第１１章

提　言

第１１章　提言

11.1　発電システム増設最適シナリオの提言

CCGT経済シナリオDは短期および中長期の電力供給に対してコスト最小の選択(least cost option)として勧告できる。これはまた技術的にはフィージブル、環境的にはフレンドリーである。環境問題で容認できないリスクを生ずるとは考えられない。国のエネルギー政策の目標に完全には応じることはできないが、経済効率を満足させ、電力供給保障に対する増大しつつある懸念を容認できるレベルまで緩和できると考えられる。また外貨節約効果は大きく、Kuduガスのロイヤリティが国庫収入として期待できる。

CCGT自立シナリオAと水力自立シナリオBは、国のエネルギー政策の目標を達成できるが、経済効率が劣るのでその選択を勧告できない。両シナリオとも対応する経済シナリオDとEに比較して、計画期間内にCCGT 1ブロックのコスト406 MUS$の追加投資を必要とする。

電力輸入シナリオCは、その経済性はシナリオDとほぼ同水準にあるが、Eskomとの更なる連系によりナミビアは相当の範囲まで外部の一供給者により多く依存することになるので、その選択を勧告できない。

水力経済シナリオEは経済性では３位に位置している。年可能発電電力量はその年の降雨量により10対1の範囲で大きく変動する。その長いリードタイムは、建設決定時における需要想定と完成時の実需要との間に大きなずれを生じる。これらはNamPowerにとって運用・収入上大変リスキーである。そして解決すべき環境上の問題が多くある。計画水力プロジェクトの発電電力全量をナミビアで使用可能の前提で経済分析が行われているが、最近になってアンゴラ側が50/50の電力シェアーを主張していることが公式に明らかになった。コスト負担もこれから交渉ということで、評価も結果次第ということになる。この問題が水力シナリオにおける最大の不確定要素であり、現状ではその選択を勧告できない。

しかしながら、2020年台には系統の安定のため北部電力系統に強力な電源を必要とするであろう。これは水力に限られるものではないが、実際問題として水力が有力オルターナティブである。水力の問題点が解明されれば、将来Kuduガス田長寿命化のためのエネルギーセービングとして水力の開発が考慮されることがあろう。

電力系統安定度および電力潮流の調査を十分に実施するよう勧告する。系統の予備的調査によると、負荷が増えるにつれ北部電力系統が不安定になる。これは北部電力系統を強化する必要があることを示唆している。

11.2　政策・制度・組織

（1）電気料金制度に対する改善提案

5.4に述べた現行の電気料金体系に対し、今後の検討事項として下記の提案をする。

a)　料金体系

MRLGHとNorthern ElectricityはRuralの低所得者が多い地域の配電を受持っているが、DomesticのカテゴリーのBasic Chargeは60アンペアまで単一料金になっている。これに対しWindhoek Municipalityでは使用電力の大きさ（契約電流値）によってBasic chargeが細分化されており、Small Consumerの方が割安になる様に考えられている（最小10A）。この考え方をRuralにも適用すべきである。

最も少ない消費電力を地方村落で300W～500W程度とすれば、200Vでせいぜい1.5～2Aであるから、分類も10A以下をさらにいくつかに分ける必要があると思われる。北部の低所得者の多い地域で電気料金の徴収率が下がっているが、上記はこれの改善にも役立ち、さらに電気の利用者の増加にもつながるものと思われる。

b)　適正な電気料金

電気料金は本来限界コストをベースに適正な利益を加えて決めるべきであるが、Windhoekの例で見るとおり、ほとんどのMunicipalityとLocal Authorityで他のインフラ整備のための資金の一部を上乗せして電気料金を決めている様である。
他のインフラ整備はそれぞれ独立で維持管理出来る方法をとり、電気料金への上乗せ分を減らし、料金の構成要素を明確にして適正な電気料金とすべきである。
また近い将来Electricity Actの施行により導入が考えられているRural Electrification Fund の検討の際には、料金構成要素の明確化が必要不可欠の条件になる。

（2）電力セクター行政

a)　発送電事業と配電事業の整合性

ナミビアでは発電・送電事業と配電事業が区分されて別々の組織で運営されている。これと類似の電力供給体制（発送配電分離型）をとっているのは欧米ではイギリス、アジアではタイ、中東ではヨルダン、アフリカではガーナなどに散見されるが例は少ない。需要家としては質の良い安価な電力が選択的に使用出来るよう供給者側をCompetitive situationに置いた方が良い。日本を含む世界の他の主要国（フランス、ドイツ、アメリカ等）および中近東、アフリカ諸国（南アフリカを含む）では発電と送配電を同一の事業者が一貫体制（発送配電統合型）で運営している例が多く、しかも地域独占が認められている場合が多い。分離型と統合型ではそれぞれ運営上の得失がある。

