identification of opportunities to improve staffing levels and skills
- Commercialization of NEPA
- Improved power system reliability
- Improved customer service
- Increased ability to finance system expansion
- Identification of explicit subsidy requirements
- Revenues from privatization sales

3.6 HUMAN RESOURCE DEVELOPMENT

3.6.1 Introduction

There is limited empowerment of individuals to match their responsibilities, partly as a result of a concern over corruption. Even more seriously, there is a general lack of individual discipline and accountability within NEPA, primarily because there are no clear job descriptions. Employee productivity is generally low and there are few consequences or

incentives for employees to improve their performance. These problems are compounded by widespread overstaffing.

At the same time, it must be recognized that employees are extremely sensitive to any initiatives that may affect the scope and security of their jobs. There will be a number of sociopolitical issues related to restructuring, and the likely results of any proposed changes must be carefully considered in advance before being initiated.

While overstaffing is a serious problem, steps will be needed to attract and retain experienced staff. In some areas, younger employees are not being developed at a sufficient rate to replace future retirees and departing staff. There is no formalized manpower development plan or performance evaluation and training plan.

3.6.2 Specific Recommendations

- Detailed job descriptions should be developed by the senior management of each division, for all levels, with clear specification of authority, responsibilities, and with agreed, achievable, and measurable performance targets. Consistency is required for similar areas.
- Individual performance relative to targets can then be monitored and appropriate measures taken for underperformance.
- An employee database of age cohorts, location, current responsibility, education, skills, and experience is required to support the development of training programs and staff rationalization.
- The transition phase provides a unique opportunity to assess and possibly correct some of the problems of the past, one of which is over-staffing. A complete and independent review of staffing needs should be commissioned.
- An employee relations plan is required for strategies related to staff levels and labor unions.
- Training is required to change staff attitudes to a commercial viewpoint with a market-driven awareness and customer service perspective.
- Care must be taken to ensure that sufficient experienced staff are retained to compensate for retirement, attrition, and diversion to the private sector.

3.6.3 Potential Impacts

- Improved productivity
- Improved ratio of revenues to staff costs
- Improved staff motivation and morale
- Improved customer service
- Reduced corruption

3.7 IMPROVED MANAGEMENT AND DECISION-MAKING

3.7.1 Introduction

Authority in NEPA is concentrated at the top and most decisions have to be referred up through the hierarchy and down again for implementation. Such bureaucratic procedures are time-consuming and frustrating. Individual authority and accountability is minimal and, as a result, initiative is stifled.

Managerial excellence is difficult to achieve when so many of the essentials are lacking. As has already been pointed out in Section 3.3, managers seldom have timely, complete, or reliable information, and there is a general lack of clear performance targets. Supporting IT systems, hardware, and software are also minimal. Management problems are compounded by the fact that communications between managers and staff are often ineffective, and in many areas individual management skills need strengthening. It is also apparent NEPA lacks a commercial perspective and that increased sensitivity to customer service is essential at all levels.

It is not possible to change the management culture of an enterprise the size of NEPA overnight. However, there are a number of steps that can be taken to overcome the inertia of the existing corporate culture, and to start moving towards more productive management.

3.7.2 Specific Recommendations

- Flatten the hierarchy by pushing more responsibility and decision-making powers to lower levels, but match this with appropriate authority and performance targets and monitoring.
- Provide managers with timely and reliable current information as a basis for decision-making.
- Move to selective computer-based data systems which can be adapted later to new structures as fast as budget and IT constraints allow.
- Provide customer service and commercial orientation seminars, and encourage teamwork and customer-focused initiatives through periodic staff meetings to discuss issues.
- Encourage openness and the dissemination of information and ideas.
- Clarify responsibilities through clear objectives, strategies and job descriptions.
- Provide management training as required.
- Reduce over-reliance on committees.

3.7.3 Potential Impacts

- Faster response times to crises and queries
- More effective programs
- Higher employee motivation and productivity
- Less waste and inefficiency

Exhibit 3-1
Corporate-level Functions and Responsibilities

Function	Lead Responsibility	Inputs
Internal Audit	IA, corporate level	▪ Divisional IA staff support ▪ Accounts from operating units
External Audit	Board of Directors	▪ Divisional IA staff support ▪ Accounts from operating units
Legal services	Legal, corporate level	Divisional legal staff support
Strategic Planning	Corporate Planning and Strategy (CP&S)	All CP&S staff
Production of the Corporate Business Plan	CP&S	Participation of all Divisions and operating units
Tariff analysis and design	CP&S	▪ F&A revenue requirements ▪ DISCO collections projections ▪ CP&S financial model simulations for NEPA
Financial analysis and planning, including financial modeling	CP&S	▪ F&A data ▪ Possible consulting support in model development and simulation
System Planning	CP&S	Generation, Transmission and Distribution plans and cost estimates
Project impact analyses	Division responsible for implementing the project or CP&S	Division responsible for implementing the project to provide cost and revenue projections
Implementation of the Action Plan	▪ Managing Director, or ▪ Executive Committee or ▪ CP&S	Interim Board's Action Plan Nexant report on Improving the Management of NEPA
Budget, revenues, and funds allocation to the line organization based on corporate-wide objectives and priorities	▪ CP&S or ▪ Finance & Accounting	▪ F&A estimates of bottom-up budget request aggregations ▪ Divisional forecasts of revenues and funds collected ▪ CP&S tariff projections and the results of the financial model simulations
Management Information System design and implementation	CP&S group chairing an MIS Taskforce	▪ Involvement of entire line organization in setting performance targets and monitoring and reporting actual performance ▪ Possible consulting inputs on key performance indicators, benchmarking, performance target setting, and the monitoring and reporting system
Other special projects	CP&S group	As required
Finance and Accounting	F&A	Accounts from operating units
Financial reports and annual reports	F&A	Accounts from operating units
Long-term corporate financial modeling and planning	▪ CP&S or ▪ F&A	Development of a basic corporate financial model

Function	Lead Responsibility	Inputs
Financing plan and debt service	▪ I&T or ▪ CP&S	▪ Simulation results of the NEPA Financial Model based on the System Development Plan, economic and financial forecasts, load forecasts ▪ Directives from the Ministry of Finance
Pension funds	F&A	Recommendations of auditors
NEPA unbundling	▪ Managing Director, or ▪ Executive Committee	▪ Implementation of the organizational recommendations from the Board and Nexant ▪ Allocation by F&A of assets and liabilities to the new cost centers, and development of the new accounting systems ▪ Recommended allocation of staff by HR and CP&S
Budget Committee and budget system rationalization	F&A	Line organization representatives on the committee
Office buildings, housing, schooling, health services, etc.	Corporate Services	From Corporate Services the pros and cons of outsourcing for each function or service
Rationalization of stores and warehousing	▪ Corporate Services or ▪ CP&S	Analysis of recommended degree of decentralization of stores and warehouse services
Human resource development plan	Human Resources	Line organization participation
Corporate-wide job descriptions	CP&S	▪ CP&S should develop the format and coordinate the participation of the entire NEPA management ▪ Consultants can help to expedite the process if required
IT system strengthening	▪ Corporate Services or ▪ CP&S	Consulting assistance will probably be required to design and implement the new system
Rural Electrification planning and funding	▪ Each of the DISCOs or ▪ CP&S	Economic and financial analysis of each RE project to identify the required subsidy before construction can proceed
Negotiations with IPPs	▪ Transco or ▪ CP&S	Results of Model simulations and tariff analyses by CP&S Co-ordination with government
Negotiations with fuel suppliers	Generation Division	▪ Operational requirements of the GENCO and dispatch plans of the TRANSCO ▪ Coordination with government
Liaison with government and financiers	CP&S	As required

