

CHAPTER 11

RECOMMENDATIONS

CHAPTER 11 RECOMMENDATIONS

11.1 Recommended Optimum Scenario

The CCGT business as usual **scenario D** is recommendable as the least cost option for the short, medium and long term supply of electricity. It is also technically feasible and environmentally friendly. The environmental issues are not considered to create unacceptable risks. It could not fully meet the target of the national energy policy, but it is deemed to satisfy the economic efficiency and to alleviate a growing concern to an acceptable level. Namibia could considerably save foreign currency expenditure and benefit from royalties and taxation income from Kudu gas.

Two self sufficiency **scenarios A** for CCDT and **B** for hydropower are not recommendable because of their inferior economic efficiency although they could meet the target of the national energy policy. Each of them would require an additional US\$406 million investment for an extra CCGT block compared to respective business as usual scenarios D and E in the time horizon.

The extended import **scenario C** is not recommendable. Because with further interconnection with Eskom, Namibia would become still more dependent on one outside supplier to a substantial extent, although it is almost the same level as the scenario D in terms of economy. This should be avoided.

The hydropower business as usual **scenario E** is ranked the third in economic terms. The annual possible generation would fluctuate with a wide range of ten to one. A long lead time might result in a big disparity between a forecast at the construction decision and the actual demand when completed. These are very risky to operation and finances for NamPower. And there are a lot of environmental issues to be solved. The economic analysis has been worked out on the premise that all the hydroelectric generation can be used in Namibia. It was recently disclosed, however, that Angola claims a 50/50 sharing of hydropower. Economic evaluation depends on cost bearing which is to be negotiated from now on. This is the most uncertain issue in the hydropower scenarios. The scenario E is not recommend in this situation.

However, a preliminary **system study** indicates the northern power system would become unstable as the load increases. This suggests that the northern power system might require a strong power source for the system stability in 2020s. It is not

always limited to a hydropower, which is the most probable alternative. If the uncertain issues in the hydropower scenario is solved into being feasible, the hydropower might be an alternative for prolonged life of Kudu gas field. It is recommended to investigate the power system stability thoroughly.

11.2 Policy, System and Organization

(1) Electricity Pricing Reform

Concerning the current system of electricity tariff rates described in 5.4, the following proposals are to be put forward for future discussion.

a) Method of Pricing

The MRLGH and Northern Electricity carry out electric power distribution in rural areas where there are many low income people, and the basic charge for the domestic category is a uniform charge up to 60 A. In Windhoek Municipality, the basic charge is finely subdivided according to the size of power use (contract ampere value) so that the tariff for small consumers (minimum 10 A) is lower. This method of pricing should also be applied in rural areas.

Assuming that the minimum unit of power consumption in rural settlements is around 300-500 W, since the current for 200 V of power is at most 1.5-2.5 A, it is considered necessary to further subdivide consumption of 10 A or less into some of smaller categories. At this moment, the collection rate of electricity charges in the northern area is low, and it is thought that the above proposal could improve this situation, and lead to an increase in the number of electricity users.

b) Appropriate Electricity Tariffs

Electricity tariffs should be determined based on marginal cost with an appropriate profit. Looking at the case of Windhoek, it appears that the electricity tariff is determined after adding on a charge to cover a part of the cost of other infrastructure development. Other infrastructure development should be managed by means of independent, self-supporting systems and the electricity tariff should be made more appropriate by reducing the said additional charge and clarifying the elements that make up the tariff.

When introducing the Rural Electrification Fund, which will be started in the near future after the enforcement the Electricity Act, it is essential to clarify the component elements of the tariff.

(2) Electricity Sector Governance

a) Coordination of the Power Generation and Transmission, and Distribution Operations

In Namibia, the power generation and transmission operation and the distribution operation are separate and run by different organizations. A similar setup to this (separate operation system) is not so widely adopted, but adopted in the United Kingdom, Thailand, Jordan and Ghana in Africa. Generally Speaking from the viewpoint of consumers, it is better to place suppliers in a competitive situation whereby consumers can selectively use good quality and inexpensive electricity.

In other countries in the world including Japan, France, Germany, the United States, and most of Asian, Middle East and African countries, it is common for the power generation, transmission and distribution utilities to be operated by the same operator (integrated operation), which came from historical process of electric power development. Moreover, there are many cases where regional monopolies of generation, transmission and distribution are permitted.

Separate operation and integrated operation both have their merits and demerits.

In the case of integrated operation, it is easier to coordinate between generation, transmission and distribution operation in development, however, tariffs inevitably become expensive due to a lack of competition. For this reason, even in advanced countries, there are gradual moves towards separate operation and the abolition of regional monopolies via privatization, introduction of private investor, etc.

In the case of separate operation, the purchase price of power tends to be cheaper, however, one drawback is the difficulty in coordinating the generation transmission and distribution development plans (including rural electrification) in accordance with the forecast of future demand. In Namibia, in order to compensate this disadvantage, establishment of the

Electricity Control Board is being proposed under the New Electricity Act, however, if operation of this board does not go well, it will become difficult to secure efficient power development plans and stable power supply, and sound future development of power supply system will be hindered.

Therefore, it is essential to give a strong authority or power to the Electricity Control Board for enabling them to make a quick decision and integrated implementations of the power development plans.

b) Reinforcement of Staffing in Implementing Agencies

Since Namibia achieved independence only recently and staffing in the MME, MRLGH and local authorities has yet to reach adequate levels, there are some areas where organizations are unable to function sufficiently.

In contrast, Northern Electricity appears to be operating smoothly according to the monthly report of January 1998, despite the fact it is still a young organization. This is a result of quick decision making regarding measures, recommendations and treatment, and effort to cultivate efficient work and loyalty to the company, which are common features characteristic to private companies.

Staffing in the MME, MRLGH and local Authorities should also be improved in order to vitalize these organizations.

c) Long-term Plans for Power Self-sufficiency

Namibia is blessed with abundant natural resources and, although it currently purchases more than half of its electric power from South Africa, in the long term, it needs to promote power source development and reduce power imports through making use of its own resources such as Kudu natural gas, etc., and it is necessary to immediately set about compiling long-term plans intended to achieve self-sufficiency in electric power as proposed in the National Development Plan (NDP-1).

(3) Human Resource Development

One issue that is indispensable in effectively implementing the Power Development Master Plan is the development of human resources.

The MME and MRLGII currently take the form of government organizations, however, they have insufficient staff and work is being heaped on a very few staffs who have enough capabilities. As a result, these bodies are failing to perform as efficient organizations.

In order to advance the Master Plan in future, it is thought that sufficient functions cannot be performed with the existing staff levels. Under the New Electricity Act, approval, guidance and supervisory functions of the central government are being imposed on and it is expected that work loads will increase even further. In addition, MME should act an important role in the Electricity Control Board which is expected to be established in order to match with NamPower.

In the electricity sector overall, there are few engineers of real capability (except in NamPower), therefore the following recommendations are made to deal with this situation.

a) Short-term measures

- Promotion of overseas training (1-2 years) for young staffs
- Staff exchange between the MME and NamPower
- Invitation of long-term stationed technical instructors from abroad

b) Long-term measures

- Review the school system and raise the rate of receiving education and education level of citizens.
- Select the most capable students and establish scholarship schemes to enable them to receive university education (at home and abroad).

(4) Recommendation for Realization and Implementation of the Master Plan

a) Utilization of the Electricity Control Board

In order to promote cooperated and balanced development between the power generation and transformation operation and distribution operation, it is essential to make effective use of the Electricity Control Board proposed under the New Electricity Act for obtaining the compatibility between the power development plan and the electrification program including rural electrification.

b) Establishment of Regional Distribution Boards

Despite being located in the same districts, municipalities, commercial farms, rural villages and settlements carry out power receiving and distribution independently and regional cooperation is thus not being secured.

In order to implement distribution and electrification plans that view districts as a whole, including municipalities, towns, villages and settlements, it is recommended that Regional Distribution Boards be established to carry out promotion and coordination work in the development and improvement of electric power distribution in the whole region.

Northern Electricity is responsible for distribution over a wide area and is eager to improve its business standing, however, the regions it serves are largely inhabited by small, low income households.

It is thought that a greater effect could be achieved if Northern Electricity is made into a regional distributor that also covers municipalities and towns.

c) Treatment of Low Income Households

One issue that is thought to hinder the promotion of the Rural Electrification Programme is the payment of power charges by low income households. According to the surveys made by the World Bank, etc., expenditure on lighting and heating expenses is said to be around 10% of all income, and it is reported that low income people (monthly income N\$ 500 or less), who wish to use electricity but find it difficult to afford the tariff, account for approximately half of the population (NEPRU, January 1998). In the current situation, the average national electrification rate is 10% or less and, in the case where the electrification programmes are advanced in non-electrified regions, it is thought that the consumers will be limited only to relatively high income classes who are able to afford the tariff.

The living standard of low income classes is not something that can be gauged solely by the average national or local per capita GDP, and the raising of actual living standards is not something that can be achieved over a short period.

The First National Development Plan (NDP-1) raises ambitious targets relating to power self-sufficiency and regional electrification, however, unless thorough-going measures to counter poverty are adopted to spread

the use of electricity to low income classes, the number of potential electricity users will be restricted and it is forecast that the national electrification rate in Namibia will reach no more some 40-50%.

Therefore, in order to increase the user of electricity and raise the electrification rate, it will be necessary to give special consideration to the treatment of low income classes. Below are some ideas for examination in respect to this matter.

- Taking a regional viewpoint (including municipalities, towns, villages, industries, settlements and subsistence farmers, etc.), set high electricity tariffs for high income classes and large-scale consumers and low tariffs for low income classes (generally small-scale consumers). In some cases, with respect to extremely low income people, establish special rates (including government subsidy), and implement this reformed electricity tariff system that achieve a balance over whole distribution districts over a certain period(10-15 years). This will contribute to expanding the range of possible electricity users to the lower income households. This may be one of the task of the aforementioned Regional Distribution Boards.
- A revolving fund for the promotion of solar electrification does exist, however, because this is limited to consumers with a minimum monthly income and the initial payment is set at 20% of the entire cost, this fund can only be utilized by relatively well-off households and not by the low and extremely low income classes. In particular, it is necessary to incorporate government subsidization with respect to the 20% initial payment.

This will give the opportunity to off-grid low income households to access to the benefit of utilizing electricity, thus contributing to result in raising the electrification rate.

In addition , since it appears that knowledge of this revolving fund system has not spread to the northern regions. It should be advertised more widely beyond the central parts of the country.

- Exemption of electricity charge for severely low income households with less than a certain amount of annual income.

(5) Action Plan

The following is a schematic diagram of the action plan which would help to effectively develop the master plan.