統合型では電力開発での発電・送配電の整合性がとりやすいが、電気料金は競争が無いためどうしても割高になる。そのため主要国でも民営化、Private investorの受入れなどにより徐々に分離型への移行、地域独占廃止の方向に進みつつある。分離型の場合には売電価格の面では割安になる傾向になるが、将来の需要予測と電力設備の開発計画や電化計画（地方電化）との整合性がとりにくい欠点がある。ナミビアではこの欠点をカバーするためにElectricity ActでElectricity Control Boardの設立が唱われているが、このBoardの運用がうまくいかないと効率的な電力開発計画と安定な電力供給が出来なくなり、今後の電力供給体制に遅延を来たすことになる。Boardに強い権限を与え、迅速な決定と統合された執行を可能ならしめる必要がある。

b) 実施機関の陣容強化

ナミビアは独立後まだ日が浅くMME、MRLGH、Local Authorityともまだ陣容の整備が不足しているため、組織が充分機能を発揮していない面がある。
一方、Northern Electricityは設立後間もないが、1998年1月のMonthly Reportによると現在は順調に運営されている様である。これは民間会社であるため各種の施策の提案や待遇改善に対してQuick Decisionを行い、Efficient workやLoyalty to the Companyの涵養に努めて来た結果の表われである。MME、MRLGH、Local Authorityも陣容を整えて活性化すべきである。

c) 電力自給への長期計画

ナミビアは天然資源に恵まれた国である。現在は50%以上の電力を購入しているが、長期的には自国産の資源であるKuduの天然ガスを活用して電源開発を推進し、電力の輸入を減らし、国家計画で唱われている将来の電力自給に向けて長期計画を早急にスタートする必要がある。

（3）電力セクターの人材育成計画

電力開発マスタープランを効果的に推進して行く上で、欠かすことが出来ない重要な課題の一つは人材の育成である。

現在、MMEとMRLGHは一応政府組織として形は出来てはいるが、人材不足であるため数少ない能力のある人に仕事が集中しており組織として機能していない。今後マスタープランを推進して行くためには、現在の陣容では充分に機能が発揮出来るとは思えない。新電気事業法にも中央政府の認可、指導監督などが唱われており、業務の増加が予想されるが、さらに近く設置が予想されているElectricity Control BoardでもNamPowerに対抗して指導力を発揮して行かねばならない。

人材育成は長期計画で着実に推進して行かなければ効果が上がらない。電力セクター全体で Engineer といえる技術者の数が（NamPower を除くと）非常に少ない。対応策として下記の提案をする。

a) 短期的な対応策

- 若手電気技術者の外国留学の推進（１～２年）
- MME と NamPower の人的交流（配置転換を含む）
- 海外からの常駐技術指導者の招請

b) 長期的な対策

- 学校制度の見直しとナミビア国民の就学率、教育水準の向上をはかる。
- 優秀な成績の生徒を選抜して（国内外の）大学教育が受けられるよう奨学金制度を設ける。

（４）マスタープランを効果的に実施するための助言

a） Electricity Control Boardの活用

発変電事業と配電事業の協調のとれた開発を推進するため、新電気事業法にあるElectricity Control Boardを効果的に活用し、電源開発計画と電化計画（地方電化を含む）の整合をとる。

b) Rural Distribution Boardの設立

同一地域でありながらMunicipality、Town、Village、Settlementなどは独立して受電し、配電事業を行っているため地域的協調がとれていない。
そこでMunicipality、Town、Village、Settlementを含む地域全体を視野に入れた配電事業や電化計画を行うことが出来るようにするために、各RegionまたはArea毎にRegional Distribution Boardを設立し、開発の調整推進を行うようにすることを提案したい。Northern Electricityは広い地域の配電を受持ち経営に意欲を示しているが、大部分が零細な低所得者の多い地域である。MunicipalityやTownも含めたRegional Distributorにすると一層の効果が上がるのではないかと思われる。

c) Low Income Householdへの対応

地方電化計画推進の上で障害になると思われるのが、低所得者層の電気料金の支払である。世銀などの調査によれば、光熱費の支出は全所得の10%程度までということがあるが、電気は使いたいが料金の支払いが困難と思われる月間所得が

N$500以下の低所得者が人口の約半分を占めていると報告されている（NEPRU JAN'98）。
現状では、全国平均の電化率は10%以下であり、今後地方の未電化地域の電化が進められて行く場合、当面その利用者は比較的所得が多く電気料金の支払が可能な所得層であろうと考えられる。

低所得者層の生活水準は全国または地域平均の一人当たりGDのみで測れるものではなく、現実の生活レベルの向上は短期間で解決出来るものではない。
国家計画（NDP-1）では電力自給と地方電化に関して高い目標を揚げているが、ナミビア全国の電化率は徹底した貧困対策により低所得者層にまで電気の使用を普及させない限り電気の使用者数が頭打ちとなり、おそらく40～50%程度が限度になると予想される。
従ってこれ以上利用者を増やし電化率を上げて行くには、当面低所得者層に対する特別な配慮が必要になってくる。以下に検討用としていくつかの提案をする。

- Regional は視野に立ち（Municipality、Town、Village、Industry、Settlement、Subsistence Farmer 等を含めて）その地域全体の中で高所得者と大量消費者の電気料金を高くし、低所得者（一般に使用量も少ない）は安く、場合によっては極低所得者には特別の料金（政府の補助）を設立し配電区域全体としてバランスのとれる電気料金体系に改革し、ある期間（10～15年）実施する。これにより電気利用可能な層の拡大を図る。これも前記の Regional Distribution Board の仕事の1つとする。