Exhibit 3-2
Guidelines on the Suggested Unbundling Allocation of Costs, Assets, and Liabilities

Operating Costs

Type of cost, asset or liability	Accounted b (Current)	ccounted by (Proposed)	Process	Action
Operating Costs at self-accounting outstations	Self-accounting outstations	Operating units*	▪ Operating units to submit trial balance to their division (i.e. generator to Genco) ▪ Divisions to consolidate their operating units trial balances ▪ HQ to consolidate the divisions consolidated trial balances	▪ Divisional accounting groups to be formed under the reorganization ▪ Operating units to be assigned to divisions during the reorganization ▪ Divisional F&A to determine a timetable for trial balance submissions to divisional F&A ▪ Headquarters (HQ) F&A to determine timetable for consolidated trial balance submission to HQ F&A ▪ Operating units submit trial balances to divisional F&A in line reporting schedule ▪ Divisions consolidate operating unit trial balances together with divisional trial balance ▪ Divisions submit consolidated trial balance to HQ F&A in line with reporting schedule

* Note that operating unit in this context is the name given to self-accounting outstations in the restructured organization.

Headquarters Costs

Type of cost, asset or liability	Accounted b (Current)	ccounted by (Proposed)	Process	Action
Headquarter operating costs	F&A HQ	No change	▪ Computation of headquarter costs to be allocated to each division to be based on pre-determined allocation methodology ▪ Costs transferred to divisions by inter-group debit / credit note	▪ Cost unbundling committee to determine which of the costs incurred by HQ relate to operating the HQ function ▪ Cost unbundling committee to determine whether these costs are to be allocated to the divisions either in total, or separately by cost item ▪ Cost unbundling committee to determine the basis of the allocation methodology / methodologies for allocating the headquarter costs to each of the divisions ▪ HQ F&A (on a monthly or other basis determined by the cost unbundling committee), from the HQ trial balance, to determine and compute the costs to be allocated to the divisions ▪ HQ F&A to transfer the computed costs to each of the divisions (on a monthly or other basis determined by the cost unbundling committee), by inter-group debit / credit note
NEPA common costs accounted by HQ	F&A HQ	No change	▪ Computation of common costs to be allocated to each division to be based on pre-determined	▪ Cost unbundling committee to determine which of the costs incurred by HQ relate to operating the NEPA organization ▪ Cost unbundling committee to determine whether these costs are to be allocated to the divisions either in total; or separately by cost

10

Exhibit 3-2
Guidelines on the Suggested Unbundling Allocation of Costs, Assets, and Liabilities

Operating Costs

Type of cost, asset or liability	Accounted b (Current)	ccounted by (Proposed)	Process	Action
Operating Costs at self-accounting outstations	Self-accounting outstations	Operating units*	▪ Operating units to submit trial balance to their division (i.e. generator to Genco) ▪ Divisions to consolidate their operating units trial balances ▪ HQ to consolidate the divisions consolidated trial balances	▪ Divisional accounting groups to be formed under the reorganization ▪ Operating units to be assigned to divisions during the reorganization ▪ Divisional F&A to determine a timetable for trial balance submissions to divisional F&A ▪ Headquarters (HQ) F&A to determine timetable for consolidated trial balance submission to HQ F&A ▪ Operating units submit trial balances to divisional F&A in line reporting schedule ▪ Divisions consolidate operating unit trial balances together with divisional trial balance ▪ Divisions submit consolidated trial balance to HQ F&A in line with reporting schedule

* Note that operating unit in this context is the name given to self-accounting outstations in the restructured organization.

Headquarters Costs

Type of cost, asset or liability	Accounted b (Current)	ccounted by (Proposed)	Process	Action
Headquarter operating costs	F&A HQ	No change	▪ Computation of headquarter costs to be allocated to each division to be based on pre-determined allocation methodology ▪ Costs transferred to divisions by inter-group debit / credit note	▪ Cost unbundling committee to determine which of the costs incurred by HQ relate to operating the HQ function ▪ Cost unbundling committee to determine whether these costs are to be allocated to the divisions either in total, or separately by cost item ▪ Cost unbundling committee to determine the basis of the allocation methodology / methodologies for allocating the headquarter costs to each of the divisions ▪ HQ F&A (on a monthly or other basis determined by the cost unbundling committee), from the HQ trial balance, to determine and compute the costs to be allocated to the divisions ▪ HQ F&A to transfer the computed costs to each of the divisions (on a monthly or other basis determined by the cost unbundling committee), by inter-group debit / credit note
NEPA common costs accounted by HQ	F&A HQ	No change	▪ Computation of common costs to be allocated to each division to be based on pre-determined	▪ Cost unbundling committee to determine which of the costs incurred by HQ relate to operating the NEPA organization ▪ Cost unbundling committee to determine whether these costs are to be allocated to the divisions either in total; or separately by cost

11

Type of cost, asset or liability	Accounted b (Current)	ccounted by (Proposed)	Process	Action
			allocation methodology ▪ Costs transferred to divisions by inter-inter debit / credit note	item ▪ Cost unbundling committee to determine the basis of the allocation methodology / methodologies for allocating the NEPA operating costs to each of the divisions ▪ HQ F&A (on a monthly or other basis determined by the cost unbundling committee), from the HQ trial balance, to determine and compute the costs to be allocated to the divisions ▪ HQ F&A to transfer the computed costs to each of the divisions (on a monthly or other basis determined by the cost unbundling committee), by inter-group debit / credit note
Division or self-accounting outstation costs accounted for by HQ	F&A HQ	F&A HQ, division or operating unit	If it has been pre-determined that the division or operating unit costs should be accounted for at HQ, then: ▪ Accounting of cost undertaken by F&A, HQ ▪ Costs transferred to division or operating unit by inter-group debit / credit note If it has been pre-determined that the division or operating unit costs should be accounted for at the division or operating unit, then: ▪ Division or operating unit accounts for the cost within its trial balance	▪ Cost unbundling committee to determine which of the costs incurred by HQ relate to identifiable divisions or operating units ▪ Cost unbundling committee to determine whether these identifiable costs are to continue to be accounted for at HQ; or whether ownership is to be transferred to the division or operating unit ▪ If cost is to be accounted for at HQ, then HQ F&A (on a monthly or other basis determined by the cost unbundling committee), from the HQ trial balance, determine and compute the costs to be transferred by inter-group debit / credit note to the division or operating unit ▪ If cost is to be accounted for at division or operating unit, responsibility is to be transferred to the division or operating unit, who account for the cost within the division's or operating unit's trial balance