ACTION PLAN OF PROPOSALS AND RECOMMENDATIONS

	ITEMS	PURPOSE	YEAR												REMARKS						
			98	99	00	01	02	03	04	05	06	07	08	09		10	11	12	13	14	15
LAW AND REGULATIONS	<ul style="list-style-type: none"> Enforcement of New Electricity Act Review of relevant laws and Regulations 																				<ul style="list-style-type: none"> Establishment of foundation of Electricity Sector Governance
ORGANIZATIONS	<ul style="list-style-type: none"> Establishment of Electricity Control Board Establishment of Regional Distribution Board Reinforcement of staff in implementing agencies 	<ul style="list-style-type: none"> Coordination of Development Plan and Policy Making Effective development of Distribution System Efficient work and functioning 																			<ul style="list-style-type: none"> Compatibility among the Development Plans Regional integration of Distribution System Efficient Implementation
TARIFF SYSTEM	<ul style="list-style-type: none"> Review of existing tariff system including Clarification of tariff elements Sub-division of fixed charge less than 10A Regional integration of tariff system (including municipalities, villages, settlements etc.) 	<ul style="list-style-type: none"> Adequate Tariff System Elimination of added overburden (in municipalities etc) Benefit for Small users Achieve total balance, but give a benefit to low income households 																			<ul style="list-style-type: none"> Establishment of reasonable Tariff System Consideration to low income households Temporary measures to increase small users or low income users
HUMAN RESOURCES DEVELOPMENT	<ul style="list-style-type: none"> Training and Education Short term measures Long term measures 	<ul style="list-style-type: none"> Upgrading technical capability and increase technical staff Upgrading the level of education and living standard 																			<ul style="list-style-type: none"> (Continuation is required) Efficient sector governance and steady implementation of Development Plans
OTHERS	<ul style="list-style-type: none"> Review of Revolving Fund Lower the min. Monthly income limit Subsidy for 20% down payment Long term plan for Power self-sufficiency 	<ul style="list-style-type: none"> Consideration to low income households Consideration to low income households Utilize own natural resources 																			<ul style="list-style-type: none"> Increase PV users Increase PV users (Raise the electrification rate)

11.3 Energy Conservation and Environmental Protection for the Power Sector

(1) Energy Conservation

a) Desirable power facilities

- In case of a hydropower plant, if its environmental impacts will be limited or mitigated, and its benefit cost ratio will be high, then such a hydropower project will be desirable from point of view of energy conservation due to not requiring fossil fuel.
- In case of a thermal power plant, combined cycle will be most desirable due to its high thermal efficiency. High thermal efficiency will mean less fuel is needed for producing same output. If Kudu gas development project will be materialized, gas combined cycle plant is recommended. SOx removal equipment will not be required for such a plant.

b) Development and effective use of renewable energy

· Wind power

The report titled "Wind Park in Grid-Parallel Operation : Proposal for an Implementation Strategy, 1996" prepared under a renewable energy project study of the MME, indicated that such a wind power to be located at Walvis Bay area could produce 30% of electric demand of this area. It gives only rough cost estimate, which does not appear to economically compete with combined cycle electricity generation by Kudu gas, including transmission costs to Walvis Bay. A project has been established to improve the framework conditions and assess the potential of wind energy at Walvis Bay and Lüderity. An assessment of wind measurement should be watched.

On the other hand, it has been known through visits to the northern part of the country that multiblade windmills are being used for water pumping at many agriculture farms. It is found at a private pasture that the water amount being pumped is large enough to operate a small tourist hotel. In addition, the private farm also utilize solar cell energy together with a backup diesel engine to supply electricity needed. Use of wind power in the country will play important role, especially for the remote rural areas.

· Solar energy

Namibia offers one of the highest solar radiation potential in the world, and it is expected that specifically the direct beam radiation is amongst the highest in the world. However, solar thermal power stations rely on the direct solar radiation and its technology is still at the demonstration stage. Solar measurement has been started at Noordoewer as only prime choice.

It is still very difficult to economically utilize the solar energy in bulk supply because of its thin energy density and inevitable low utilization factor. However, where conventional rural electrification is impractical on cost or technical grounds, the benefits from the use of PV systems can be considerable. Small scale PV systems also is being used for water pumping and others at some farms in the remote areas. From this, it is recommended that further studies will be implemented for effective use of solar energy in the country.

(2) Environmental Protection for the Power Sector

a) Implementation of environmental impact assessment

The Ministry of Environment and Tourism has issued the "Namibia's Environmental Assessment Policy, January 1995". The Policy requires implementation of environment assessment (EA) for power projects. On the other hand, most of international and foreign financing organizations also require implementation of EA for power plant projects. Therefore, carrying out EAs for power projects in the country is needed. It is recommended that effective use of EA system as a meaningful tool to improve power project planning.

b) Hydroelectric Power Project

For hydroelectric power project planning, including the case of Epupa project, it is recommended to pay special attentions to the following points of concerns.

· If resettlement of people will be needed, resettlement plan has to be prepared in advance and compensation to the people has to made. It is desirable that such a plan will be agreed upon with the people concerned.

- Economic loss generated by inundation must be compensated to the people affected.
- If negative impact to the fishery of downstream side of a dam or reservoir will be incurred, measures to mitigate the impact shall be planned and implemented.
- If water reduction section in downstream side of a dam or reservoir will be generated, the length of such section shall be kept minimum.
- To minimize negative impacts to nature environment.

c) Thermal electric power project

As mention before, gas combined cycle thermal power plant is most recommendable, due to its high thermal efficiency and less air pollution. In case of coal or oil thermal power, it is recommended to install SO_x and NO_x removal systems to reduce such air pollution sources. In any case, the following points are recommended:

- Project site shall be so selected to minimize negative impacts to both nature and social environments.
- If project site will be located at coastal area and sea water will be used to cool the condenser, measures shall be taken to minimize negative impact to the nearby marine organisms and fishery.
- Air pollution to be generated shall be avoided and mitigated.
- Waste water and liquid shall be treated before discharge to the environment.

Because it is getting clear that the planning of Combined Cycle Gas-fired Power Plant Project using Kudu gas is being actively implemented now, some recommendations specific to the project site selection from point of view of environmental consideration are provided here as below.

The Kudu gas field is located in the Atlantic Ocean 150 to 200 km west of Oranjemund off Namibia's southern coast. Therefore, siting the gas-fired power plant at the nearby onshore area would be most desirable. From this point of view, the area from the coastal zone located at west side of Oranjemund town to the point 8 km east side of the town running along the Orange River will be the desirable siting region, if potential negative environmental impacts could be avoided or mitigated. The further eastern side of the region will not be suitable due to its steep slope from the river

bed. In connection with the region, it is recommended that the following environmental considerations will be given to the plant site selection.

a. Pay attentions to the coastal marine environment and fishery

The marine ecosystem is very rich with large population of seals and seabirds being presented. The ocean adjacent to the coastal line supports up to 35 species of whales and dolphins. A lot of seabirds are also found and habitat here. Marine fishery is being actively performed offshore along the coastal line. Rock lobster and various kinds of mussels are also being aquacultured. Considering the nature environment and fishery resources, it is desirable to pay attentions to the following points for the purpose of environmental consideration.

- In case that the site will be located at the coastal area, extension and dredging work of harbor facility needed for unloading large equipment may become needed. In such case, negative impacts to the marine bio-environment and fishery must be avoided or mitigated.
- In case of using sea water for cooling condenser, intake of marine organisms together with sea water must be avoided or mitigated. On the other hand, negative impact to the marine biology due to the thermal discharge shall also be mitigated.

b. Pay attentions to the nature environment conservation of the Orange River region

The Orange River mouth is a vitally important wetland and is registered as a Wetland of International Importance under the Ramsar Convention. The bio-diversity of the wetland must be maintained and preserved. The colonies of waders and breeding seabirds should not be disturbed. In addition, The Swartkops Nature Reserve is located at the area nearby the Ernest Oppenheimer Bridge.

Therefore, it is desirable to pay attentions to the following points for the purpose of environmental conservation.

- The plant site shall be located at such a place that the nature environment of this area can be protected.

- In case of using surface water cooled cooling tower, use of Orange River water shall be kept minimum.
- During construction of the power plant, negative impacts to the nature environment shall be mitigated or kept minimum.
- After commission of the power plant, periodical environmental monitoring shall be implemented to ensure that environmental negative impacts would have been avoided or mitigated as intended.