- Solar Electrification の奨励策として Revolving Fund の制度があるが、これにも最低月収の制限があり Initial Payment（前払金）も費用総額の20%と決められているため、現状では比較的余裕のある Household では利用可能であるが、低所得層または極低所得層の人々には利用困難と思われる。特に Initial Payment の20%について政府の補助を組込むことも必要となろう。これによりオフグリッドの電気を利用できない低所得層にも電気利用の恩恵が受けられるようにし、電化率の上昇にも寄与することが出来る。
  なお、この Revolving Fund の制度は北部の地方までよく知られていないように見受けられるので中央のみならず地方にも広く広告すべきである。

- 低所得層のうちでも一定所得以下の極貧層には電気料金を無料にする。

（5）アクションプラン

マスタープランを効果的に実施するためのアクションプランを以下に示す。これは上記の提案・助言を図にまとめたものである。

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	· Enforcement of New Electricity Act · Review of relevant laws and Regulations			- Establishment of foundation of Electricity Sector Governance
ORGANIZATIONS	· Establishment of Electricity Control Board · Establishment of Regional Distribution Board · Reinforcement of staff in implementing agencies	· Coordination of Development Plan and Policy Making · Effective development of Distribution System · Efficient work and functioning		- Compatibility among the Development Plans - Regional integration of Distribution System - Efficient Implemeotation
TARIFF SYSTEM	· Review of existing tariff system including - Clarification of tariff elements - Subdivision of fixed charge less than 10A · Regional integration of tariff system (including municipalities, villages, settlements etc.)	· 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		- Establishment of reasonable Tariff System - Cousideration to low income households - Temporary measures to increase small users or low income users
HUMAN RESOURCES DEVELOPMENT	· Training and Education - Short term measures - Long term measures	- Upgrading technical capability and increase technical staff - Upgrading the level of education and living standard		- (Continuation is required) - Efficient sector governance and steady implementation of Development Plans
OTHERS	· Review of Revolving Fund - Lower the min, Monthly income limit - Subsidy for 20% down payment · Long term plan for Power self-sufficiency	- Consideration to low income households - Consideration to low income households - Ulilize own natural resources		- Iocrease PV users - Increase PV users (Raise the electrification rate)

11.3　省エネルギーおよびパワーセクターにおける環境保全

（1）省エネルギー

a)　望ましい発電設備

・10.2節で言及したように、環境問題を回避し、またコスト効果的である水力発電の開発を行うこと。水力発電は運転上燃料を必要とせず、省エネルギーの観点から望ましいものといえる。

・火力発電設備では、省エネルギーにつながる熱効率が最も高いコンバインドサイクル発電を採用することが望ましい。Kudu ガスの利用と大気汚染防止の観点からはそのガス火力の採用が最も有利であると見られる。

b)　再生可能エネルギーの開発と利用

a.　風力エネルギー

ナミビア国における風力発電の可能性は、1996年の MME プロジェクト報告書“Wind Park in Grid-Parallel Operation : Proposal for an Implementation Strategy”で示されている。国の送電網との連携で、Walvis Bay では風力で同地区の電力需要の約30%を供給する計画である。かなりの発電コストの低減が期待されているが、最新鋭コンバインドサイクル発電の性能・経済性の向上が著しく、送電コストを含む Kudu 発電コストにまだまだ及ばない。

一方、地方の遠隔地における水供給に風力ポンプ（多翼型風車）を大いに利用することが望まれる。北部での現地調査で、水供給に風力ポンプを実際に有効利用した牧場を訪問することができた。そこは観光客の宿泊施設をも経営し、さらにディーゼルエンジンをバックアップとした太陽電池により必要電力を賄っており、再生可能エネルギーを活用した良い事例である。

b.　太陽エネルギー

太陽エネルギーの開発と有効利用

ナミビアは世界で最も高い日射ポテンシャルを有し、特に直達日射量は世界でも最高の部にあると期待されている。しかしながら、太陽熱発電所は直達日射量に依存し、その技術はまだデモンストレーションの段階にある。南部国境にある Noordoewer が太陽エネルギーポテンシャルの高い地区として最初に選ばれ、ここで太陽光の測定が開始された。

太陽エネルギーの密度は薄く、また太陽の特性上不可避的に設備の利用率が低くなるので、電力の大量供給に太陽エネルギーを経済的に利用することは大変困難である。しかしながら、従来の方式による地方電化がコスト或いは

技術的理由により実際的でない所では PV システムの利用により多くのメリットを受けることがある。小規模 PV システムはまた遠隔地の農場などで水の汲み上げなどに使われている。この点より太陽エネルギーの有効利用についてさらに調査がなされることが望まれる。

（2）パワーセクターにおける環境保全

a) 環境アセスメントの実施

環境保全の側面から見た場合、発電設備の建設計画においては、そのマスタープランや実現可能性調査（F/S）の段階で環境アセスメント(EIA)を行い、サイトの選定および影響緩和のための諸対策を事前に検討し、計画の具体化に反映させることが必要である。前述のように環境・観光省は1995年1月に同国の「環境アセスメント政策」を発表し、各種開発プロジェクトの環境アセスメントの実施を求めている。したがって、同国のパワーセクターにおいても同政策を遵守することが重要である。

b) 水力発電計画について

現在計画が進められているEpupa水力発電計画については、そのF/Sが既に行われ、その中で環境影響評価も実施されている。また特定サイトの選定に関する調査・評価が進められている。このプロジェクトを含めて、水力発電計画においては、下記の諸事項に留意することが望まれる。