Fixed Assets

Type of cost, asset or liability	Accounted b (Current)	ıccounted by (Proposed)	Process	Action
Fixed Assets	F&A HQ	F&A HQ, divisions or operating units	▪ Fixed asset cost; accumulated depreciation and depreciation to be accounted for within the owning entities trial balance	▪ Fixed assets will warrant special attention from the cost unbundling committee as: ▪ All NEPA's fixed assets are accounted for within the HQ' trial balance ▪ The fixed assets cannot easily be identified to specific operating units ▪ As a result of the inflation, the net book value of the fixed assets is understated compared with either net realizable value or replacement cost ▪ The cost unbundling committee should decide on a methodological basis to allocate NEPA's fixed assets to HQ, divisions, or operating units. There are two alternatives: ▪ NEPA could hire a professional qualified valuation firm to appraise all of it's physical assets, on a site by site basis, from which asset registers for HQ, divisions and operating units could be compiled. The valuation firm should also conclude on the expected remaining life of the assets valued ▪ NEPA could allocate the fixed assets on the HQ fixed asset register to new fixed asset registers for HQ, divisions, and operating units. The cost unbundling committee will need also to decide whether to revalue these assets ▪ The fixed assets and accumulated depreciation separately identifiable to divisions or operating units should then be transferred by inter-group debit / credit note to the division or operating unit, to be accounted for within that division or operating unit's trial balance
Stock	Outstation	No change	▪ As currently operates	
Other Assets	F&A HQ, outstations	F&A HQ, divisions, operating units	If the asset should continue to be accounted for by HQ, the asset is to be accounted for by F&A, HQ, within the HQ' trial balance If the asset should be accounted for by the division or operating unit, the asset is to be accounted for by the division or operating unit, within the division's or operating unit's trial balance	▪ Cost unbundling committee to determine whether the assets accounted for at HQ are separately identifiable to HQ, or can be separately identified to a division or an outstation. ▪ If the assets are identifiable to HQ, then HQ should continue to account for the asset within the HQ trial balance ▪ If the assets can be separately identifiable to a division or an operating unit, then the asset should be transferred to the division or operating unit, at a valuation to be decided on by the cost unbundling committee, by inter-group debit / credit note. The division or operating unit will then account for the asset within that divisions' or operating units' trial balance

13

Liabilities

Type of cost, asset or liability	Accounted b (Current)	ccounted by (Proposed)	Process	Action
Trade Creditors	F&A HQ; self-accounting outstations	No change	▪ As currently operates	
Loans	I&T HQ	I&T HQ, divisions, operating units	Loans attributable to a division or operating unit: ▪ Loan serviced by I&T, HQ ▪ Loan accounted for by F&A, HQ, within HQ trial balance ▪ Costs transferred to division or operating unit by inter-company debit / credit note Loans not attributable to a division or operating unit: ▪ Loan serviced by I&T, HQ ▪ Loan accounted for by F&A, HQ, with in HQ trial balance	Cost unbundling committee should undertake a review of NEPA's loan book, to determine whether loans are separately identified to a division or an operating unit, or whether the loan is attributable to NEPA in whole. If the loan is separately identifiable to a division or outstation, then: ▪ HQ I&T should continue to service the loan ▪ HQ F&A should continue to account for the loan within the HQ trial balance ▪ The cost of the loan i.e. interest payments should be transferred by inter-group credit / debit note to the identified division or operating unit If the loan is not separately identifiable to a division or outstation, then: ▪ HQ I&T should continue to service the loan ▪ HQ F&A should continue to account for the loan within the HQ trial balance
Pension	F&A	F&A		Cost unbundling committee to: ▪ Identify all the pension issues as a consequence of the functional unbundling ▪ Mitigate the identified pension issues
Other Liabilities	HQ and self-accounting outstations	HQ, divisions, operating units	If the liability should be accounted for by HQ, the liability is to be accounted for by F&A, HQ, within the HQ' trial balance If the liability should be accounted for by the division or operating unit, the liability is to be accounted for by the division or operating unit, within the division's or operating unit's trial balance	▪ Cost unbundling committee to determine whether the liabilities accounted for at HQ are separately identifiable to HQ, or can be separately identified to a division or an operating unit. ▪ If the liabilities are identifiable to HQ, then HQ should continue to account for the liability within the HQ trial balance ▪ If the liabilities can be separately identifiable to a division or an operating unit, then the liability should be transferred to the division or operating unit, at a valuation to be decided on by the cost unbundling committee, by inter-group debit / credit note. The division or operating unit will then account for the asset within that division's or operating unit's trial balance

14

Section 4
Improving Revenue Generation

Section 4
Improving Revenue Generation

4.1 INTRODUCTION

This section of the report focuses on improving NEPA's revenue generation, building on the specific initiatives outlined in the interim report, together with other items specifically requested by the NEPA board at the interim report presentation in May. These initiatives directly impact the ability of the distribution and marketing division to improve its cash flow.

The distribution and marketing division is the principal revenue generator within NEPA, deriving its income from the sale of electricity. The amount of income generated is directly related to the volume of energy generated and distributed to registered customers. Once energy has been delivered, the amount of revenue generated is a factor of the accuracy of the usage recording, billing, and collecting processes. Our review suggests that there are significant "revenue leakage" weaknesses throughout this supply chain, as illustrated in Figure 4-1. Recommended solutions to the most urgent of these weaknesses are discussed in the following sections:

- Pilot collection improvement program and credit vetting procedures
- Large debtor improvement task force
- Solid-state metering
- The use of distribution control centers
- Equipment standards

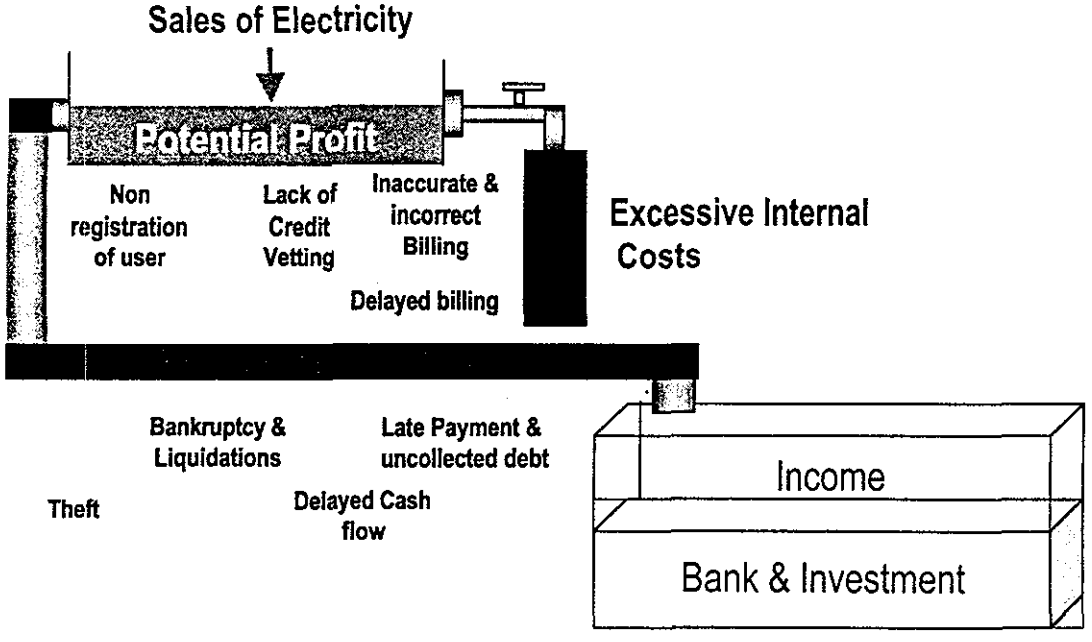


Figure 4-1 Sources of Revenue Leakage

16

4.2 PILOT COLLECTION IMPROVEMENT PROGRAM AND CREDIT VETTING PROCEDURES

4.2.1 Introduction

Electricity debt is not considered by large sectors of the Nigerian population to be "personal" debt. This perception must be changed to obtain any significant and lasting improvement. Such changes can be accomplished by measures such as publicity campaigns, a concerted effort by the various levels of government to pay their own electricity debts promptly, and by positive and consistent collection action from within NEPA.