d) Environmental protection during construction and operation

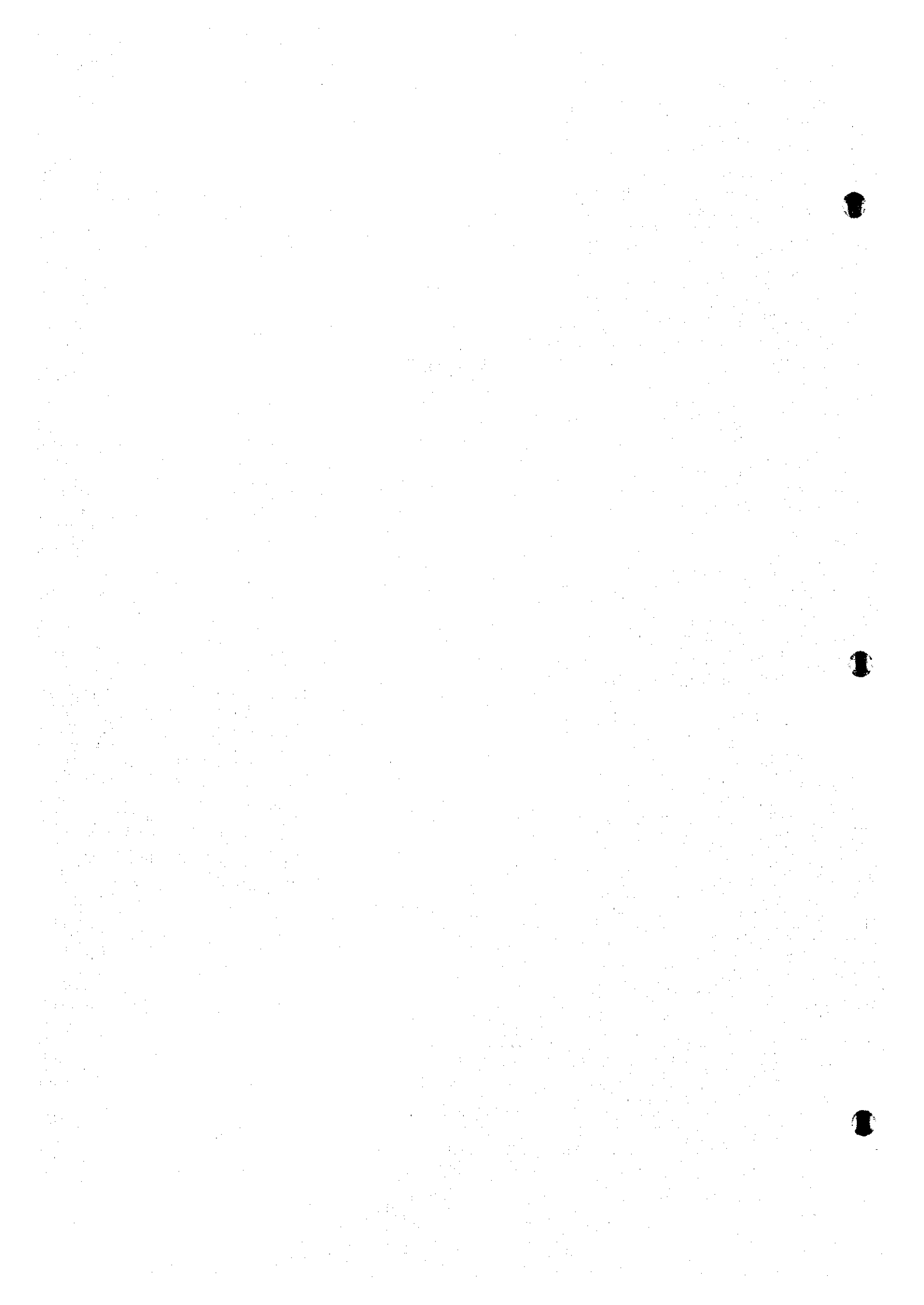
a. During construction

During construction, measures planned as the result of environment assessment shall be carried out to protect or mitigate potential impacts. Environmental monitoring shall also be implemented to verify that the measures taken work well as intended.

b. During operation

During operation, environmental monitoring required by the result of environmental assessment shall be implemented to verify that various effluents and discharges from the power plant are not exceeding the environmental standards and discharge standards as designed. If any parameter would exceed such standard, corrective measures shall be taken.

ANNEX



*Standaardnywerheidsklassifikasie
van alle
Ekonomiese Bedrywighede
(SNK)*

*Standard Industrial Classification
of all
Economic Activities
(SIC)*

*Vyfde Uitgawe
Fifth Edition*

**SENTRALE STATISTIEKDIENS (SSD)
CENTRAL STATISTICAL SERVICE (CSS)**

*Januarie
January 1993*

LYS VAN HOOFAFDELINGS

- 1 Landbou, jag, bosbou en vissery
- 2 Mynwese en steengroefwerk
- 3 Fabriekswese
- 4 Elektrisiteit-, gas- en watervoorsiening
- 5 Konstruksie
- 6 Groot- en kleinhandel; herstel van motorvoertuie, motorfietsse en persoonlike en huishoudelike goedere; hotelle en restaurante
- 7 Vervoer, opberging en kommunikasie
- 8 Finansiële tussengangs-, versekerings-, vaste-eiendoms- en besigheidsdienste
- 9 Gemeenskaps-, maatskaplike en persoonlike dienste
- 0 Private huishoudings, eksteritoriale organisasies, verteenwoordigers van buitelandse regerings en ander werksaamhede nie voldoende omskryf nie

LIST OF MAJOR DIVISIONS

- 1 Agriculture, hunting, forestry and fishing
- 2 Mining and quarrying
- 3 Manufacturing
- 4 Electricity, gas and water supply
- 5 Construction
- 6 Wholesale and retail trade; repair of motor vehicles, motor cycles and personal and household goods; hotels and restaurants
- 7 Transport, storage and communication;
- 8 Financial intermediation, insurance, real estate and business services
- 9 Community, social and personal services
- 0 Private households, extraterritorial organisations, representatives of foreign governments and other activities not adequately defined

**HOOFAFDELINGS,
AFDELINGS EN
HOOFGROEPE**

**MAJOR DIVISIONS,
DIVISIONS AND
MAJOR GROUPS**

LYS VAN HOOFAFDELINGS, AFDELINGS EN HOOFGROEPE

LIST OF MAJOR DIVISIONS, DIVISIONS AND MAJOR GROUPS

Titel van kategorie	Afdeling Division	Hoofgroep Major group	Title of category
<u>HOOFAFDELING 1: LANDBOU, JAG, BOSBOU EN VISSERY</u>			<u>MAJOR DIVISION 1: AGRICULTURE, HUNTING, FORESTRY AND FISHING</u>
Landbou, jag en verwante dienste	11		Agriculture, hunting and related services
Gewasverbouwing; groentetuine; tuinbou		111	Growing of crops; market gardening; horticulture
Veeboerdery		112	Farming of animals
Kweek van gewasse gekombineer met veeboerdery (gemengde boerdery)		113	Growing of crops combined with farming of animals (mixed farming)
Landbou- en veeteeltdienste, uitgesonderd veeartsenywerkzaamhede		114	Agricultural and animal husbandry services, except veterinary activities
Jag, vang van wild en wildeelt, insluitende verwante dienste		115	Hunting; trapping and game propagation, including related services
Produksie van organiese misstof		116	Production of organic fertilizer
Bosbou-, houtkappery en verwante dienste	12		Forestry, logging and related services
Bosbou- en verwante dienste		121	Forestry and related services
Houtkappery en verwante dienste		122	Logging and related services
Vissery, die bedryf van vistelerye en -plase	13		Fishing, operation of fish hatcheries and fish farms
Diepsee- en kusvissery		131	Ocean and coastal fishing
Vistelerye en -plase		132	Fish hatcheries and fish farms
<u>HOOFAFDELING 2: MYNHESE EN STEENGROEFWERK</u>			<u>MAJOR DIVISION 2: MINING AND QUARRYING</u>
Steenkool- en lignietontginning	21	210	Mining of coal and lignite
Ekstrahering van ru-petroleum en natuurlike gas; dienswerkzaamhede bykomstig tot ekstrahering van olie en gas, met uitsluiting van opmeting	22	221	Extraction of crude petroleum and natural gas; service activities incidental to oil and gas extraction, excluding surveying
Ontginning van goud- en uraanerts	23	230	Mining of gold and uranium ore
Ontginning van metaalertse, uitgesonderd goud en uraan	24		Mining of metal ores, except gold and uranium
Ontginning van ystererts		241	Mining of iron ore
Ontginning van nie-ystermetaalhoudende ertse, uitgesonderd goud en uraan		242	Mining of non-ferrous metal ores, except gold and uranium
Ander mynbedrywighede en steengroewe	25		Other mining and quarrying
Steen-, klei- en sandgroewe		251	Stone quarrying, clay and sand-pits
Ontginning van diamante (met inbegrip van alluviale diamante)		252	Mining of diamonds (including alluvial diamonds)
Myn- en steengroefbedrywighede n.e.g.		253	Mining and quarrying n.e.c.
Dienswerkzaamhede bykomstig by ontginning van minerale	29	290	Services activities incidental to mining of minerals
<u>HOOFAFDELING 3: FABRIEKSE</u>			<u>MAJOR DIVISION 3: MANUFACTURING</u>
Vervaardiging van voedselprodukte, drankte en tabakprodukte	30		Manufacture of food products, beverages and tobacco products
Produksie, verwerking en preservering van vleis, vis, vrugte, groente, olies en vette		301	Production, processing and preserving of meat, fish, fruit, vegetables, oils and fats

Titel van kategorie	Afdeling Division	Hoofgroep Major group	Title of category
Vervaardiging van suivelprodukte		302	Manufacture of dairy products
Vervaardiging van graanmeelprodukte, stysels en styselprodukte en bereide veevoer		303	Manufacture of grain mill products, starches and starch products and prepared animal feeds
Vervaardiging van ander voedselprodukte		304	Manufacture of other food products
Vervaardiging van drankke		305	Manufacture of beverages
Vervaardiging van tabakprodukte		306	Manufacture of tobacco products
Vervaardiging van tekstielstowe, klerasie en leergoedere	31		Manufacture of textiles, clothing and leather goods
Spin, weef en afwerk van tekstielstowe		311	Spinning, weaving and finishing of textiles
Vervaardiging van ander tekstielstowe		312	Manufacture of other textiles
Vervaardiging van gebreide en gehekelde materiaal en artikels		313	Manufacture of knitted and crocheted fabrics and articles
Vervaardiging van klerasie, behalwe klere van pels		314	Manufacture of wearing apparel, except fur apparel
Bewerking en kleur van pels; vervaardiging van pelsartikels		315	Dressing and dyeing of fur; manufacture of articles of fur
Lool en afwerk van leer; vervaardiging van bagasie; handsakke, saals en tufe		316	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery and harness
Vervaardiging van skoetse		317	Manufacture of footwear
Vervaardiging van hout en van produkte van hout en kurk, behalwe meubels; vervaardiging van artikels van strooi- en vlegmateriaal; vervaardiging van papier en papierprodukte; uitgewery en reprodusering van opgeneemde media	32		Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials; manufacture of paper and paper products; publishing, printing and reproduction of recorded media
Saag en skaaf van hout		321	Sawmilling and planing of wood
Vervaardiging van produkte van hout, kurk, strooi en vlegmateriaal		322	Manufacture of products of wood, cork, straw and plaiting materials
Vervaardiging van papier en papierprodukte		323	Manufacture of paper and paper products
Uitgewery		324	Publishing
Drukwerk en dienswerkseenhede verwant aan drukwerk		325	Printing and service activities related to printing
Reprodusering van opgeneemde media		326	Reproduction of recorded media
Vervaardiging van kooks, geraffineerde petroleumprodukte en kernbrandstof; vervaardiging van chemikalieë en chemiese produkte; vervaardiging van rubber- en plastiekprodukte	33		Manufacture of coke, refined petroleum products and nuclear fuel; manufacture of chemicals and chemical products; manufacture of rubber and plastic products
Vervaardiging van produkte van kooksoonde		331	Manufacture of coke oven products
Petroleumraffinaderye/-sintetiseerders		332	Petroleum refineries/synthesisers
Verwerking van kernbrandstof		333	Processing of nuclear fuel
Vervaardiging van basiese chemikalieë		334	Manufacture of basic chemicals
Vervaardiging van ander chemiese produkte		335	Manufacture of other chemical products

