

LEGEND

| LINE | |
|-------------------|----------------------------|
| — | DRINKING WATER PIPING |
| - - - | MISCELLANEOUS WATER PIPING |
| · · · · · | WELL WATER PIPING |
| · · · · · | SIGNAL |
| VALVE | |
| ⊗ | GATE |
| ⊘ | CHECK |
| ⊢ | NORMAL CLOSE |
| ⊣ | NORMAL OPEN |
| ACCESSORY | |
| D | REDUCER |
| ⊙ | PUMP |
| ∇ | Y-TYPE STRAINER |
| ⋈ | FLEXIBLE HOSE |
| Y | PIT |
| PS | FLOW SWITCH |
| ⊡ | PRESSURE TANK |
| ⊠ | CONTROL PANEL |
| INSTRUMENT SYMBOL | |
| P | PRESSURE |
| L | LEVEL |
| I | INDICATOR |
| S | SWITCH |
| L | LEVEL |
| A | ALARM |
| SUFFIX | |
| ○ | LOCAL MOUNTED |
| ⊙ | BOARD MOUNTED |

| | | | | |
|--|--------------------|--------------------|--------------------|----------------------|
| BASIC DESIGN STUDY ON ATOLL ISLAND ELECTRIFICATION PROJECT IN THE REPUBLIC OF MALDIVES | | | | SCALE NONE |
| WATER SYSTEM OF EYDAPUSHI POWER STATION エダフシ発電所水系統図 | | | | DWG. NO. MME-G105 |
| | | | | |
| DATE | DESIGNED | CHECKED | APPROVED | REVISION |
| 7 Jan '94 | <i>[Signature]</i> | <i>[Signature]</i> | <i>[Signature]</i> | |
| JAPAN INTERNATIONAL COOPERATION AGENCY | | | | |

5-3-4 機材整備計画

(1) 計画内容

前述した計画方針(4-3-4参照)に従って機材整備計画を以下のとおり策定する。

- 1) 約2年分のスペアパーツの調達
- 2) 屋外照明器具
- 3) 修理用機材
- 4) 高周波無線設備
- 5) 保守用道工具の調達
- 6) OJT用教材の調達

(2) 機材の主な内容

1) スペアパーツ

- (a) ディーゼルエンジン部品
- (b) ディーゼルエンジン補機及びその部品
- (c) 発電機部品
- (d) 電気品用部品

2) 保守用道工具

当該発電設備及び配電設備の定期点検、オーバーホール、スペアパーツの交換等の作業に必要な道具及び工具とする。

3) OJT用教材

- (a) 教育用教科書(英文) : 20部
- (b) 当該発電設備の運転・保守用マニュアル(英文) : 20部

5-3-5 OJT計画

(1) 計画内容

前述した計画方針(4-3-4参照)に従って下記OJTを実施する。

1) OJT実施期間と実施場所

保守及び運転の実施訓練：建設工事期間中(現地、約3ヶ月)

2) 訓練員

OJTに参画する「モ」国側技術者は、本工事終了後当該発電設備の維持管理に直接従事する技術者とし、下記訓練員が「モ」国側より任命されるものとする。

- (a) 総括技術者：1名
- (b) 保守技術者
 - 機械技術者：1名
 - 電気技術者：1名
- (c) 保守技能者
 - 機械技能者：3名
 - 電気技能者 1名

3) 教育内容

下記教育を実施する。

(a) 基礎管理技術についての教育

- ① O&Mスケジュールコントロール（予防保全の考え方、設備機能の分析とその改善策立案等）
- ② 予備品及び工具の管理
- ③ O&M用図書管理

(b) 当該発電設備の保守及び運転作業の実施訓練

訓練項目は、以下のとおりとする。

- ① シリンダヘッド開放整備実習
- ② 燃料弁の分解整備実習
- ③ 給排気弁のグラインダー仕上実習
- ④ ピストンの分解整備実習
- ⑤ クランクピン軸受開放点検実習
- ⑥ 電動ポンプの整備実習
- ⑦ 吸気フィルター、ラジエータ等の洗滌の実習
- ⑧ 起動及び停止方法
- ⑨ 緊急停止の方法
- ⑩ 監視方法