Studies have shown that the cost of collection increases significantly with the length of time the debt has been outstanding (Figure 4-2). Simultaneously, the process of collection increases in difficulty with the length of time the debt has been outstanding, as shown in Figure 4-3. Therefore, the aim must be to get bills in the customer's hands as promptly as possible and to elicit payment within a few days of the bill receipt. A clear and workable collection policy is needed, the elements of which include:

- Establishing and maintaining a habit of prompt payment.
- Establishing an integrated workflow process for billing and debt management.
- Implementing a computerized collection program for federal, state, and business customers. Consideration should be given to the acquisition and introduction of such a system, to be integrated with the billing database to provide a range of tailored debt-tracking processes, both manual and automated. Such a system would provide accurate and up-to-date analyses of debts and payment profiles, together with comprehensive management information reports. Figure 4-4 illustrates the overall billing and collection process for a modern utility.
- Engaging an experienced and qualified revenue collection consultant, hired directly by the NEPA board, to develop the collection program over a period of 3 to 4 months. The consultant's scope of work is outlined in Section 4.2.2.

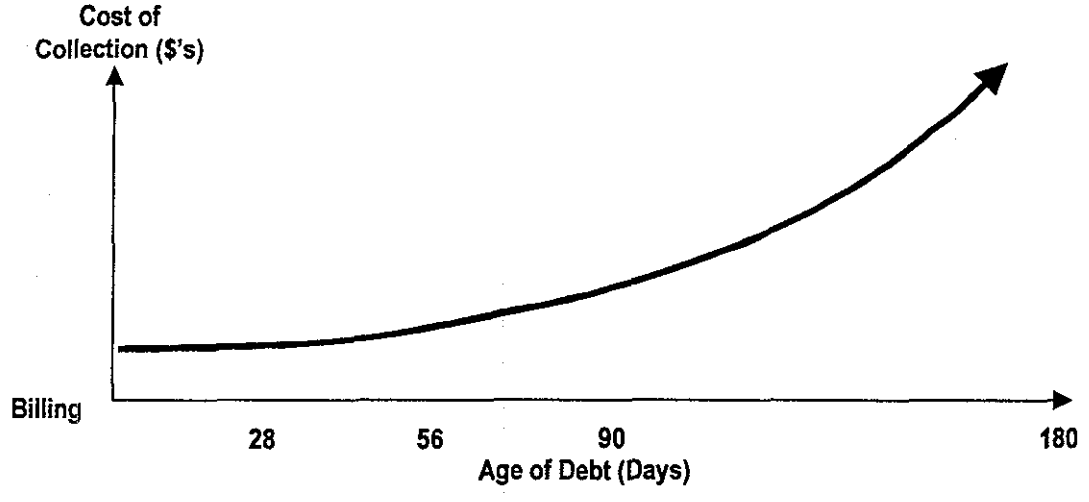


Figure 4-2 Impact of Time on Cost of Debt Collection

11

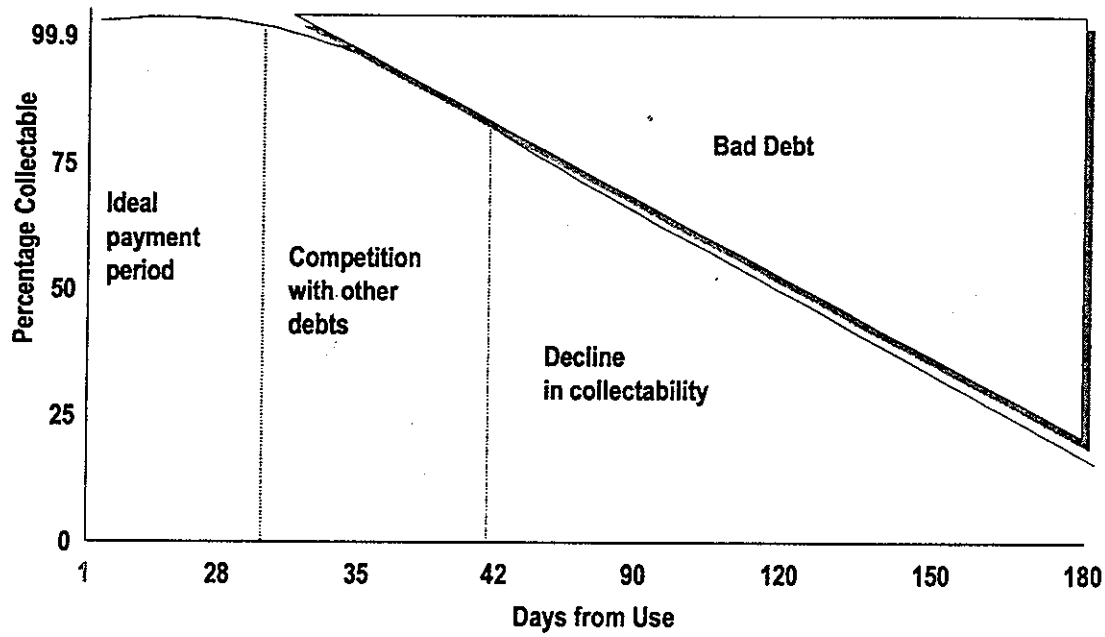


Figure 4-3 Impact of Time on Debt Profile

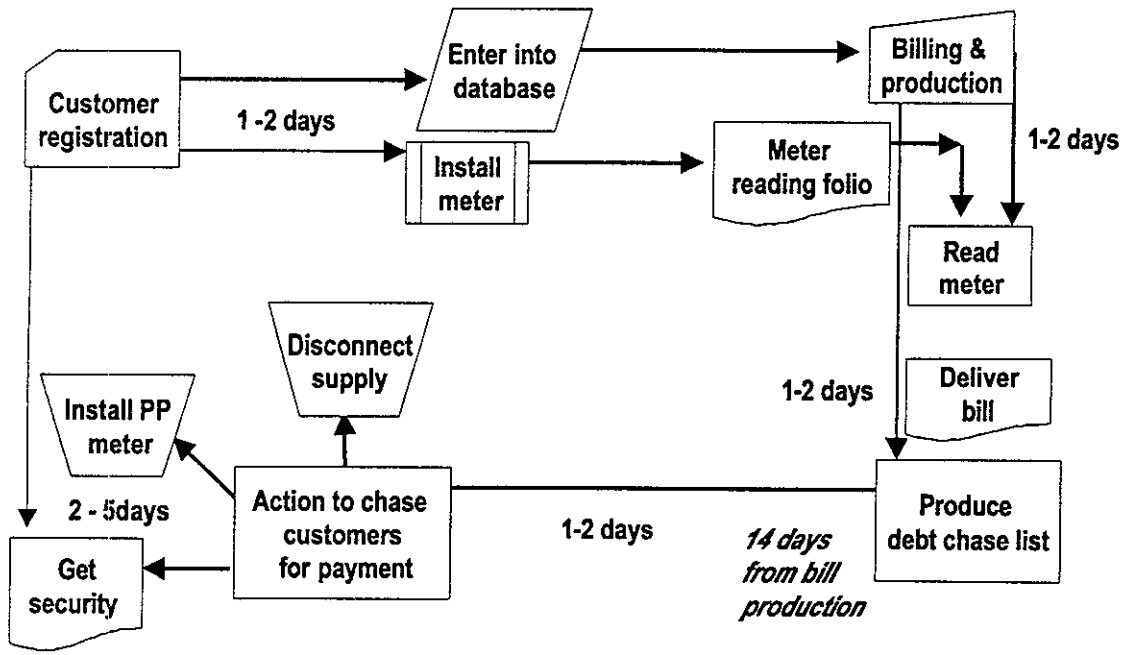


Figure 4-4 Billing and Collection Process

18

4.2.2 Scope of Work for NEPA Collection Program Design Consultation

The main components of the scope of work for the revenue consultant include:

- Developing a collection improvement plan, composed of detailed actions for achieving agreed collection performance targets. This plan should cover issues such as: (1) improving work flow; (2) maximizing cash flow; (3) optimizing collections levels; (4) reducing average payment cycles; (5) accelerating bill production and distribution; (6) performing collection followup (including doorstep collection methods); and (7) preparing management information reports.
- Recommending methods and mechanisms for minimizing loss through the use of credit vetting measures, eliciting prompt payment, and enforcing payment where necessary.
- Providing appropriate targets for collection rates and debt levels for each customer category. NEPA should consider adopting the following currently accepted industry standards for collection percentages:

Days After Billing	Percentage Outstanding
14 days	30%
28 days	5%
42 days	2%
56 days	< 1%

- Providing expert training and assistance to NEPA staff in the pilot district and within the counterpart team. Train office and field staff (including supervisory staff) in proactive collection and debt recovery techniques.
- Reviewing the use of tariffs to assist delivery of prompt and full payments and penalize slow payment.
- Recommending policies and procedures for collecting debts that are more readily and appropriately collected at the national or zonal level rather than at district level. Make recommendations for setting up national and/or zonal task forces to collect federal and state debts and large industrial and commercial debts.
- Analyzing uncollected debt; recommending bad debt writeoff procedures (to ensure that uncollectable debts are not held on the accounts indefinitely); and recommending appropriate provisioning. Table 4-1 is a sample form for collecting data on bad debts to be written off each month, quarter, or year. It is used for credit vetting and prioritizing collection actions.
- Establishing procedures for preventing and deterring the unauthorized and illegal use of electricity, including methods for detecting theft, recovering undercharges, and prosecuting offenders.
- Recommending appropriate IT and collection software systems for large debtor groups.
- Producing monthly aged debt analysis of outstanding debts and levels of collection, as shown in Table 4-2. This type of summary analysis should be completed district-by-

district and zone-by-zone each month, up to HQ level. This analysis can be most easily produced using computerized spreadsheets.

- Presenting the results and recommendations of the pilot program to the NEPA board at the conclusion of the assignment.

A draft *Request for Services* document has been attached to this report as Exhibit 4-1. When customers (particularly potentially large users of energy, such as maximum demand [MD] customers), request a supply connection or transfer, it would be appropriate for NEPA to apply credit vetting processes before acting on the request. A simple credit vetting policy is detailed in Exhibit 4-2. Finally and importantly, NEPA ought to have a collection philosophy or policy (an example is presented in Exhibit 4-3).

Table 4-1
Bad Debt Writeoff Analysis

Age Debt Analysis Date _____ Region _____ District _____

Code	Reason	Customer details	Amount
1	Company liquidation		
2	Company bankrupt		
3	Individual bankrupt		
4	Debtor deceased		
5	State debt cancelled		
6	Moved abroad		
7	Untraceable		
8	Debtor in prison		
9	Legal proceedings abortive		
10	Other reason		

Table 4-2
Aged Debt Analysis
(Amounts in $)

	Age in Months					
Debt Type	**0-3**	**3-6**	**6-9**	**9-12**	**> 1 year**	**Total**
Domestic						
Residential						
Commercial non-MD						
Commercial MD						
Industrial						
Federal						
State						
Total						

4.3 LARGE DEBTOR IMPROVEMENT TASK FORCE

It is a widely accepted credit management belief that about 20% of the industry's debtors account for as much as 80% of the late payments and ultimate bad debts. It is a general principle of good management to allocate resources in a direct ratio to the amount of income or profit such resources can generate. In the case of debt collection regimes, it follows that the resources ought to be targeted in the first instance to those customers who are probably going to create the largest debt problem. It is appropriate in the case of NEPA to consider separating ownership of customers into two categories. The recommended split would be: (1) all residential and domestic customers under one manager and (2) all business customers under another manager.

Although MD customers are only about 4% of the total customer base, they constitute approximately 50% of the potential revenue. There is some evidence that these, together with the biggest non-MD customers, have the largest debt and delinquency levels within NPPA. There was firm evidence from our in-country research that insufficient management attention is given to this important area at the various subunit levels. Because the engineering imperative of delivering a supply seems to marginalize sales activities—as well as a number of reasons enumerated in the interim report—it was recommended that a task force approach be taken for debt collection with respect to all MD customers and the top 15% of non-MD customers, ranked by size of debt. The task force's scope of activities is detailed in Section 4.3.1.

4.3.1 Scope of Task Force

The collection task force, to be known as the business customer department, would be based at headquarters and be responsible for collecting the entire large-debt portfolio for a predetermined period (perhaps 2 to 3 years). The task force would be led by a principal manager, assisted by appropriate collection staff (about 10-20). Additional staff, equipped with desktop PCs and printers using MS Word, Excel, and Access, would support the task force.

To gain a better understanding of the customers causing debt problems and their reasons for delinquency, the task force should review the schedule of all bad debts written off for its customer category over the preceding 12 months and analyze debts by age. In addition, task force personnel should obtain a schedule of active non-paying MD and non-MD customers within its category and incorporate these into a separate database. They should then make contact with each customer, focusing first on those with the largest and oldest debts. During this exercise, the task force should identify the key individuals within each customer organization responsible for dealing with energy accounts and making payments. The task force should also uncover payment problems, such as cash flow, trading difficulties, bureaucratic delay, etc.

It is important to understand the exact nature of a customer's business, which should be categorized as follows:

- *Federal government*—departments, agencies, and offices; educational, defense, or security facilities; hospitals; water and sewage facilities; and government-owned industries.

- *State governments*— departments, agencies, and offices; residences; agricultural, educational, and medical facilities.
- *Businesses*—oil/petrochemical companies; heavy industries, transport firms, commercial enterprises, and banks; light industries; workshops; and wholesalers, suppliers, offices, hotels, restaurants, and shops.

The geographical location of each account should be noted and each account should be given a customer classification code to enable subsequent analysis of customer's debts by classification. For example, standard industrial classification codes are in use in the U.K. and the U.S. and could be adopted for use by NEPA.

From these sets of data, the task force will be able to understand the age of debts, their size, the likelihood of future payment problems (based on historical performance and geographic location).

Meetings should be arranged with each customer to establish NEPA's billing and payment requirements. Once NEPA has established customer key contacts, those names and contact details should be recorded in the database and used for future contact. If the debtor has a tardy payment history, NEPA should bring this fact to their attention, establish a customer-specific schedule designed to ensure prompt payment in future, and confirm the payment schedule by letter.