Titel van kategorie	Afdeling Division	Hoofgroep Major group	Title of category
Vervaardiging van kunsvesels		336	Manufacture of man-made fibres
Vervaardiging van rubberprodukte		337	Manufacture of rubber products
Vervaardiging van plastiekprodukte		338	Manufacture of plastic products
Vervaardiging van ander nie-metaalhoudende mineraalprodukte	34		Manufacture of other non-metallic mineral products
Vervaardiging van glas en glasprodukte		341	Manufacture of glass and glass products
Vervaardiging van nie-metaalhoudende mineraalprodukte n.e.g.		342	Manufacture of non-metallic mineral products n.e.c.
Vervaardiging van basiese metale, vervaardigde metaalprodukte, masjinerie en uitrusting en van kantoor-, reken- en rekenaarmasjinerie	35		Manufacture of basic metals, fabricated metal products, machinery and equipment and of office, accounting and computing machinery
Vervaardiging van basiese yster en staal		351	Manufacture of basic iron and steel
Vervaardiging van basiese edel en nie-ystermetale		352	Manufacture of basic precious and non-ferrous metals
Giet van metale		353	Casting of metals
Vervaardiging van struktuurmetaalprodukte, tanks, reservoïrs en stoomopwekkers		354	Manufacture of structural metal products, tanks, reservoirs and steam generators
Vervaardiging van ander gefabriseerde metaalprodukte; dienswerkzaamhede vir metaalwerk		355	Manufacture of other fabricated metal products; metalwork service activities
Vervaardiging van masjinerie vir algemene doeleindes		356	Manufacture of general purpose machinery
Vervaardiging van masjinerie vir spesiale doeleindes		357	Manufacture of special purpose machinery
Vervaardiging van huishoudelike toestelle n.e.c. n.e.g.		358	Manufacture of household appliances
Vervaardiging van kantoor-, boekhou- en rekenaarmasjinerie		359	Manufacture of office, accounting and computing machinery
Vervaardiging van elektriese masjinerie en apparaat n.e.g.	36		Manufacture of electrical machinery and apparatus n.e.c.
Vervaardiging van elektriese motore, generators en transformators		361	Manufacture of electric motors, generators and transformers
Vervaardiging van elektrisiteitsverspreidings- en beheerapparaat		362	Manufacture of electricity distribution and control apparatus
Vervaardiging van geïsoleerde draad en kabel		363	Manufacture of insulated wire and cable
Vervaardiging van akkumulators, primêre selle en primêre batterye		364	Manufacture of accumulators, primary cells and primary batteries
Vervaardiging van elektriese lampe en verligtingsuitrusting		365	Manufacture of electric lamps and lighting equipment
Vervaardiging van ander elektriese uitrusting n.e.g.		366	Manufacture of other electrical equipment n.e.c.
Vervaardiging van radio-, televisie- en kommunikasie-uitrusting en apparaat en van mediese, presisie- en optiese instrumente, horlosies en uurwerke	37		Manufacture of radio, television and communication equipment and apparatus and of medical, precision and optical instruments, watches and clocks
Vervaardiging van elektroniese lampe en buise en ander elektroniese komponente		371	Manufacture of electronic valves and tubes and other electric components

Titel van kategorie	Afdeling Division	Hoofgroep Major group	Title of category
Vervaardiging van televisie- en radio-senders en apparaat vir lyntelefonie en lyntelegrafie		372	Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy
Vervaardiging van televisie- en radio-ontvangstoestelle, klank- en video opname- of reproduksie-apparaat en verwante goedere		373	Manufacture of television and radio receivers, sound or video recording or reproducing apparatus and associated goods
Vervaardiging van mediese toestelle en instrumente en toestelle vir meet-, kontrole-, toets-, navigasie- en ander doeleindes, behalwe optiese instrumente		374	Manufacture of medical appliances and instruments and appliances for measuring, checking, testing, navigating and other purposes, except optical instruments
Vervaardiging van optiese instrumente en fotografiese uitrusting		375	Manufacture of optical instruments and photographic equipment
Vervaardiging van horlosies en uurwerke		376	Manufacture of watches and clocks
Vervaardiging van vervoeruitrusting	38		Manufacture of transport equipment
Vervaardiging van motorvoertuie		381	Manufacture of motor vehicles
Vervaardiging van bakwerk vir motorvoertuie; vervaardiging van sleepwaens en leunwaens		382	Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers
Vervaardiging van onderdele en toebehore vir motorvoertuie en hulle enjins		383	Manufacture of parts and accessories for motor vehicles and their engines
Bou en herstel van skepe en bote		384	Building and repairing of ships and boats
Vervaardiging van spoorweg- en tramweglokomotiewe en rollende materiaal		385	Manufacture of railway and tramway locomotives and rolling stock
Vervaardiging van vliegtuie en ruimtetuie		386	Manufacture of aircraft and space craft
Vervaardiging van vervoeruitrusting n.e.g.		387	Manufacture of transport equipment n.e.c.
Vervaardiging van meubels; vervaardiging n.e.g.; herwinning	39		Manufacture of furniture; manufacturing n.e.c.; recycling
Vervaardiging van meubels		391	Manufacture of furniture
Vervaardiging n.e.g.		392	Manufacture n.e.c.
Herwinning n.e.g.		395	Recycling n.e.c.
<u>HOOFAFDELING 4: ELEKTRISITEIT-, GAS- EN WATERVOORSIENING</u>			<u>MAJOR DIVISION 4: ELECTRICITY, GAS AND WATER SUPPLY</u>
Elektrisiteit-, gas-, stoom- en warmwatervoorsiening	41		Electricity, gas, steam and hot water supply
Produksie, versameling en verspreiding van elektrisiteit		411	Production, collection and distribution of electricity
Vervaardiging van gas; verspreiding van gasagtige brandstof deur hoofleidings		412	Manufacture of gas; distribution of gaseous fuels through mains
Stoom- en warmwatervoorsiening		413	Steam and hot water supply
Versameling, suiwering en verspreiding van water	42	420	Collection, purification and distribution of water
<u>HOOFAFDELING 5: KONSTRUKSIE</u>			<u>MAJOR DIVISION 5: CONSTRUCTION</u>
Konstruksie	50		Construction
Terreinvoorbereiding		501	Site preparation

Titel van kategorie	Afdeling Division	Hoofgroep Major group	Title of category
Bou van volledige konstruksies of dele daarvan; siviele ingenieurswese		502	Building of complete constructions or parts thereof; civil engineering
Bouinstallasie		503	Building installation
Bouafwerking		504	Building completion
Verhuur van konstruksie- of slopings- uitrusting met bestuurders/bedieners		505	Renting of construction or demolition equipment with operators
<u>HOOFAFDELING 6: GROOT- EN KLEINHANDEL; HERSTEL VAN MOTORVOERTUIG, MOTORFIETSE EN PERSOONLIKE EN HUISHOUDELIKE GOEDERE; HOTELLE EN RESTAURANTE</u>			<u>MAJOR DIVISION 6: WHOLESALE AND RETAIL TRADE; REPAIR OF MOTOR VEHICLES, MOTOR CYCLES AND PERSONAL AND HOUSEHOLD GOODS; HOTELS AND RESTAURANTS</u>
Groothandel en kommissiehandel, behalwe van motorvoertuie en motorfietse	61		Wholesale and commission trade, except of motor vehicles and motor cycles
Groothandel op 'n vergoeding- of kontrakbasis		611	Wholesale trade on a fee or contract basis
Groothandel in onverwerkte landbou- materiaal, lewende hawe, voedsel, drank en tabak		612	Wholesale trade in agricultural raw materials, livestock, food, beverages and tobacco
Groothandel in huishoudelike goedere		613	Wholesale trade in household goods
Groothandel in nie-landbou interme- diere produkte en afval		614	Wholesale trade in non-agricultural intermediate products, waste and scrap
Groothandel van masjinerie, toerusting en voorraad		615	Wholesale trade in machinery, equipment and supplies
Ander groothandel		619	Other wholesale trade
Kleinhandel, behalwe motorvoertuie en motorfietse, herstel van huishoudelike en persoonlike goedere	62		Retail trade, except of motor vehicles and motor cycles; repair of personal household goods
Niegespesialiseerde kleinhandel in winkels		621	Non specialised retail trade in stores
Kleinhandel in voedsel, drank en tabak in gespesialiseerde winkels		622	Retail trade in food, beverages and tobacco in specialised stores
Ander kleinhandel in nuwe goedere in gespesialiseerde winkels		623	Other retail trade in new goods in specialised stores
Kleinhandel in tweedehandse goedere in winkels		624	Retail trade in second-hand goods in stores
Kleinhandel nie in winkels nie		625	Retail trade not in stores
Herstel van persoonlike en huishoudelike goedere		626	Repair of personal and household goods
Verkope, instandhouding en herstel van motorvoertuie en motorfietse; kleinhandel in brandstof	63		Sale, maintenance and repair of motor vehicles and motor cycles; retail trade in automotive fuel
Verkope van motorvoertuie		631	Sale of motor vehicles
Instandhouding en herstel van motorvoertuie		632	Maintenance and repair of motor vehicles
Verkope van motorvoertuigonderdele en -toebehore		633	Sale of motor vehicle parts and accessories
Verkope, instandhouding en herstel van motorfietse en verwante onderdele en toebehore		634	Sale, maintenance and repair of motor cycles and related parts and accessories
Kleinhandelverkope van motorbrandstof		635	Retail sale of automotive fuel

Titel van kategorie	Afdeling Division	Hoofgroep Major group	Title of category
Hotelle en restaurante	64		Hotels and restaurants
Hotelle, kampeerterreine en ander voor- siening vir kortverblyfakkomodasie		641	Hotels, camping sites and other provision of short-stay accommodation
Restaurante, kroëe en kantiene		642	Restaurants, bars and canteens
<u>HOOFAFDELING 7: VERVOER, OPBERGING EN KOMMUNIKASIE</u>			<u>MAJOR DIVISION 7: TRANSPORT, STORAGE AND COMMUNICATION</u>
Landvervoer; vervoer per pylleiding	71		Land transport; transport via pipelines
Spoonwegvervoer		711	Railway transport
Ander landvervoer		712	Other land transport
Vervoer per pylleiding		713	Transport via pipelines
Watervervoer	72		Water transport
See- en kuswatervervoer		721	Sea and coastal water transport
Binnelandse watervervoer		722	Inland water transport
Lugvervoer	73	730	Air transport
Ondersteunende en hulpwerkzaamhede verwant aan vervoer; werksaamhede van reisagente	74	741	Supporting and auxiliary transport activities; activities of travel agencies
Pos en telekommunikasies	75		Post and telecommunications
Pos- en verwante koerierwerksaamhede		751	Postal and related courier activities
Telekommunikasie		752	Telecommunications
<u>HOOFAFDELING 8: FINANSIËLE TUSSENGANGS- VERSEKERINGS-, VASTE-EIENDOMS- EN BESIG- HEIDSDIENSTE</u>			<u>MAJOR DIVISION 8: FINANCIAL INTERMEDIA- TION, INSURANCE, REAL ESTATE AND BUSINESS SERVICES</u>
Finansiële tussengang, behalwe verseke- rings en pensioenbefondsing	81		Financial intermediation, except in- surance and pension funding
Monetêre tussengang		811	Monetary intermediation
Ander finansiële tussengang n.e.g.		819	Other financial intermediation n.e.c.
Versekerings- en pensioenbefondsing, behalwe verpligte bestaansbeveiliging	82	821	Insurance and pension funding, except compulsory social security
Hulpwerkzaamhede vir finansiële tussengang	83		Activities auxiliary to financial intermediation
Hulpwerkzaamhede vir finansiële tussen- gang, behalwe versekerings- en pensioen- befondsing		831	Activities auxiliary to financial intermediation, except insurance and pension funding
Hulpwerkzaamhede vir versekerings- en pensioenbefondsing		832	Activities auxiliary to insurance and pension funding
Vaste-eiendomswerksaamhede	84		Real estate activities
Vaste-eiendomswerksaamhede met eie of gehuurde eiendom		841	Real estate activities with own or leased property
Vaste-eiendomswerksaamhede op 'n ver- goedings- of kontrakbasis		842	Real estate activities on a fee or contract basis
Verhuur van masjinerie en uitrusting, sonder bedieners, en van persoonlike en huishoudelike goedere	85		Renting of machinery and equipment, without operator, and of personal and household goods
Verhuur van vervoeruitrusting		851	Renting of transport equipment