- 地域住民の移転を要する場合は、移転住民への補償および移転計画を事前に明らかにし、移転住民との合意を得ることが望まれる。
- 水没地区の地域住民への経済的損失に対する補償を行うこと。
- 下流での漁業などへの影響が生じる場合は、その対策を講じること。
- 減水区間をできるだけ短くし、それによる自然環境への影響を最小限にすること。
- ダム等による自然景観へのインパクトを最小限にすること。

c) 火力発電計画について

Kuduガスの開発を行い、大気汚染防止及び省エネルギーの観点から最も望ましいコンバインドサイクルガス火力発電計画を推進することが望ましい。石炭や石油火力発電を行う場合は、脱硫装置等の設置を行うことが望ましい。いずれの場合においても、下記の諸事項に留意することが望まれる。

- 立地の選定に際して、その周辺の自然環境および社会環境へのインパクトが最も少ない地点であるように配慮すること。

・ 海岸立地で、海水を冷却水に利用する場合は、その温排水による沿岸海洋生物や漁業への影響を軽減する対策等を講じることが望まれる。
・ 周辺地域の大気汚染を防止する対策を講じることが望まれる。
・ 発電所からの廃水は、周辺地域の水質汚濁にならないよう事前に廃水処理を行うことが望まれる。

現在、Kuduガスを利用したコンバインドサイクル火力発電計画の検討が鋭意進められている。したがって、ここでは環境配慮の観点から見たその立地点の留意事項について言及する。

Kuduガス田は、ナミビア国最南部にあるOrange River河口の海岸から西方約150～200 km沖合いの大西洋に位置している。そのガスを利用するには、そこから最も距離的に近い場所が有利であろう。その条件から見ると、同河口付近のOranjemund周辺が有力な候補地であると考えられる。地形を見た場合、同海岸からOrange Riverに沿ってOranjemund町東方約8 kmまでは地形がなだらかであり、そこからさらに東方へいくと同河川の河岸から傾斜がきつい状態になる。したがって、同海岸からOranjemund町東方約8 kmまでの一帯が発電所の立地に適しているといえる。この一帯で立地する場合、環境配慮から下記の諸事項に留意することが望まれる。

a. 付近の海洋生物および漁業への配慮

この海岸一帯の海洋生物相はかなり豊かであり、イセエビや貝類の棲息に適し、それらの養殖が盛んに行われている。またアザラシ、クジラ、イルカなどが多く棲息している。ペンギン等海鳥類も多く見られる。このような自然環境を考慮し、下記のことに特に留意する必要がある。

・ 沿岸立地の場合、機材搬入用港湾の増設やそれに伴う沿岸の浚渫工事に伴う海洋生物や漁業への影響を緩和すること。
・ 復水器の海水冷却を行う場合、付近の海洋生物の迷入を防ぎ、また温排水による海洋生物への悪影響を最小限にすること。

b. Orange River 河口からその上流一帯の自然環境への配慮

Orange River 河口一帯は国際的に重要な湿地帯としてラムサール条約の保護地に登録されており、多様な生物の棲息地になっている。渉禽類（水辺にいる鳥類）や海鳥が多く見られる。この湿地帯生物相は保護しなければならないことになっている。また Ernest Oppenheimer Bridge の付近は Swartkops Nature Reserve として自然保護区に指定されている。したがって、下記の事項に留意することが重要になる。

・ 立地点の選定には上記自然環境の保全が可能な場所でなければならない。
・ 水冷式冷却塔を採用する場合、その取水量を抑制すること。
・ 工事中の自然環境への影響を最小限に押さえること。
・ 発電所運開後は自然環境への影響の有無を確かめるための環境モニタリングを実施すること。

d) 建設・運転段階における環境保全

a. 建設段階における環境保全

建設段階においては、環境アセスメントの結果特定された環境保全および環境影響の緩和のための諸対策等を確実に実施すること。その効果の有無は、環境モニタリングで確認することが必要である。

b. 運転段階における環境保全

運転段階においては、環境アセスメントの中で特定された種々の環境モニタリングを実施すること。その結果、施設からの排煙や排水等が遵守すべき各種環境基準や排出基準を超えたものになっているか否かの確認を定期的に行うこと。諸基準値を超えた場合は、設備の改善等を含む新たな対策を講じることが求められる。