The task force should be able to offer customers a range of payment methods and schedules appropriate to the customer's problems. Examples could include:

- A phased weekly repayment of outstanding debt, together with phased payment or full payment of future bills as they become due
- Payment by check, credit card (at an enhanced charge), or cash
- Payment to designated banks rather than NEPA offices
- Payment by bank direct debit or standing order

NEPA should make it very clear that defaulting on an agreed payment schedule will lead to immediate discontinuance of supply. Furthermore, NEPA should explain that supply will only be restored after the customer has paid the full outstanding balance, a reconnection fee, and an appropriate security deposit. Accordingly, it follows that the task force must have direct access to, and priority use of, reliable service disconnection and restoration mechanisms.

It is recommended that members of the task force be encouraged to study for membership in a professional body, such as the U.K. Institute of Credit Management. The team should be paid an incentive related to its annual performance in improving the speed and level of collections and reducing the amount of debt that is written off as uncollectable. Any incorrect billings should be adjusted against turnover rather than against bad debt.

4.4 SOLID-STATE METERING

Managing investment to optimize potential return is extremely important to any business. NEPA has some 3.8 million meters on circuit and is actively considering the possible purchase of prepayment systems and new credit meters. To date, these meters have been

ferrous disc electromechanical meters. Although such meters have a proven track record, they are no longer suitable for the demands of an emerging privatized utility. These meters deteriorate significantly over time, are prone to inaccuracy and failure, and are easily tampered with to obtain energy fraudulently. They are not cheap to buy and maintain, and their displays are hard to read, thus inviting recording errors.

A new generation of solid-state meters is now available that is relatively inexpensive, cheap to maintain and refurbish, and simple to upgrade. These meters are high quality, consistently accurate, and provide easy manual or electronic data collection. A number of manufacturers produce solid-state meters and it is recommended that NEPA explore the possibility of a joint venture operation with a manufacturer to supply, test, refurbish, and repair such meters.

4.4.1 Credit Meters

Single and three-phase meters are produced at 50 hertz, 230 /400 volts, from 15 to 120 amps, are of modular solid-state subassembly construction, and possess the following features:

- Flag ports—an optical data port for bidirectional interfacing with handheld units, for data recording, meter configuration, and diagnostic testing
- Expansion data ports for modular expansion/interfacing
- Multirate recording capability
- Pulsed output
- Fraud protection measures—reverse energy detection/export registration and recording of reverse energy use in a separate register. A range of various fraud protection measures to combat theft of energy, such as extended terminal cover to prevent the use of shunts, ultrasonic welded cover ("sealed for life"), etc.
- Compact in size—about 126 x 109 x 45 millimeters
- Lightweight—about 400 grams
- Switched isolation is available on many types, allowing meters to be installed at the time of service installation on new connections, and then sealed and isolated in readiness for subsequent internal electrical wiring connections
- Configurable, optional maximum demand indication; rising MD indication; cumulative MD; fraud prevention measures; and manual and automatic MD resetting. Active and reactive energy measurement is available. MD can be recorded over a number of separately defined periods to cross over possible tariff thresholds
- Up to eight separate times-of-day usage and recording registrations together with auxiliary output controls for separate circuit switching

4.4.2 Prepayment Meters

A range of prepayment meters similar in design, construction, and basic features to the credit meters described above is also available. They are fully programmable and configurable for standing/fixed charges; debt recovery; four-rate tariff switching; audible disconnect warning; emergency credit facility and friendly "no disconnect" periods; and credit load limiting. The use of magnetically encoded activation cards allows disposable tokens to provide a cashless infrastructure.

Alternatively, "smart card" prepayment metering of similar design and construction is available. Figure 4-7 shows the basic structure of such a system.

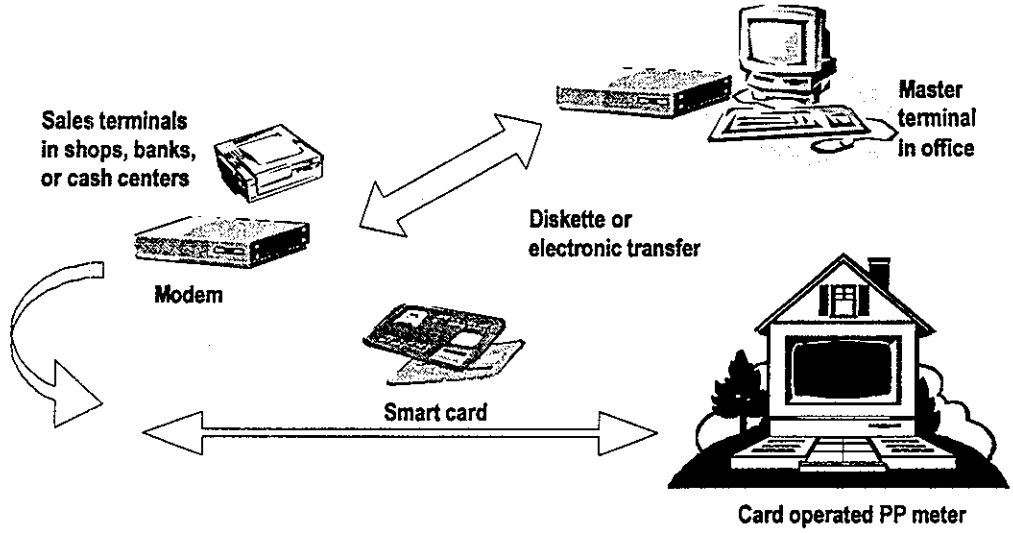


Figure 4-7 Smart Card Prepayment System

4.5 DISTRIBUTION CONTROL CENTERS

We commented in the interim report on the fact that NEPA has number of issues associated with having an adequate control system for 132kV network and dispatch of generation. These issues were addressed in Section 2. However at voltages of 33kV and below, there are no centralized control operation and there is also a need to improve the operating systems in place.

This situation is not uncommon in many countries. However, experience shows the necessity of paying as much attention to the lower voltages as NEPA intends to pay to the higher ones because most customer interruptions occur as a result of faults on the lower voltage networks. Also, the greatest number of incidents and accidents is at these lower voltages. The following section sets out a rationale and top-level proposals for distribution control center(s).

4.5.1 Benefits of a Distribution Control System

A control system at distribution voltages brings:

- Structured and consistent approach to distribution operations
- Improved operating discipline
- Improved safety of field operators and the public
- Improved accountability for safety, network performance, and customer service
- Greater compliance with the law and better defense if legal action is brought against a supply authority (an increasingly important issue)
- Reduced number of supply interruptions, through coordination of load flows and planned outages

84

- Faster restoration of interruptions through early detection (and anticipation) of faults
- Reduced network losses through improved running arrangements
- More effective interface with the 132kV grid and with dispatch
- Better monitoring of vandalism and its effects on system integrity

4.5.2 Control Principles

At minimum, all control systems should support the principles described below.

Critical

- Only one controller in charge of the network (or defined part of it) at any given time, with all parties knowing who the controller is
- No one operates without a specific instruction from the controller
- The operator carries out the instruction personally
- The operator immediately reports the completed operation (with time of operation) to the controller
- The controller logs the operation
- The controller maintains a record of the state of the network (at minimum—a pinned diagram)
- The controller (or his team) liaises with all other control centers—132kV grid, embedded generators, private networks, and emergency services and local authorities
- Operational discipline, plant and circuit naming, switching terminology, and reporting and recording procedure standards are all in place
- All personnel are trained and periodically retested and retrained

Important

- A central point for all trouble calls
- Customers and the media are given information about faults and projected restoration times
- Trouble calls sorted into HV/LV/service/cut out/consumers installation and passed quickly to appropriate teams for action
- Faults are tracked from start to finish—one owner allows for more efficient operation
- A formal system to pass longer term problems to the mains section (temporary repairs to be made permanent, low voltages, flicker, overloaded circuits, incipient faults, and meter/billing/disconnection queries). Problems should be followed through to ensure completion and recording of changes
- Network performance and customer service performance evaluated, recorded, and reported
- Online metering data (via SCADA or metering modems) to collect intelligence on network losses

From these principles the required functionality flows. Minimum functions can be performed with a relatively simple, low-cost, low-technology arrangement—or, if required, developed into very sophisticated (high-cost) arrangements which bring greater efficiency by integrating all associated functions.