Titel van kategorie	Afdeling Division	Hoofgroep Major group	Title of category
Verhuur van ander masjinerie en uitrusting		852	Renting of other machinery and equipment
Verhuur van persoonlike en huishoudelike goedere n.e.g.		853	Renting of personal and household goods n.e.c.
Rekenaar- en verwante werksaamhede	86		Computer and related activities
Apparatuurraadgewing		861	Hardware consultancy
Programmatuurraadgewing en -voorsiening		862	Software consultancy and supply
Dataverwerking		863	Data processing
Databasiswerksaamhede		864	Data base activities
Instandhouding en herstel van kantoor-, boekhou- en rekenaar masjinerie		865	Maintenance and repair of office, accounting and computing machinery
Ander rekenaarverwant werksaamhede		869	Other computer related activities
Navorsing en ontwikkeling	87		Research and development
Navorsing en eksperimentele ontwikkeling i.v.m. natuurwetenskappe en ingenieurswese		871	Research and experimental development of natural sciences and engineering
Navorsing en eksperimentele ontwikkeling i.v.m. sosiale en geesteswetenskappe		872	Research and experimental development of social sciences and humanities
Ander besigheidswerksaamhede	88		Other business activities
Regs-, rekening-, boekhou- en ouditeringsdienste; belastingkonsultering; marknavorsing en openbare meningspeiling; besigheids- en bestuurskonsultering		881	Legal, accounting, bookkeeping and auditing activities; tax consultancy; market research and public opinion research; business and management consultancy
Argitek-, ingenieurs- en ander tegniese werksaamhede		882	Architectural, engineering and other technical activities
Reklame		883	Advertising
Besigheidswerksaamhede n.e.g.		889	Business activities n.e.c.
<u>HOOFAFDELING 9: GEMEENSKAPS-, MAATSKAP- LIKE EN PERSOONLIKE DIENSTE</u>			<u>MAJOR DIVISION 9: COMMUNITY, SOCIAL AND PERSONAL SERVICES</u>
Publieke-administrasie en verdedigingswerksaamhede	91		Public administration and defence activities
Sentrale-owerheidswerksaamhede		911	Central government activities
Streeksdiensradewerksaamhede		912	Regional services council activities
Plaaslike-owerheidswerksaamhede		913	Local authority activities
Onderwys	92		Education
Onderwysdienste		920	Educational services
Gesondheids- en maatskaplike werk	93		Health and social work
Mensgerigte gesondheidswerksaamhede		931	Human health activities
Veeartsenywerksaamhede		932	Veterinary activities
Maatskaplikewerk-werksaamhede		933	Social work activities
Ander gemeenskaps-, maatskaplike en persoonlike werksaamhede	94		Other community, social and personal service activities

Titel van kategorie	Afdeling Division	Hoofgroep Major group	Title of category
Riool- en vuilnisverwydering, sanitasie en soortgelyke werksaamhede		940	Sewage and refuse disposal, sanitation and similar activities
Herksaamhede van lede-organisasies n.e.g.	95		Activities of membership organisations n.e.g.
Herksaamhede van besigheds-, werkgewers- en professionele organisasies		951	Activities of business, employers' and professional organisations
Herksaamhede van vakverenigings		952	Activities of trade unions
Herksaamhede van ander lede-organisasies		959	Activities of other membership organisations
Ontspannings-, kulturele en sportwerksaamhede	96		Recreational, cultural and sporting activities
Rolprent-, radio-, televisie- en ander vermaaklikheidswerksaamhede		961	Motion picture, radio, television and other entertainment activities
Nuusagentskapwerksaamhede		962	News agency activities
Biblioteek-, argief-, museum- en ander kulturele werksaamhede		963	Library, archives, museums and other cultural activities
Sport- en ander ontspanningswerksaamhede	964		Sporting and other recreational activities
Ander dienswerksaamhede	99	990	Other service activities
<u>HOOFAFDELING 0: PRIVATE HUISHOUDINGS, EKSTERRITORIALE ORGANISASIES, VERTEENWOORDIGERS VAN BUITELANDSE REGERINGS EN ANDER WERKSAMHEDE NIE VOLDOENDE OMSKRYF NIE</u>			<u>MAJOR DIVISION 0: PRIVATE HOUSEHOLDS, EXTERRITORIAL ORGANISATIONS, REPRESENTATIVES OF FOREIGN GOVERNMENTS AND OTHER ACTIVITIES NOT ADEQUATELY DEFINED</u>
Private huishoudings met persone in diens	01	010	Private households with employed persons
Eksterritoriale organisasies	02	020	Exterritorial organisations
Verteenwoordigers van buitelandse regerings	03	030	Representatives of foreign governments
Ander werksaamhede nie voldoende omskryf nie	09	090	Other activities not adequately defined



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Annex-2 Estimation of Dimensions of Rural Electrification

The Study Team had difficulty in carrying out the rural forecast in the first stage of the Study because information on rural electrification was scarce.

Therefore the number of future connections which would be the basis for the rural forecast was attained in the following process:

- A realistic estimate was made for the number of connections per annum up to the year 2015 for the various sub-sectors namely housing, schools, clinics, etc.
- This was based on a number of parameters, such as demographics, cost estimates, economic viability and funding.
- Cost estimates were made base on model of typical centres, representative of the different rural areas in the country, actually a model settlement in the northern rural areas and the central/southern rural areas.

A text of "chapter 6 electricity demand forecast" has been revised at a later stage based on additional information provided by MME. There are some small disparities between the chapter 6 and this annex. However the annex can be still very useful in some cases, although it was prepared for the rural forecast. So it dares to be attached for a reference.

Estimation of Dimensions of Rural Electrification in Namibia

Revised June 17, 1997

JICA Study Team

1. 1991 Census

The following three tables which constitute the basic frame for the rural electrification planning are based on the 1991 Population and Housing Census, Report B.

2. Number of electrified households

The 1991 Census gives urban and rural number of households of each region but no number of electrified households. This electrified number was estimated via Housing conditions, per cent; Households with Electricity for lighting for each region only (no urban/rural) in 1991 Census. It should be noted that this number would include diesel power generation supply on top of grid electricity supply.

3. Urban areas in Census Report B

Urban areas are all Government-proclaimed municipalities and towns. All other localities proclaimed as villages and other settlements constitute rural areas. Localities proclaimed as municipalities and towns are as follows:

<u>Municipalities (15)</u>	<u>Towns (12)</u>
Swakopmund	Henties Bay
Windhoek	Luderitz
Gobabis	Okakarara
Grootfontein	Ondangwa
Karibib	Ongwediva
Karasburg	Opuwo
Keetmanshoop	Oshakati
Mariental	Rehoboth
Okahandja	Katima Mulilo
Omaruru	Rundu
Otavi	Khorixas
Otjiwarongo	
Arandis	
Outjo	
Tsumeb	The Walvis Bay municipality has about 21,000
Usakos	inhabitants, and about 4,000 households.
(Walvis Bay)	It was not included in 1991 Census.

Table 1 Number of Households by REGION 1991 Census & Estimated Electrified One

Region	Total region Enumerated population	Households population	Number of households	Electricity for lighting	* Electrified households	Average per capita income N\$
Caprivi	90422	87276	18061	0.05	903	1338
Erongo	55470	50538	13453	0.53	6987	4701
Hardup	66495	62095	13358	0.3	4007	5153
Karas	61100	51452	12046	0.41	4939	5758
Khomas	167071	157019	33662	0.78	25731	9995
Kunene	64017	56778	12460	0.16	1994	1864
Ohangwena	179634	175139	28427	0.01	284	863
Okavango	116830	110751	17831	0.05	892	1459
Omaheke	52735	43706	9500	0.22	2090	3341
Omusati	189919	183492	30882	0.01	309	1204
Oshana	134884	126677	22190	0.08	1775	1577
Oshikoto	128745	123560	21426	0.14	3000	1406
Otjozondjupa	102536	90452	21093	0.39	8144	3126
NAMIBIA	1409920	1318935	254389	0.24	61053	3031
Rural		969184	180519			1550
Urban		349751	73870			6676

*: Estimated number

Table 2 Number of Households by URBAN 1991 Census & Estimated Electrified One

Region	Urban			
	Household population	Number of households	*Electrified households	Average number of persons per household
Caprivi	12654	2705	750	4.7
Erongo	32564	8687	5913	3.7
Hardup	27635	5027	3322	5.5
Karas	20335	4394	3734	4.6
Khomas	139543	28716	22980	4.9
Kunene	7538	1889	1653	4
Ohangwena	-	-	-	-
Okavango	18185	3169	740	5.7
Omaheke	7608	1606	1540	4.7
Omusati	-	-	-	-
Oshana	27806	6037	1472	4.6
Oshikoto	14094	3014	2488	4.7
Otjozondjupa	41789	8626	6821	4.8
Total	349751	73870	70% 51413	4.7

*: Estimated number

Table 3 Number of Households by RURAL 1991 Census & Estimated Electrified

Rural					
	Household population	Number of households	*Electrified households	Average number of persons per households	*Unelectrified households
Caprivi	74622	15356	82	4.9	15274
Erongo	17974	4766	657	3.8	4109
Hardup	34460	8331	370	4.1	7961
Karas	31117	7652	4923	4.1	2729
Khomas	17476	4946	1210	3.5	3736
Kunene	49240	10571	184	4.7	10387
Ohangwena	175139	28427	262	6.2	28165
Okavango	92566	14662	82	6.3	14580
Omaheke	36098	7894	386	4.6	7508
Omusati	183492	30882	285	5.9	30597
Oshana	98871	16153	164	6.1	15989
Oshikoto	109466	18412	277	5.9	18135
Otjozondjupa	48663	12467	758	3.9	11709
Total	969184	180519	5.3% 9640	5.4	170879

*:Estimated number

4. Number of rural households in 2015

The population figures from the 1991 Census are reliable. The population figures from the 1993/94 National Housing Survey are less reliable. This is because they extrapolated from a sample of about 4,000 households.