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		LIST OF MAJOR DIVISIONS	
1	Landbou, jag, bosbou en vissery	1	Agriculture, hunting, forestry and fishing
2	Mynwese en steengroefwerk	2	Mining and quarrying
3	Fabriekswese	3	Manufacturing
4	Elektrisiteit-, gas- en watervoorsiening	4	Electricity, gas and water supply
5	Konstruksie	5	Construction
6	Groot- en kleinhandel; herstel van motorvoertuie, motorfietse en persoonlike en huishoudelike goedere; hotelle en restaurante	6	Wholesale and retail trade; repair of motor vehicles, motor cycles and personal and household goods; hotels and restaurants
7	Vervoer, opberging en kommunikasie	7	Transport, storage and communication;
8	Finansiële tussengangs-, versekerings-, vaste-eiendoms- en besigheidsdienste	8	Financial intermediation, insurance, real estate and business services
9	Gemeenskaps-, maatskaplike en persoonlike dienste	9	Community, social and personal services
0	Private huishoudings, eksterritoriale organisasies, verteenwoordigers van buitelandse regerings en ander werksaamhede nie voldoende omskryf nie	0	Private households, exterritorial 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
HOOFAFDELING 1: LANDBOU, JAG, BOSBOU EN VISSERY			MAJOR DIVISION 1: AGRICULTURE, HUNTING, FORESTRY AND FISHING
Landbou, jag en verwante dienste	11		Agriculture, hunting and related services
Gewasverbouing; 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 veeartsenywerksaamhede		114	Agricultural and animal husbandry services, except veterinary activities
Jag, vang van wild en wildteelt, 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
HOOFAFDELING 2: MYNWESE EN STEENGROEFWERK			MAJOR DIVISION 2: MINING AND QUARRYING
Steenkool- en lignietontginning	21	210	Mining of coal and lignite
Ekstrahering van ru-petroleum en natuurlike gas; dienswerksaamhede 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.
Dienswerksaamhede bykomstig by ontginning van minerale	29	290	Services activities incidental to mining of minerals
HOOFAFDELING 3: FABRIEKSWESE			MAJOR DIVISION 3: MANUFACTURING
Vervaardiging van voedselprodukte, dranke 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 suiwelprodukte		302	Manufacture of dairy products
Vervaardiging van graanmeulprodukte, 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 dranke		305	Manufacture of beverages
Vervaardiging van tabakprodukte		306	Manufacture of tobacco products
Vervaardiging van tekstielstowwe, klerasie en leergoedere	31		Manufacture of textiles, clothing and leather goods
Spin, weef en afwerk van tekstielstowwe		311	Spinning, weaving and finishing of textiles
Vervaardiging van ander tekstielstowwe		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 dying of fur; manufacture of articles of fur
Looi en afwerk van leer; vervaardiging van bagasie; handsakke, saals en tuie		316	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery and harness
Vervaardiging van skoeisel		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 reproduserings 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 dienswerksaamhede verwant aan drukwerk		325	Printing and service activities related to printing
Reproduserings 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-metaal-houdende 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, tenks, reservoirs en stoomopwekkers		354	Manufacture of structural metal products, tanks, reservoirs and steam generators
Vervaardiging van ander gefabriseerde metaalprodukte; dienswerksaamhede 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 elektrisiteits-verspreidings- en beheerapparatuur		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 motor-voertuie; vervaardiging van sleep-waens en leunwaens		382	Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers
Vervaardiging van onderdele en toebe-hore 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 tremweg-lokomotiewe 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.
HOOFAFDELING 4: ELEKTRISITEIT-, GAS- EN WATERVOORSIENING			MAJOR DIVISION 4: ELECTRICITY, GAS AND WATER SUPPLY
Elektrisiteit-, gas-, stoom- en warmwater-voorsiening	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
HOOFAFDELING 5: KONSTRUKSIE			MAJOR DIVISION 5: CONSTRUCTION
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 slopingsuitrusting met bestuurders/bedieners		505	Renting of construction or demolition equipment with operators
HOOFAFDELING 6: GROOT- EN KLEINHANDEL; HERSTEL VAN MOTORVOERTUIE, MOTORFIETSE EN PERSOONLIKE EN HUISHOUDELIKE GOEDERE; HOTELLE EN RESTAURANTE			MAJOR DIVISION 6: WHOLESALE AND RETAIL TRADE; REPAIR OF MOTOR VEHICLES, MOTOR CYCLES AND PERSONAL AND HOUSEHOLD GOODS; HOTELS AND RETAURANTS
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 landboumateriaal, 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 intermediêre 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 voorsiening vir kortverblyfakkommodasie		641	Hotels, camping sites and other provision of short-stay accommodation
Restaurante, kroeë en kantiene		642	Restaurants, bars and canteens
HOOFAFDELING 7: VERVOER, OPBERGING EN KOMMUNIKASIE			MAJOR DIVISION 7: TRANSPORT, STORAGE AND COMMUNICATION
Landvervoer; vervoer per pypleiding	71		Land transport; transport via pipelines
Spoorwegvervoer		711	Railway transport
Ander landvervoer		712	Other land transport
Vervoer per pypleiding		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 hulpwerksaamhede 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
HOOFAFDELING 8: FINANSIëLE TUSSENGANGS-, VERSEKERINGS-, VASTE-EIENDOMS- EN BESIGHEIDSDIENSTE			MAJOR DIVISION 8: FINANCIAL INTERMEDIATION, INSURANCE, REAL ESTATE AND BUSINESS SERVICES
Finansiële tussengang, behalwe versekerings en pensioenbefondsing	81		Financial intermediation, except insurance 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
Hulpwerksaamhede vir finansiële tussengang	83		Activities auxiliary to financial intermediation
Hulpwerksaamhede vir finansiële tussengang, behalwe versekerings- en pensioenbefondsing		831	Activities auxiliary to financial intermediation, except insurance and pension funding
Hulpwerksaamhede 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 vergoedings- 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 rekenaarmasjinerie		865	Maintenance and repair of office, accounting and computing machinery
Ander rekenaarverwantewerksaamhede		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
Argiteks-, 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.
HOOFAFDELING 9: GEMEENSKAPS-, MAATSKAPLIKE EN PERSOONLIKE DIENSTE			MAJOR DIVISION 9: COMMUNITY, SOCIAL AND PERSONAL SERVICES
Publieke-administrasie en verdedigingswerksaamhede	91		Public administration and defence activities
Sentrale-owerheidswerksaamhede		911	Central government activities
Streeksdiensteradewerksaamhede		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	Veterenary 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 vullisverwydering, sanitasie en soortgelyke werksaamhede		940	Sewage and refuse disposal, sanitation and similar activities
Werksaamhede van lede-organisasies n.e.g.	95		Activities of membership organisations n.e.c.
Werksaamhede van besigheids-, werkgewers- en professionele organisasies		951	Activities of business, employers' and professional organisations
Werksaamhede van vakverenigings		952	Activities of trade unions
Werksaamhede 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
HOOFAFDELING 0: PRIVATE HUISHOUDINGS, EKSTERRITORIALE ORGANISASIES, VERTEENWOORDIGERS VAN BUITELANDSE REGERINGS EN ANDER WERKSAAMHEDE NIE VOLDOENDE OMSKRYF NIE			MAJOR DIVISION 0: PRIVATE HOUSEHOLDS, EXTERRITORIAL ORGANISATIONS, REPRESENTATIVES OF FOREIGN GOVERNMENTS AND OTHER ACTIVITIES NOT ADEQUATELY DEFINED
Private huishoudings met persone in diens	01	010	Private hosueholds 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