4) 教材

- (a) OJT実施後、実際のO&Mに活用できる教育用教科書を調達する。
- (b) 保守点検に係わる実習作業用として当該発電設備の運転・保守用マニュアルを調達する。

5-4 施工計画

5-4-1 建設事業及び施工上の注意

(1) 「モ」国の建設事情

- 1) 建築及び基礎工事等を施工できる技術者・作業員は、「モ」国において確保可能であるが、その数が少なく、日本国の無償資金協力システムに合致した技術・工程管理上、第3国の施工業者の採用を考慮する必要がある。
- 2) 本計画で調達する小型発電設備の据付・調整等が可能な技術者は「モ」国にもいるが、建築及び基礎工事と同様、工事工程の管理も含めて日本から技術者の派遣を計画する。
- 3) 工事用の建設機械の内、クレーン、トラック及び溶接機等の特殊なものを除いて調達は可能と思われるが、上述の技術者と同様、その数が少なく、第3国からの持込を計画する。
- 4) 現地での工事用水及び電力の確保は難しく、簡易型の海水淡水化装置及び発電機を現地へ持ち込む必要がある。

(2) 施工計画の注意点

- 1) 現地で通関のための陸揚げ港は首都のあるマレ島である。マレ島には水深の深いバースがなく、入港できないため、リーフの外側に停泊し、そこからマレ島までタグボートで運ぶため、沖待ち期間（約半月）を工程に含めておく必要がある。
- 2) マレ島より当プロジェクトサイトの約150km海上の輸送は、3トン級のバージを使用し砂浜に乗り上げ、荷おろしを行う方法を計画する。
- 3) 当該地の5月～10月は雨期であり、特に5月～7月には南西季節風で海が荒れるので、海上輸送は困難である。このため、この期間を外して海上輸送を行うなど工程計画上の留意が必要である。
- 4) 発電設備の据付工事は、基礎工事後、すみやかに開始する事とし、機械設備工事、電気設備工事も並行して実施し、出来るだけ工程を短縮する。

5-4-2 施工方針

本計画は日本国政府の無償資金協力制度の枠組に従って実施される。本計画は両国政府において承認され、E/Nが締結された後に実施に移ることとなる。この後、「モ」国政府により日本法人コンサルタントが選定され、実施設計作業に入る。実施設計結果に基づく入札図書の内容の完成後、入札によって決定した日本法人請負業者により、施設建設及び資機材調達が行われる予定である。なお事業を実施する場合の基本事項及び特に配慮を要する点は以下のとおりである。

(1) 事業実施主体

「モ」国側の本計画実施担当機関は、同国の電力事業の一切の運営・管理を行っているMEBである(2-2-1 参照)。MEBにおける実施体制は、2-2-1に示したとおり地方環礁島発電管理部が担当する。「モ」国政府は、日本のコンサルタント及び請負業者と密接な連絡並びに協議を行い、本計画の実施を円滑に進めるため、本計画を担当する責任者を専任する必要がある。

上記責任者は、発電所員に対し本計画内容を十分に説明・把握させ、建設工事実施中の安全確保について注意をうながすとともに、プロジェクトの進行に対し協力するように指導する必要がある。

(2) コンサルタント

本計画の無償資金協力に係る施設建設・機材調達のため、日本法人コンサルタントが「モ」国政府と設計監理契約を結び、当該プロジェクトに係わる施設建設及び調達資機材の実施設計及び工事監理業務を行う。また、コンサルタントは入札図書を作成するとともに事業実施主体に対し入札推進業務を代行する。

(3) 工事請負業者

日本国政府の無償資金協力制度により、公開入札で選定される日本国法人請負業者が、施設の建設工事と資機材の調達を行う。

なお、当該発電設備は建設完了後も引続きスペアパーツの供給、故障時の対応等のアフターケアが必要と考えられるため、請負会社は、当該設備引渡しの後の連絡調整についても十分配慮する必要がある。

(4) 技術者派遣の必要性

当該発電設備の建設工事には、当該発電設備の構成、機能にさほど熟練した技術は要求されない。「モ」国では本技術を持つ技術者の確保は可能と思われるが、工事工程管理も含めて日本の当該発電設備のメーカーより発電設備建設等に精通した技術者を派遣する必要がある。