The "Provisional Population Projections 1991 - 2011" document provides more accurate annual growth forecast, at about 3% per annum for the whole country, and is considered to be the most reliable information available. The NDP1 document mentions an urbanization rate of 5.5% (page 6), and expects this to continue for at least 10 years (page 120). Windhoek had experienced urban growth rates of 5.44% from 1990 to 1995 (1995 Residents Survey Report) and expect this to increase to 2000 and then decrease slightly. We therefore assume national population growth according to Provisional Population Development of about 3%, and urban growth of at least 5%, possibly 5.5% for the next 20 years.

Table 4 Number of Rural Households in 2015

<u>Growth Rate</u>							Total
	1991 ---	2003 ---	2009 ---	2015			
Total, annual	3.1%	3.0%	2.9%				
		1.031 ¹² x	1.03 ⁶ x	1.029 ⁶			= 2.044
Urban, annual	5%	5%	5%				
				1.05 ²⁴			= 3.225
	<u>1991</u>			<u>2015</u>			
<u>Population</u>							
Enumerated		1,409,920	x 2.044				2,881,876
Institutional		90,985	x 2.044				185,973
Urban Households		349,751	x 3.225				1,127,947
Rural Households		969,184					1,567,956
<u>Households</u>							
Total		254,389					530,455
Urban		73,870	(1,127,947 ÷ 4.73)				238,467
Rural		180,519	(1,567,956 ÷ 5.37)				291,988

5. Number of rural households electrified after 1991

(a) Owambo rural electrification programme

This programme commenced in 1991, completed in 1995 and supplied grid electricity to 76 rural settlements in the former Owambo region of Northern Namibia. Total costs for the entire programme are N\$37 million (1995 terms), of which two-third has been paid by NORAD grant.

There are 270 billed and 1507 prepayment consumers on MRLGH's system. Government and parastatal institutions such as schools, clinics, hospitals, police stations, post offices, other government offices, pumps & DWA, Telecom, and larger shops and mission stations are billed customers, whereas a few small shops and mostly households are on a prepayment metered system. Number of prepayment consumers is regarded as that of households. An average cost per connection is 37 million ÷ (270+1507)=N\$20,800.

The initial concept of the programme was to supply grid electricity to the principal rural centres, primarily for the use of public facilities. Most of the larger settlements have now been connected to the grid, although the majority of households, dispersed through region, do not have an electricity supply. It could be realized that electrification of these dispersed settlements will be more costly (less viable) than the larger settlements that are already electrified.

[Source: Review of the Owambo Rural Electrification Programme, October 1996, EDRC]

(b) Southern Namibia rural electrification programme

The rural electrification programme started in Owambo in 1991 is presently in progress for 17 rural centres in Southern Namibia. The Namibian government is committed to continue with the rural electrification programme during the period 1995-2000.

Phase 1 of the Southern Namibian rural electrification project including four villages of Kalkrand, Hoachanas, Berseba and Kosis was completed in April 1996. Phase 2 of the project is currently in progress, with four villages of Khomnarib, Klein Vaalgras, Koichas and Blouwes being electrified. Nine larger villages remaining to be electrified as Phase 3 for which feasibility analysis was conducted are Aroab, Koës, Warmbad, Aus, Rietoog, Schlip, Duineveld, Tsumipark and Dordabis.

It is assumed that phase 1 of the project constitutes 120 connections of socio-economic institutions and 370 connections of households. Its construction costs are N\$4.01 million (1995 terms). Phase 2 of the project constitutes 22 connections of socio-economic institutions and 110 connections of households. Its construction costs are N\$3.82 million (1996 terms). Phase 3 of the project constitutes 125 connections of socio-economic institutions and 1400 connections of households. Its construction costs are N\$10.2 million.

Total number of connections of socio-economic institutions is 267 (=120+22+125). Total number of households connections is 1880 (=370+110+1400). Total construction costs are N\$18.03 million (=4.01+3.82+10.2 million). An average cost per connection is N\$8,400 (=18.03 million ÷ (267+1880)).

(c) Total number of electrified rural households

Latest Northern Electricity's statistics shows the following number of rural customers actually connected to the grid:

	<u>Conventional meter</u>	<u>Pre-payment meter</u>
Owambo	738	2,900
Kavango	1,164	1,009
Caprivi	24	571
(Southern Namibia)*	267	1,880
Total	2,193	6,360

* comes from Item 5.(b)

Prepayment meter is considered private household and assumed to have been connected after 1991. Conventional meter is considered socio-economic institution.

[Source: Phase 3; Feasibility Analysis, Rural Electrification of Southern Namibia, July 1996]

6. Number of households attained access to national grid by 1998

The term 'electrified' here includes supplied by diesel generators. Almost all government and social institutions in larger rural centres in the non-electrified areas and some household there had been supplied by diesel generators. However, number of the latter households seems to be very small. It is assumed that 10% of electrified rural households had independent supply before the rural electrification programme started.

Thus we gain the true number of electrified rural households attained access to grid excluding diesel generators supply after the southern Namibia electrification project, maybe in 1998.

Electrified rural households in 1991	9,640
Households electrified via diesel generators , 10% of above	-964
Newly electrified households after 1991	6,360
Total, maybe in 1998	15,036

7. Ultimate target of rural electrification

In order to avoid a confusion in the planning, ultimate target of rural electrification should, in unmistakable terms, be defined as follows:

To provide rural households non-electrified or supplied by diesel generators with access to electricity grid, aiming at 90% coverage of the entire rural households by the year 2015. Namely,

90% of the entire rural households in 2015 (291,988 x 0.9=) 262,789 (90.0%)

Total number of truly electrified rural households in 1998 -15,036 (5.1%)

Total number of rural households to be electrified hence Sum 247,753 (84.9%)

The ultimate figure of 90% coverage is meant to be an imaginary one so as to look through the possible maximum impact to various factors.

8. Number of localities by population size

Next table gives a pattern of settlements largely composed of small localities. About 88% of all localities belong to the smallest category, that is with 200 people or less. These cover all together about 22% of the population. In view of the fact that 27 municipalities and towns, and probably dispersed smallest settlements of 10% of rural households (approximately 96,900 people) are out of a target of the rural electrification, and priority targets for current electrification project are socio-economic centers in larger or medium-sized settlements (93 settlements), 500-600 people could be an average size per settlement for the rural electrification planning.

Table 5 Number of Localities by Population Size

Locality Size	All localities	Less than 200 people	200 ~ 499	500 ~ 999	1000 ~ 1999	2000 ~ 4999	5000 ~ 9999	10000 ~ 19999	20000 and more
Localities									
Number	10953	9592	866	338	106	31	7	9	4
%	100	88	8	3	1	0.3	0.1	0.1	0.04
Population									
%	100	22	19	16	10	7	4	10	12
Number	1409920	306966	274105	232177	139479	92812	52502	140680	171199

[Source' 1991 Population and Housing Census)

9. Health Facilities by Type, December 1995

CSO's Statistical Abstract 1996 presents the following data:

<u>Whole country</u>	<u>Number, 1995</u>
Hospitals	41
Health centres	32
Clinics	224
(Number of households)	(244,828)

It seems that hospitals/health centres are located in large localities at present. It is not likely that they are installed in small localities in the near future, although they are rapidly being extended. Clinics are sparsely distributed in the ratio of one clinic to 1,100 households (both urban and rural). In practice, clinics may be upgraded to health centres if the size of the local centres warrants it. A rural clinic only opens during the day. Its statistics is not available.

10. Distribution of Schools, 1995

CSO's Statistical Abstract 1996 presents the following data:

<u>Whole country</u>	<u>Number, 1995</u>
Schools	1,372
Pupils	466,000
Teachers	16,007
Pupil/teacher ratio	29

Schools are distributed in the ratio of one school to 180 households (both urban and rural).

11. Billed connections in Owambo project

EDRC's report "Review of the Owambo Rural Electrification Programme" presents the following data for phases one and two only (42 settlements):

Customer	Number	(Number per settlement)
Schools	66	1.6
Clinics	20	0.5
Hospitals	8	0.2
Police stations	8	0.2
Post offices	3	0.07
Other government offices	16	0.4
Pumps & DWA	21	0.5
Telecom	21	0.5
Missions & churches	9	0.2
Private consumers	47	1.1
Others	6	0.1
Total	228	5.4

Above table presents the number of customers on conventional meters for phase one and two. Besides there are 1507 prepayment metered customers. The number of settlements supplied with electricity is 42 after phase two. An average number of the billed consumers per settlement is 5.4 and an average number of households per settlements is estimated to be $37\{(1507+47)/42\}$. Although population or number of households is not available for the settlements electrified in the project, it is supposed that an average size of the settlements is of 300 ~ 400 population.

12. Major dimensions on southern Namibia rural electrification; Phase 3

The following table is a list of major dimensions of planning summarized from MME's Feasibility Analysis, Rural Electrification of Southern Namibia, Phase. This provides with useful information for a model of typical rural centres in our rural electrification planning.