4.5.3 Example of a Fully Developed Control System

An example of a sophisticated control room system is presented below and illustrated in Figure 4-8. It illustrates how a single system can integrate all the functions related to system control, network diagrams, customer service, customer calls, emergency response, fault management, control of repair teams, and communications.

- One database holds all records—plant, network diagram, customer records, maintenance history, plant, and circuit capacities.
- The system has links with the corporate telephone network, field radio, data channels, SCADA, plans-in-vans, and CAD drawing office. The system is extensible and able to interface with the company's existing and future IT.
- The system supports transparency, teamwork, and interdepartmental communications.
- The Action Plan calls for a long-term upgrade for the NCC SCADA and the DASA SCADA equipment. It is recommended that all control centers and communication links be designed with adequate capacity and functionality to facilitate the development of a fully integrated national system.

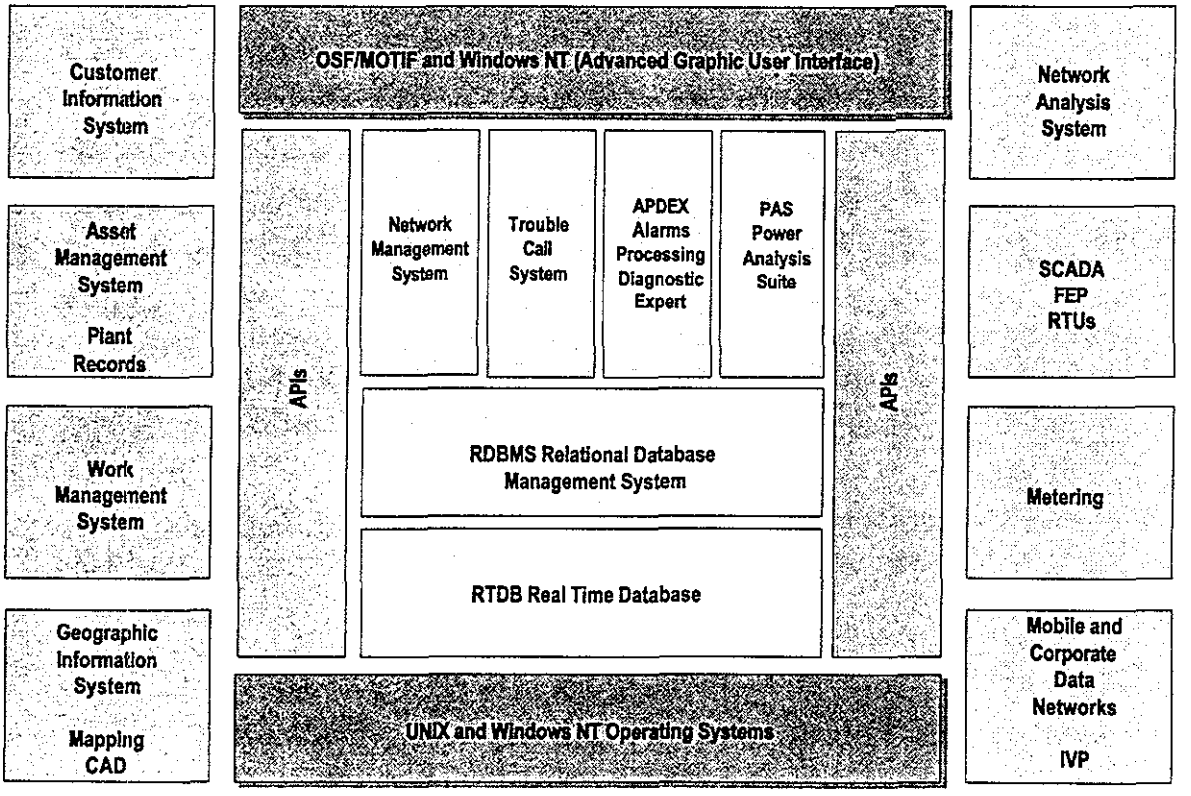


Figure 4-8 Functional Diagram of an Integrated Control System

86

4.6 EQUIPMENT/PROCUREMENT STANDARDS

4.6.1 Procurement

Significant sums of money can be wasted if the procurement process is defective. This is particularly true if, as in Nigeria's case, substandard materials and equipment are sourced from local suppliers or from other third-party suppliers. The existing stores operations, facilities, equipment, and processes are neither modern nor user responsive. Procurement must be firmly vested with the main user—the distribution division.

A robust set of standards must be drawn up for all plant equipment and materials. Purchases must be made against such standards and only from duly accredited manufacturers or their authorized agents. A full study should be carried out into the need for central, zone, and district stores; the need to introduce IT into the stores activity; and franchise activity.

4.6.2 Standards

There appears to be few engineering standards in place that are being used for procurement. Based on our review, it appears that the design and specification of new network extensions or plant reinforcements are largely determined by the contracts placed for each project. A wide variation in plant, manufacturers, and equipment is the result. Similarly, network development is determined by various consultant reports, each with a different emphasis.

The development of in-house standards and specifications for design, procurement, construction, and operation would bring numerous benefits. Key benefits would be as follows:

- Realization of the "intelligent implementation of projects" called for in the action plan, which can only be achieved by applying consistent standards
- Realization of the action plan objective of improving transmission efficiency by 30% by December 2001 cannot be met without adequate standards in place
- Reduced lost time, duplication, rechecking, and staffing levels as a result of procedure standards
- Realization of the action plan objective of preparing for "eventual privatization". Having standards in place would greatly enhance the saleability of the company
- Increased benefit from technical developments
- Better compliance with national and international technical standards
- Standardized training, reducing the range of required skills
- Economies of scale achieved in bulk plant purchases
- More structured staff environment
- Reduced stores inventories
- Better communications due to common plant and procedure standards
- Better cooperation and coordination between departments

Exhibit 4.1
DRAFT REQUEST FOR THE SERVICES OF A SUITABLY TRAINED CONSULTANT FOR A DEBT COLLECTION IMPROVEMENT PROGRAM.

Design and Implementation of a
Collection Improvement Program Pilot Project for NEPA
Terms of Reference

1. Introduction

NEPA has a serious problem of under collection of revenues from the sales of energy to its customers. In order to assist in the implementation of the financial action plan prepared by the Board of NEPA, the services of a professional account collection consultant are required. The consultant will design and implement a pilot collection project to improve the collection of receivables. The consultant will be required to draw up a plan containing concrete recommendations to improve the collection of electricity charges. These recommendations will form the basis of a pilot project to be carried out in a representative district of the NEPA utility. The assignment will consist of three phases, will last for 3 to 4 months, and be performed within Nigeria throughout the life of the project.

The consultant will work with a selected counterpart task force from NEPA and the staff of the pilot district and will report to the executive director marketing.