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:

Municipalities (15)	Towns (12)
Swakopmund	Henties Bay
Windhoek	Luderitz
Gobabis	Okakarara
Grootfontein	Ondangwa
Karibib	Ongwediva
Kasasburg	Opuwo
Keetmanshoop	Oshakati
Mariental	Rehoboth
Okahandja	Katima Mulilo
Omaruru	Rundu
Otavi	Khorixas
OtjiwarongoArandis	
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

	Total region					
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

	Urban			
Region	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
Otiozondjupa	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

Growth Rate								
	1991	---	2003	---	2009	---	2015	Total
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

	1991			2015
Population				
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
Households				
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 supplie 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:

	Conventional meter	Pre-payment meter
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 ~ 1999	2000 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:

Whole country	Number,1995
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:

Whole country	Number,1995
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	Warmbad	Aus	Rietoog	Schlip	Duineveld	Tsumipark	Dordabis	Total
Population	4000	3500	500	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		-	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	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	1030	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	Koes	Warmbad	Aus	Rietoog	Schlip	Duineveld	Tsumipark	Dordabis	Total
Population	4000	3500	500	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		-	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	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	1030	2870	600	1670	420	420	2000	17630
ditto [km]	110	70	40	10	25	20	-	-	-	-

[N$ 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 ÷ 107=N$5,600 per overall connection (N$603,000 ÷ 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 x 70km ÷ 150 = 4km). Also in central/southern areas we get 12km of average span (3 x 80km ÷ 20 = 12km). By the way population density is 11.9 persons/km^2 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 ÷ 107 = N$7,900 per overall connection and N$841,000 ÷ 100 = N$8,400 per households for northern areas, and N$1,020,000 ÷ 108 = N$9,400 per overall connection and N$1,020,000100 = 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;

N$ 841,000 x 1,350 =	N$1,135,350,000
N$1,020,000 x 1,130 =	N$1,152,600,000
Total	N$2,287,950,000

Total load for the ultimate target electrification will be;

94kW x 2,480 x 1.15 (loss) ÷ 1.023 (diversity factor) = 262,000 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		N$1,020,000 x 0.04 = 40,800
Interest on capital		N$1,020,000 x 0.07 = 71,400
NamPower demand charge		N$33.15 x 12 x 94 = 37,400
NamPower unit charge including loss		N$0.0695 x 155,300 x 1.1 = 11,900
Operation and maintenance	(a)	N$606,000 x 0.05 = 30,300
NamPower extension charges (O&M)	(b)	N$414,000 x 0.05 = 20,700
Total expenditure	(c)	N$212,500
Revenue from electricity sale	(d)	N$0.32 x 155,300 = 49,700
Difference (Deficit) (d) - (c)		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.