Table 6 Major dimensions on southern Namibia rural electrification: Phase 3 (ENLARGED)

	Aroab	Koes	Wambud	Aus	Rietvog	Schlip	Duineveld	Tsumpak	Dordabis	Total
Population	4000	3500	300	2500	400	2500	2500	300	1500	17700
(Description in No.)										
Private Enterprises	8	8	3	5	2	11	5	1	4	47
Govern. Institutions	6	7	6	9	2	2	2	1	3	38
(Clinics included)	0	1	1	1	1	1	1	0	1	7
Semigov. Institut.	4	3	3	4	1	1	1	1	3	19
Schools + Hostels	3	3	1	2	1	3	1	1	1	16
Churches	3	2	3	3	1	3	2	1	1	18
Formal Houses	120	40	50	30	30	70	30	15	30	415
Informal Houses	200	250	100	200	50	100	15	30	100	1045
No. of connections	258	312	83	245	98	190	55	55	142	1438
Being supplied via	Diesel	Diesel	Diesel	Diesel	None	Diesel	Diesel	None	Diesel	-
MV 11kV line [km]	2.1	4.5	2.1	3.5	1.9	3.5	2	0.7	2.5	22.8
LV conductor [km]	7.5	10.25	4.5	7	4	13.8	3.5	2	5	57.55
Trans 200, 100kVA	3. 2	3. 3	1. 2	2. 3	0. 2	2. 3	1. 2	0. 2	1. 1	13. 20
Trans 50, 25kVA	0. 0	1. 0	0. 0	0. 1	1. 0	1. 0	0. 0	0. 0	0. 1	3. 2
(Capital costs)										
MV+LV [N\$000]	1530	1930	720	1470	700	1750	560	430	790	9880
Per connection[N\$]	5900	6200	8700	6000	7100	9200	10200	7800	5600	6870
Feeder line[N\$000]	4310	4310	1020	2870	600	1670	420	420	2000	17630
ditto [km]	110	70	40	10	25	20	-	-	-	-

[N\$ in 1996 terms]

Table 6 Major dimensions on southern Namibia rural electrification: Phase 3 (ENLARGED)

	Aroab	Koos	Wammbad	Aus	Rietvlei	Schlip	Duineveld	Tsumipark	Dordabis	Total
Population	4000	3500	500	2500	4000	2500	2500	3000	1500	17700
(Description in No.)										
Private Enterprises	8	8	3	5	2	11	5	1	4	47
Govern. Institutions	6	7	6	9	2	2	2	1	3	38
(Clinics included)	0	1	1	1	1	1	1	0	1	7
Semigov. Institut.	4	3	3	4	1	1			3	19
Schools + Hostels	3	3	1	2	1	3	1	1	1	16
Churches	3	2	3	3	1	3	2	-	1	18
Formal Houses	120	40	50	30	30	70	30	15	30	415
Informal Houses	200	250	300	200	50	100	15	30	100	1045
No. of connections	258	312	83	245	98	190	55	55	142	1438
Being supplied via	Diesel	Diesel	Diesel	Diesel	None	Diesel	Diesel	None	Diesel	-
MV 11kV line [km]	2.1	4.5	2.1	3.5	1.9	3.5	2	0.7	2.5	22.8
LV conductor [km]	7.5	10.25	4.5	7	4	13.8	3.5	2	5	57.55
Trans 200, 100kVA	3.2	3.3	1.2	2.3	0.2	2.3	1.2	0.2	1.1	13.20
Trans 50, 25kVA	0.0	1.0	0.0	0.1	1.0	1.0	0.0	0.0	0.1	3.2
(Capital costs)										
MV+LV [NS000]	1530	1930	720	1470	700	1750	560	430	790	9880
Per connection [NS]	5900	6200	8700	6000	7100	9200	10200	7800	5600	6870
Feeder line [NS000]	4310	4310	1030	2870	600	1670	420	420	2000	17630
ditto [km]	110	70	40	10	25	20	-	-	-	-

[NS in 1996 terms]

13. A model of typical rural settlement

There is some difference between northern rural areas and central/southern rural areas in terms of per capita income, persons per household and population density. However, it is difficult to, from the statistical data, tell the difference in a model of typical rural electrification schemes, representative of the different rural areas in the country.

As discussed in Item 8, 500 ~ 600 could be an average size per settlement for the planning. Therefore we get 100 households could be the typical size for a model settlement from 5.4 of an average number of persons per rural households in the entire country.

(a) Consumers and the number

It is assumed from the similar sized settlements that the model settlement includes the following consumers:

	Northern	Central/Southern
Households	100	100
Population	600	410
Schools	2	1
Clinics	1	1
Government facilities	2	3
Churches	1	1
Shops	1	2
Sum, billed consumers	7	8
Prepaid consumers	100	100

(b) Model and capital for MV+LV distribution systems

	DMD	kWh/month	Number	Total ADMD	Annual kWh
Category 1	1.5 kW	250	10 (10)	15 kW (15 kW)	30,500 (30,500)
Category 2	0.8 kW	80	90 (90)	72 kW (72 kW)	86,400 (86,400)
Category 3	3 kW	400	7 (8)	21 kW (24 kW)	33,600 (38,400)
Total			107 (108)	108 kW (111 kW)	150,500 (155,300)

Total kW ÷ diversity factor 1.175 → 94kW

(): Figures for Central/Southern

	Unit rate N\$	Quantity	Total N\$
MV 11 kV line reticulation	30,000/km	2.0 km	60,000
ABC LV conductor	45,000/km	3.5km	157,000
Transformer - 100 kVA	25,000	1	25,000
Transformer - 50 kVA	20,000	2	40,000
1 phase meter connections	3,000	107 (108)	321,000 (324,000)
Total			N\$603,000 (606,000)

[Costs: in 1996 dollar terms] Demand factor is 50% and normal.

These figures are provisional to see an outlook, subject to further studies. We tentatively got $N\$603,000 \div 107 = N\$5,600$ per overall connection ($N\$603,000 \div 100 = N\$6,000$ per household connection), excluding NamPower capital cost for link to the national grid.

(c) Model and capital for 33/22kV feeder (NamPower link to the grid)

More than 150 settlements are located in Owambo within a radius of 60 km of a substation while 20 settlements are located on an average in central/southern areas. An eight-70km-feeder reticulation can cover the whole range in Owambo, then we get 4km of average span of feeders ($8 \times 70\text{km} \div 150 = 4\text{km}$). Also in central/southern areas we get 12km of average span ($3 \times 80\text{km} \div 20 = 12\text{km}$). By the way population density is 11.9 persons/km² in Owambo, and 0.2 ~ 0.7 persons in central/southern areas. Economies of scale can be expected in the regard in the comprehensive rural electrification programme. NamPower is extending distribution systems with capital cost of N\$900 million for at least 30 years.

Capital cost for 33/22kV feeder per settlement	Northern	Central/Southern
33/22kV feeder @N\$22,000/km x 4km (12km)	88,000	(264,000)
SS with trans. MV/11kV	150,000	(150,000)
Total	N\$238,000	(N\$414,000)
 (Capital for MV + LV system)	 603,000	 (606,000)
 (Grand total)	 841,000	 (1,020,000)

We tentatively got $N\$841,000 \div 107 = N\$7,900$ per overall connection and $N\$841,000 \div 100 = N\$8,400$ per households for northern areas, and $N\$1,020,000 \div 108 = N\$9,400$ per overall connection and $N\$1,020,000 \div 100 = N\$10,000$ per households for central/southern areas, including NamPower capital cost for link to the national grid.

14. Summary of a model of typical rural settlement

A model settlement	Northern	Central/Southern
Households	100	100
Population	600	410
Households connections	100	100
Overall connections	107	108
Connections other than households	7	8
Schools	2	1
Clinics	1	1
Government facilities	2	3
Churches	1	1
Shops	1	2
Total ADMD [kW]	94	94
Annual energy consumption [kWh]	150500	155300
MV 11kV line [km]	2	2
ditto [N\$]	60000	60000
ABC LV conductor [km]	35	35
ditto [N\$]	157000	157000
Transformers - 100kVA [bank]	1	1
ditto [N\$]	25000	25000
Transformers - 50kVA [bank]	2	2
ditto [N\$]	40000	40000
Meter connections [N\$]	321000	324000
Distribution systems - Total [N\$]	603000	606000
Cost per overall connection [N\$]	5600	5600
Cost per households connection [N\$]	6000	6000
33/22kV feeder [km]	4	12
ditto [N\$]	88000	264000
Transformers, MV/11kV [N\$]	150000	150000
Nam Power capital - Total [N\$]	238000	414000
Grand total [N\$]	841000	1020000
Cost per overall connection [N\$]	7900	9400
Cost per households connection [N\$]	8400	11000

[Subject to further studies, N\$ at 1996 terms]

54,4% of total unelectrified rural households exist in the northern rural areas of Ohangwena, Omusati, Oshana and Oshikoto regions. Ultimate target in the rural electrification planning - 248,000 households are broken down into the following equivalent model settlements:

	Northern	Central/Southern
Target households number 248,000	135,000	113,000
Equivalent model settlements 2,480	1,350	1,130

Total capital costs for plural settlements are calculated pro rata. Total capital cost for the ultimate target electrification will be;

$$\begin{array}{r}
 \text{N\$ } 841,000 \times 1,350 = \text{N\$ } 1,135,350,000 \\
 \text{N\$ } 1,020,000 \times 1,130 = \text{N\$ } 1,152,600,000 \\
 \hline
 \text{Total} \qquad \qquad \qquad \text{N\$ } 2,287,950,000
 \end{array}$$

Total load for the ultimate target electrification will be;

$$94\text{kW} \times 2,480 \times 1.15 \text{ (loss)} + 1.023 \text{ (diversity factor)} = 262,000 \text{ kW}$$

15. Preliminary economic assessment

An assessment of the genuine economy (without donation or subsidy) of a model settlement is fundamental to any understanding of the rural electrification nature. We tentatively assess the genuine economy of a model settlement in central/southern areas which seems to be nearer to a real one. NamPower feeder lines are included in capital costs calculation (not in the extension charges).

Annual expenditure and revenue

An example of a typical Central/Southern rural settlement is shown here.

Depreciation for 25 years		$\text{N\$}1,020,000 \times 0.04 = 40,800$
Interest on capital		$\text{N\$}1,020,000 \times 0.07 = 71,400$
NamPower demand charge		$\text{N\$}33.15 \times 12 \times 94 = 37,400$
NamPower unit charge including loss		$\text{N\$}0.0695 \times 155,300 \times 1.1 =$ $11,900$
Operation and maintenance	(a)	$\text{N\$}606,000 \times 0.05 = 30,300$
NamPower extension charges (O&M)	(b)	$\text{N\$}414,000 \times 0.05 = 20,700$
Total expenditure	(c)	$\text{N\$}212,500$
Revenue from electricity sale	(d)	$\text{N\$}0.32 \times 155,300 = 49,700$
Difference (Deficit)	(d) - (c)	$\text{N\$}162,800$

[Figures in 1996 dollar terms and rate]

It is noted that the rural electrification project is far from paying. The revenue cannot cover even operation and maintenance costs. (d) - {(a) + (b)}.

16. Schemed Number of Rural Household Connections

Target rate of rural electrification, which is stated in the policy paper, is 25% in the year of 2010. In this clause, possibility to accomplish the target and actual condition of investment for rural electrification comparing with national economy are studied for the purpose of assuming potential investment amount in future.

(a) Actual Trend of Investment in Namibia

The economic growth rate in Namibia during 7 years from 1990 to 1996 was 4.3% on the average, and GDP in 1996 was N\$13.9 billion approximately.

Rate of GFCF to GDP during 7 years from 1990 to 1996 were 15.7 – 21.8% and 20.17% on the average.

Trend rate of investment for power sectors to GDP during the same period were 0.4 – 0.8% and 0.59% on the average.

Rate of rural electrification, of which the programme has started in 1991,

to GDP varies from 0.06% to 0.53% every year and 0.19% on the average.

In the budget for 1997/98, N\$28.4 million has been allotted for the rural electrification programme.