(5) 施工上特に留意すべき項目

当該発電設備の建設工事は、何にかにつけ制約された島において実施される工事である事及び無償資金協力のプロジェクトである事から、以下の項目に留意すべきである。

- 1) 工事に際しては、重機の使用が制約されるので施工法、施工機械の選定を工夫する必要がある。
- 2) 工事に必要な仮設施設、資機材置場は、既存住宅、社会福祉施設等には影響を及ぼさない場所とする。
- 3) 既設設備の撤去等を伴う工事は時期、所要時間等を事前にMEBと確認し、これを厳守する事。
- 4) 現地据付工期が短いので、契約工期を厳守するため各工事を並行して実施する必要がある。

5-4-3 施工監理計画

日本国政府の無償資金協力制度に基づき、コンサルタントは基本設計の主旨を踏まえ、実施設計業務・工事監理業務について一貫したプロジェクトチームを編成し、円滑に業務実施を行う。施工監理段階において、コンサルタントは、工事進捗に合わせて必要時期に短期間、技術者を派遣し、施工監理及び検査立会いを行う。

また、竣工前の約2ヶ月間、電気技師1名を派遣して機器の据付工事監理及び検査立会いを行う。

(1) 施工監理の基本方針

コンサルタントは、本工事が所定の工事期間内に確実かつ安全に実施されるよう工事全般にわたり適切な施工監理を行う必要があり、下記をその基本方針とする。

1) 工程管理

- (a) 資機材の製作と搬入、工事について常に計画と実績を比較し出来高の管理を行う。
- (b) 各工事項目毎の工程を、月別、週別、日別に管理し工事請負業者が契約工期を厳守するよう指導する。

2) 品質管理

- (a) 資機材については、実施設計図書に基づき、照合し管理する。
- (b) 現地で実施される据付工事、配管、配線及び接続工事等については、精度検査、工法検査及び各種性能試験等に立会う。

3) 安全管理

- (a) 末端の労働者まで各種災害防止に関する意識を持たせ、職長クラスについては危険予知能力を身に付けさせるよう請負業者を指導する。
- (b) 建設機械類の点検を常に行うように指導し災害防止に努める。
- (c) 運搬車輛及び工事用機械等がサイト内を通行する場合、徐行運転を厳守し、人身事故等が起こらないよう十分注意するように指導するとともに既設の建物、既設設備等を破損しないよう留意し、その防止に努めるように注意を喚起する。