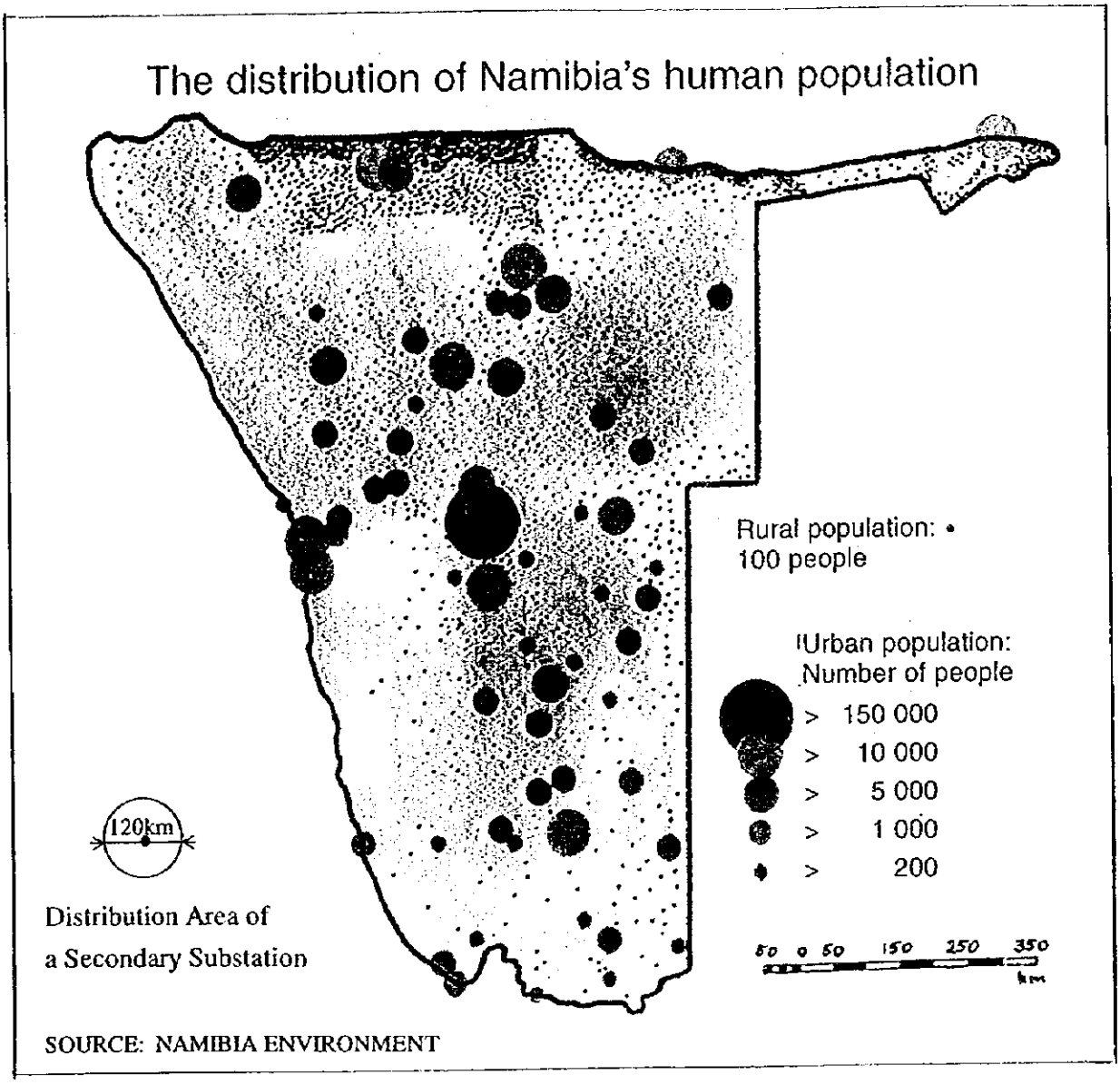
Table 1 Summary of Number of Households Connections