(b) Assumption of Potential Investment Amount in Future

According to the result of the above mentioned analysis, potential investment amount in future are assumed based on the following conditions;

- Economic Growth Rate 1997: 3.5% per year
- GDP in 1997: N\$14.37 billion
- Budget amount for rural electrification: 0.2% of GDP

(c) Study of Number of Household Connections and Electrification Rate

From the potential investment amount in rural electrification, possible number of household connections and electrification rate in rural areas were studied. The case study was made in two cases i.e. one is the case that the cost per household is N\$11,000 which includes NamPower capital cost for link to the national grid, and the other is the case that the cost per household is N\$6,000 which excludes the NamPower capital cost.

The result of the study is shown in the following tables, summary in Table 1 and detail in Table 2 respectively. As the result of the study, we have got the figures, 24% in former case and 38.5% in latter case. The former figure is nearly same as the target rate of rural electrification, and the latter one is bigger than the target rate.

Table 1 Summary of Number of Households Connections

Year	No. of Rural Households (A)	N\$6,000/Connection		N\$11,000/Connection	
		No. of Electrified Households (B)	Rate of Rural Electrification (B/A: %)	No. of Electrified Households (B)	Rate of Rural Electrification (B/A: %)
1997	207,748	18,043	8.7	18,043	8.7
2000	222,286	33,670	15.1	26,567	12.0
2005	246,959	64,927	26.3	43,616	17.7
2010	270,778	104,254	38.5	65,067	24.0
2015	292,199	153,733	52.6	92,056	31.5

Table 2 Number of House Hold Connections

Year	(A) GDP (Con Price Changes 1990/1997 NS Millions)	(B) GDP (Current prices NS Millions)	(C) GFCF (Current prices Million NS)	(D) GFCF of Elec Indust. Rural Elec Million NS	(E) Dev Bdgt for Rural Elec Million NS	(F) GFCF Share of GDP (C/B)	(G) Share of GDP (F/C)	(H) Rural Elec Share of GDP (E/B)	(I) No of Elec Houses in Rural/Year (NS6,000/Household)	(J) Accumulate No of Elec Houses in Rural (NS6,000/Household)	(K) Elec Ratio in Rural	(L) No of Elec Houses in Rural/Year (NS11,000/Household)	(M) Accumulate No of Elec Houses in Rural Area (NS11,000/Household)	(N) Elec Ratio in Rural Area	No of Houses in Rural Area
1990	6409	6409	1290	42.00	0.00	20.1%	0.66%	0.00%	1756	9640	5.3%	1756	9640	5.3%	180519
1991	6775	7074	1107	52.80	19.40	15.6%	0.75%	0.27%	2844	12484	6.8%	2844	12484	6.8%	184877
1992	7274	8284	1672	55.70	44.20	20.2%	0.67%	0.53%	663	13147	6.9%	663	13147	6.9%	189309
1993	7128	8860	1934	35.70	10.00	21.8%	0.40%	0.11%	588	13735	7.1%	588	13735	7.1%	193813
1994	7600	10985	2309	46.00	6.80	21.0%	0.42%	0.06%	629	14364	7.2%	629	14364	7.2%	198388
1995	7988	12262	2629	53.50	13.00	21.4%	0.44%	0.11%	546	14910	7.3%	546	14910	7.3%	203034
1996	8226	13886	2907	108.40	9.40	20.9%	0.78%	0.07%	1377	18043	8.7%	1377	18043	8.7%	207748
1997	14372	14372	103.5%	28.40	28.40	20.0%	0.20%	0.20%	5000	23043	10.8%	2727	20770	9.8%	212530
1998	14875	14875	103.5%	30.00	30.00	20.0%	0.20%	0.20%	5191	28234	13.0%	2832	23602	10.9%	217376
1999	15574	15574	103.5%	31.15	31.15	20.0%	0.20%	0.20%	5435	33670	15.1%	2965	26567	12.0%	222286
2000	16306	16306	103.5%	32.61	32.61	20.0%	0.20%	0.20%	5691	39361	17.3%	3104	29671	13.1%	227257
2001	17073	17073	103.5%	34.15	34.15	20.0%	0.20%	0.20%	5958	45319	19.5%	3250	32921	14.2%	232286
2002	17875	17875	103.5%	35.75	35.75	20.0%	0.20%	0.20%	6238	51557	21.7%	3403	36324	15.3%	237370
2003	18715	18715	103.5%	37.43	37.43	20.0%	0.20%	0.20%	6532	58089	24.0%	3563	39886	16.5%	242151
2004	19595	19595	103.5%	39.19	39.19	20.0%	0.20%	0.20%	6839	64927	26.3%	3730	43616	17.7%	246989
2005	20516	20516	103.5%	41.03	41.03	20.0%	0.20%	0.20%	7160	72087	28.6%	3905	47522	18.9%	251788
2006	21480	21480	103.5%	42.96	42.96	20.0%	0.20%	0.20%	7496	79584	31.0%	4089	51611	20.1%	256633
2007	22489	22489	103.5%	44.98	44.98	20.0%	0.20%	0.20%	7849	87433	33.4%	4281	55892	21.4%	261488
2008	23546	23546	103.5%	47.09	47.09	20.0%	0.20%	0.20%	8218	95650	35.9%	4482	60374	22.7%	266347
2009	24653	24653	103.5%	49.31	49.31	20.0%	0.20%	0.20%	8604	104254	38.5%	4693	65067	24.0%	270778
2010	25812	25812	103.5%	51.62	51.62	20.0%	0.20%	0.20%	9008	113263	41.2%	4914	69981	25.4%	275174
2011	27025	27025	103.5%	54.05	54.05	20.0%	0.20%	0.20%	9432	122694	43.9%	5145	75125	26.9%	279524
2012	28295	28295	103.5%	56.59	56.59	20.0%	0.20%	0.20%	9875	132569	46.7%	5386	80512	28.4%	283819
2013	29625	29625	103.5%	59.25	59.25	20.0%	0.20%	0.20%	10339	142908	49.6%	5640	86151	29.9%	288048
2014	31017	31017	103.5%	62.03	62.03	20.0%	0.20%	0.20%	10825	153733	52.6%	5905	92056	31.5%	292199
2015	32475	32475	103.5%	64.95	64.95	20.0%	0.20%	0.20%							

Notes 1. (A) GDP is shown at constant 1990 prices for 1990 -1996 and constant 1997 prices for 1997 -2015.

2. Data for (A),(B),(C) & (D) is based on "National Accounts 1981-1996, CSO".

3. (C) shows GFCF (Gross Fixed Capital Formation) in Namibia.

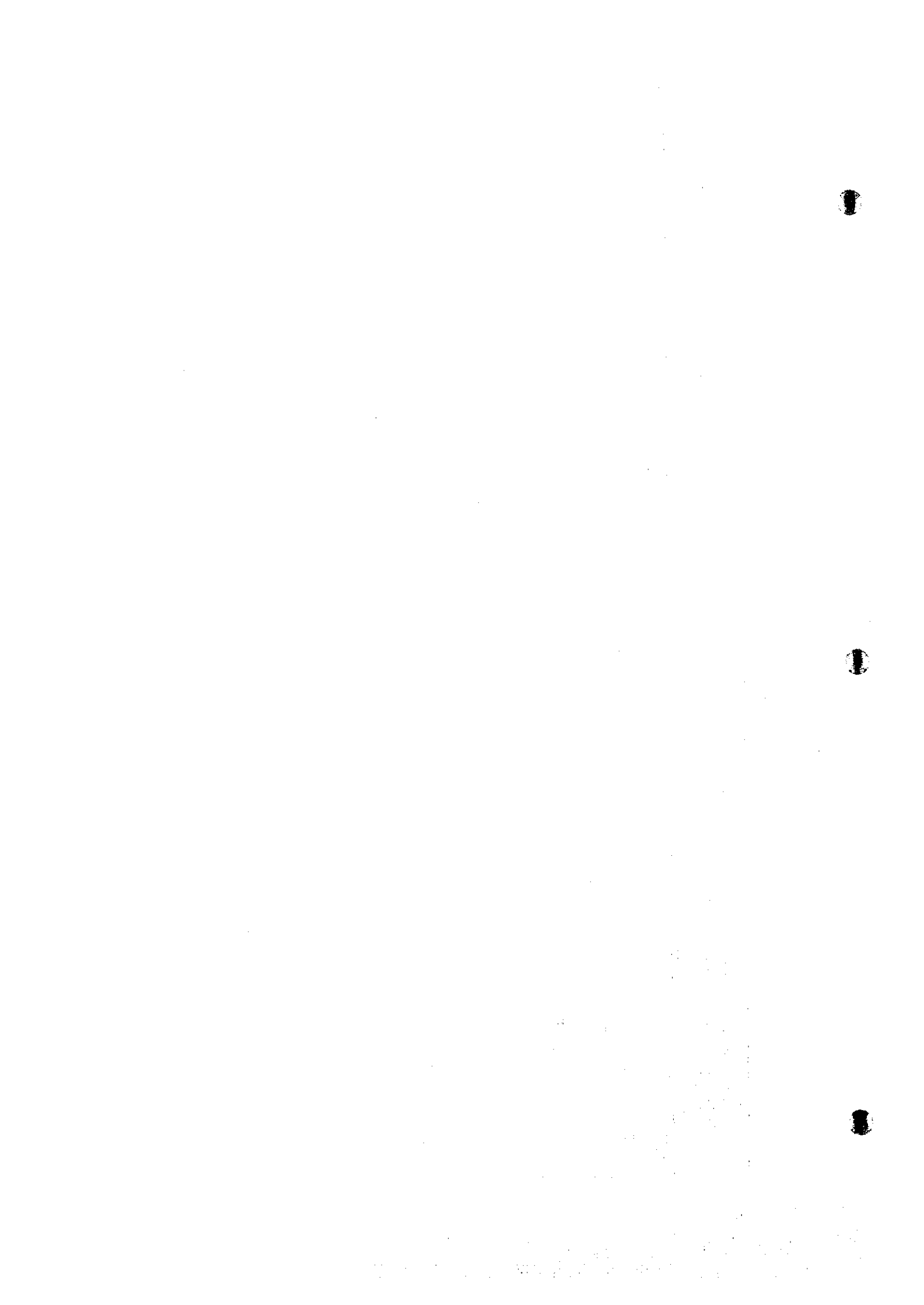
4. (D) shows GFCF in Electricity industry only.

5. (E) shows development expenditures for rural electrification for 1990 -1996 and assumed development budgets for 1997 -2015.

6. (F), (G) & (H) show percentage share of GFCF, electricity industry and development budgets for rural electrification of GDP respectively.

7. (I),(J) & (K) show assumed number of electrified households and electrified ratio in rural area based on NS 6,000 per household connection.

8. (L),(M) & (N) show number of assumed electrified households and electrified ratio in rural area based on NS 11,000 per household connection.





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