2. Objectives

The primary objective of the consultant will be:

- To develop a collection improvement plan by assessing existing collection performance, processes, and procedures.
- Assist NEPA in implementing this collection improvement plan within a pilot district. This district will be selected after consultation with NEPA.

3. Scope of Work

The assignment will consist of the following three phases:

1. Assessment of the practices and procedures at present being used within the utility
2. Collection improvement plan development
3. Collection improvement plan implementation

Phase 1 – Assessment of Practices and Procedures. This assessment will take place within NEPA and the sub organizational layers at zone and district level. The scope of work for this phase will include the following (inter alia):

- Assess existing billing and collection work flow; collection practices, and procedures, and recent collection performance
- Prepare recommendations to maximize value by streamlining the existing processes and developing tailored solutions. Consideration will be given to methods of more effectively dealing with large customers—federal and state governments as well as industrial.
- Identify the categories of problem payers within the utility's region of geographical areas and classifications of customers (government, industrial, commercial,

residential, etc.): largest non-paying customers, payment affordability, ranges of debt outstanding and bad debts written off, and age analysis of debt outstanding.

- In consultation with NEPA, agree on the location of the pilot district, and the members of the counterpart team.

Phase 2 – Collection Improvement Plan Development. Develop a collection improvement plan, consisting of detailed actions to occur in order to achieve agreed collection performance targets. This plan will cover issues such as work flow improvement; ways of maximizing cash flow; optimizing the collections levels and reducing the average times to pay speed of bill production and receipt; follow up activity; methods of achieving collection at doorstep; and management of reports and information. The plan will also:

- Provide recommendations on methods and mechanisms for minimizing loss through the use of credit vetting measures, eliciting prompt payment, and enforcing payments where necessary.
- Provide appropriate targets for collection rates and debt levels for each category of customer.
- Assist NEPA in implementing the various measures recommended.
- Provide training, assistance, and expertise to NEPA staff in the pilot district and within the counterpart team. Train office and field staff (including supervisory staff) in proactive collection and debt recovery techniques.
- Review the use of tariffs to assist in delivering prompt and full payments and to penalize tardy payment.
- Give recommendations on the segregation of debts between those that can more readily and appropriately be collected and dealt with on a national level or a zonal level, rather than district. Give recommendations to setting up a national and/or zonal task forces to collect federal and state debts; and large industrial and commercial debts.
- Analyze the uncollected debt, give recommendations on bad debt write-off and future procedures to be followed to ensure that uncollectable debt is not held on the accounts; and recommend appropriate provisioning.
- Establish procedures for preventing and deterring the unauthorized and illegal use of electricity, including methods of detection of theft, recovery of under charges, and prosecution of offenders.
- Give recommendations into the use of any appropriate IT and collection software systems for large debtor groups

Phase 3 – Collection Improvement Plan Implementation. The scope of work for this phase will include the following:

- Implement the agreed changes and techniques within the chosen district, using members of the counterpart team and local dedicated collection staff.
- Liaise with the headquarters of NEPA throughout the project. Provide monthly update reports on the progress of the three phases of the project and in the training of staff and in the improvements to the levels of receivables.

- Produce a monthly age debt analysis of the outstanding debts and levels of collection.
- Present the results and recommendations of the pilot program to the board of NEPA at the conclusion of the assignment.

Consultant Profile

This project requires the services of an experienced consultant, who has worked at senior levels in an international energy utility. The consultant will need to demonstrate that he/she has significant experience and expertise in:

- Energy distribution supply and sales
- Energy payment profiling and monitoring
- Billing and collection systems used in modern energy companies
- Cash flow and collection processes and procedures used to minimize bad debts and maximize collection levels and speed of collection
- Setting in place deterrent measures to prevent the unauthorized and illegal use of energy
- Evidence of having worked in developing countries (Africa in particular)

4. Reporting

- The consultant will report to the marketing executive director of NEPA and keep him updated on a regular basis with regard to findings and progress. The consultant will be required to keep the local zone and district general managers apprised of progress.
- The consultant will submit a monthly report to the executive director and present a final report at the end of the pilot period. This report will not only detail the project process and results but will be expected to make recommendations for rolling out the project to all units; establishing any agreed national or zonal collection task forces and any collection IT/software systems.

5. Deliverables

- At the completion of the task, the consultant will submit a final report to the marketing executive director detailing the work covered, the processes and procedures implemented, and the results of the trial.
- Recommendations for rolling out the project to the rest of NEPA and for tackling the problems of loss of energy through theft will also be submitted.

6. NEPA's Commitment

- The board of NEPA will provide the consultant with prompt access to all relevant data necessary for this project to be carried out within the timeframe.
- A counterpart team will be assigned to work full time with the consultant.
- NEPA will provide office accommodation and facilities such as furniture, telephone, printing and photocopying, and transport to NEPA offices together with a guide.
- The consultant will provide other facilities such as IT and consumables.

90

Exhibit 4.2
CREDIT VETTING POLICY

The following is a sample credit vetting policy, which should be in place to help prevent the accumulation of large debts amongst new customers.

1 Basic Data

Whenever a customer requires an energy connection for the first time, or because they are moving into a property that has previously been the responsibility of another customer, the following basic information must be obtained to assist in the process of potential subsequent debt collection:

- The correct spelling of the full name of the potential customer.
- The status of the prospective customer (e.g., sole trader, government or state enterprise, limited company, partnership, domestic/residential customer)
- Their previous address, and whether they were responsible for payment of electricity charges at that property
- Any other property or premises for which they are responsible
- The name and address of any employer
- Any telephone number
- Any bank details

2 Procedure

A few simple rules can then be applied:

- Check the previous address to see if the customer was in fact the registered customer
- Determine whether or not the customer owes any electricity charges from there
- Determine payment history

3 Security Against Default

Deposits are held for a predefined length of time perhaps one or two years . Interest at standard rates can be payable annually on the deposit held. If the customer defaults on payment, then the whole or part of the deposit can be applied against the debt. The amount of deposit is variable, but should normally be assessed as the average amount of the potential bills for a 3-, 6-, or 12-month period.

If during the period the security deposit is held the customer pays bills promptly, then the deposit many be refunded at the end of the agreed period. However, if bills are not promptly paid, the deposit should be held for such time until a prompt payment pattern is firmly established.

Consideration should be given to whether:

- A deposit is security against future default
- The deposit should be based on a 3-, 6-, or 12-month average usage level
- A personal, legally binding guarantee from another person is appropriate
- A prepayment meter is more appropriate, and is supply through a prepayment meter more economical

Exhibit 4.3
Draft Collection Policy

The following is the outline of a possible collection policy for NEPA

- It must be remembered that the sale is not made until the money is received from the customer. Our aim is to minimize the period between the use of energy and the receipt of FULL payment.
- It is important to remember that the earlier a customer is asked for payment then the earlier it will be paid
- The older an uncollected debt becomes the more difficult it is to get paid and the greater is the probability that it will not be paid
- Information about the reasons for bad debts occurring and debts remaining unpaid needs to be gathered, analyzed, and fed into the supply chain through actions such as credit vetting.

The aims of credit management in NEPA are:

- To get the money in full, and in the shortest time
- To prevent new debts occurring
- To understand reasons for late and non payment
- To achieve control of bad debts
- To optimize the recovery of bad and delinquent debt
- Influence business policy and practices on debt
- Retain /improve customers good will