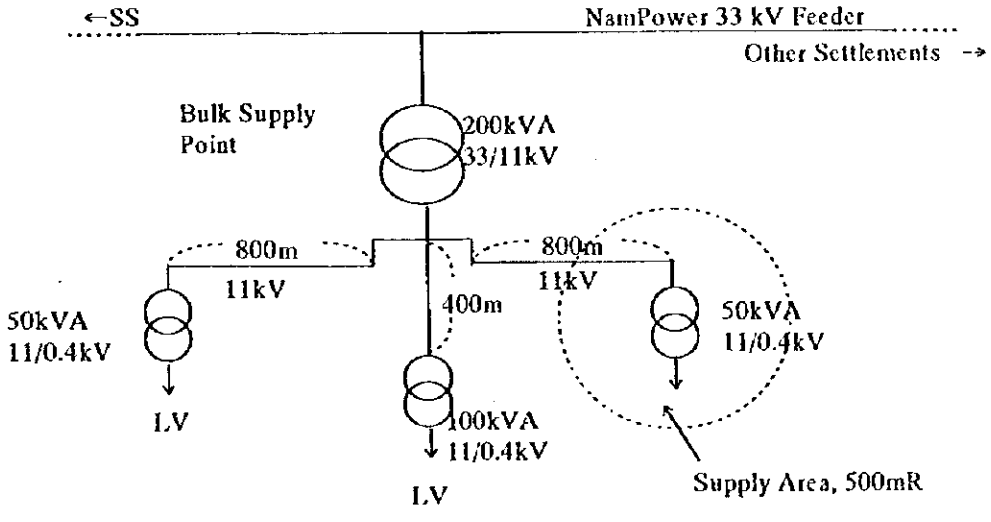
Year	No. of Rural Households (A)	N$6,000/Connection		N$11,000/Connection	
		No. of Electrified Households (B)	Rate of Rural Electrification (B/A: %)	No. of Electrified Households (B)	Rate of Rural Electrification (B/A: %)
1997	207,748	18,043	8.7	18,043	8.7
2000	222,286	33,670	15.1	26,567	12.0
2005	246,959	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 1990/1997 N$ Millions)	Annual Changes	(B) GDP (Current prices N$ Millions	(C) GFCF (Current prices N$ Million	(D) GFCF of Elec Indust N$ Million	(E) Dev Bdgt for Rural Elec N$ Millions	(F) GFCF Shar of GDP (C/B)	(G) Ele Share of GDP (F/C)	(H) Rural Elec Share of GDP (E/B)	(I) No of Elec Houses in Rural/Year (N$6,000/Household)	(J) Accumulate No of Elec House	(K) Elec Ratio of House in Rural	(L) No of Elec Houses in Rural/Year (N$11,000/Household)	(M) Accumlate No of Elec House in R	(N) Elec House Ratio in Rural Area	No of Houses in Rural Area
1990	6409		6409	1290	42.00	0.00	20.1%	0.66%	0.00%							
1991	6775	105.7%	7074	1107	52.80	19.40	15.6%	0.75%	0.27%	1756	9640	5.3%	1756	9640	5.3%	180519
1992	7274	107.4%	8284	1672	55.70	44.20	20.2%	0.67%	0.53%	2844	12484	6.8%	2844	12484	6.8%	184877
1993	7128	98.0%	8860	1934	35.70	10.00	21.8%	0.40%	0.11%	663	13147	6.9%	663	13147	6.9%	189309
1994	7600	106.6%	10985	2309	46.00	6.80	21.0%	0.42%	0.06%	588	13735	7.1%	588	13735	7.1%	193813
1995	7988	105.1%	12262	2629	53.50	13.00	21.4%	0.44%	0.11%	629	14364	7.2%	629	14364	7.2%	198388
1996	8226	103.0%	13886	2907	108.40	9.40	20.9%	0.78%	0.07%	546	14910	7.3%	546	14910	7.3%	203034
1997	**14372**	**103.5%**				**28.40**			**0.20%**	**1377**	**18043**	**8.7%**	**1377**	**18043**	**8.7%**	**207748**
1998	14875	103.5%				30.00			0.20%	5000	23043	10.8%	2727	20770	9.8%	212530
1999	15574	103.5%				31.15			0.20%	5191	28234	13.0%	2832	23602	10.9%	217376
2000	**16306**	**103.5%**				**32.61**			**0.20%**	**5435**	**33670**	**15.1%**	**2965**	**26567**	**12.0%**	**222286**
2001	17073	103.5%				34.15			0.20%	5691	39361	17.3%	3104	29671	13.1%	227257
2002	17875	103.5%				35.75			0.20%	5958	45319	19.5%	3250	32921	14.2%	232286
2003	18715	103.5%				37.43			0.20%	6238	51557	21.7%	3403	36324	15.3%	237370
2004	19595	103.5%				39.19			0.20%	6532	58089	24.0%	3563	39886	16.5%	242151
2005	**20516**	**103.5%**				**41.03**			**0.20%**	**6839**	**64927**	**26.3%**	**3730**	**43616**	**17.7%**	**246959**
2006	21480	103.5%				42.96			0.20%	7160	72087	28.6%	3905	47522	18.9%	251788
2007	22489	103.5%				44.98			0.20%	7496	79584	31.0%	4089	51611	20.1%	256633
2008	23546	103.5%				47.09			0.20%	7849	87433	33.4%	4281	55892	21.4%	261488
2009	24653	103.5%				49.31			0.20%	8218	95650	35.9%	4482	60374	22.7%	266347
2010	**25812**	**103.5%**				**51.62**			**0.20%**	**8604**	**104254**	**38.5%**	**4693**	**65067**	**24.0%**	**270778**
2011	27025	103.5%				54.05			0.20%	9008	113263	41.2%	4914	69981	25.4%	275174
2012	28295	103.5%				56.59			0.20%	9432	122694	43.9%	5145	75125	26.9%	279524
2013	29625	103.5%				59.25			0.20%	9875	132569	46.7%	5386	80512	28.4%	283819
2014	31017	103.5%				62.03			0.20%	10339	142908	49.6%	5640	86151	29.9%	288048
2015	**32475**	**103.5%**				**64.95**			**0.20%**	**10825**	**153733**	**52.6%**	**5905**	**92056**	**31.5%**	**292199**

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 percenage 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 N$ 6,000 per household connection.
8. (L),(M) & (N) show number of assumed electrified households and electrified ratio in rural area based on N$ 11,000 per household connection.


The distribution of Namibia's human population
Rural population: •
100 people
Urban population:
Number of people
> 150 000
> 10 000
> 5 000
> 1 000
> 200
120km
Distribution Area of
a Secondary Substation
50 0 50 150 250 350
km
SOURCE: NAMIBIA ENVIRONMENT


←SS
NamPower 33 kV Feeder
Other Settlements →
Bulk Supply
Point
200kVA
33/11kV
800m
11kV
800m
11kV
400m
50kVA
11/0.4kV
50kVA
11/0.4kV
LV
100kVA
11/0.4kV
LV
Supply Area, 500mR