(2) 施工監理実施時の全体的な関係

施工監理実施時の施工監理体制及び関連機構等の全体的な関係は下図に示すとおりである。

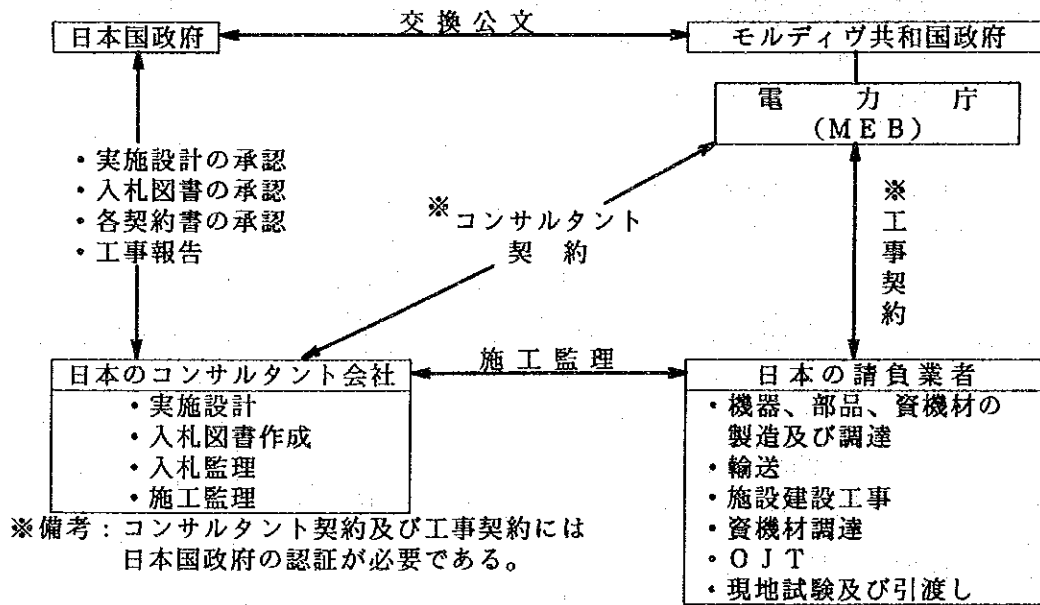


図 5-1 事業実施関係図

(3) 施工監督者

工事請負業者が実施設計図書に合致した施設建設及び機材整備を工期内に完成させるためには、「モ」国、又は第3国の現地施工会社との共同作業を円滑に運営出来る能力と、現地施工会社に適切な技術指導の出来る能力が必要とされる。さらに、より良い品質を確保するためにも同種プロジェクトの経験を持つ施工監督者が望ましい。

本プロジェクトの施設規模、内容から必要とされる請負業者側の常駐施工監督者の人数、種類は次のように想定される。

| | | |
|---------|-------|------------------|
| 現 場 所 長 | : 1 名 | 施工全般の監理及びOJTの指導員 |
| 機 械 担 当 | : 1 名 | 機械設備据付指導、工程管理 |

上記の他、各施工項目ごとに工程に合わせ必要に応じて試験調整技術者、建築・土木技術者、機器据付指導員、配管・溶接工、盤据付・ケーブル配線工等の技術者派遣が必要である。

5-4-4 資機材調達計画

(1) 資機材の調達先

本計画に使用する建設用資機材及び調達機械用資機材は、「モ」国では、製作されておらず、また一部の資機材は輸入されているものの、納期及び品質の保証は困難である為、日本または第三国より調達する。

したがって、本計画に使用する資機材の調達先は、規格、仕様、品質、生産、供給の安定性、供給時間ならびに価格の面から比較検討した結果、下記とする。

表5-5 資 機 材 調 達 先

| 調達先 | 資 機 材 | 備 考 |
|------------------|---|-----|
| 「モ」国 | サンゴのブロック 燃料油 | |
| 第三国 | セメント、砂、砂利、鋼材、 配電用ケーブル、ローカル 分電盤、各戸分電盤、外灯 | |
| 日 本 又は 第三国 | ディーゼルエンジン 発電機 400V主配電盤 機械補機設備 電気補機設備 配管、バルブ類 電線管及びケーブル類 塗 料 保守用特殊道工具 予備品 | |

(2) 輸送方法

前述(5-4-1参照)した様に、マレ島より当プロジェクトサイトまでの約150 kmの海上輸送は3トン級のバージを使用する必要がある。

5-4-5 実施スケジュール

日本国政府の無償資金協力により当該プロジェクトが実施される場合、両国間で交換公文(E/N)締結後に、①実施設計図書作成、②入札・工事契約、③建設工事の3段階を経て機材整備、施設建設が行われる。

(1) 実施設計業務

E/N締結後、日本のコンサルタントは「モ」国と直ちにコンサルタント契約を締結し実施設計に着手する。

基本設計調査及び実施設計調査の結果を基に、入札図書(仕様書及び実施設計図)の作成を行う。実施設計の初期と最終の2段階に、「モ」国側関係機関と綿密な打合せを行い、最終成果品の承認を得て入札業務に進む。

所要作業時間は3ヶ月と予想される。

(2) 入札・業者契約

コンサルタントは「モ」国に代って入札公示、入札参加書の受理、資格審査、入札説明会の開催、入札図書配布等を行い、一定の入札準備期間をおき、入札価格及び図書を受領後速やかにその結果を審査し、「モ」国と日本国法人の請負会社間の業者契約の締結促進をはかる。

なお、入札は、関係者立会いのもとに行われ、最低価格を提示した入札者が、その入札内容が適正であると評価された場合に落札者となり、「モ」国政府と業者契約を行う。

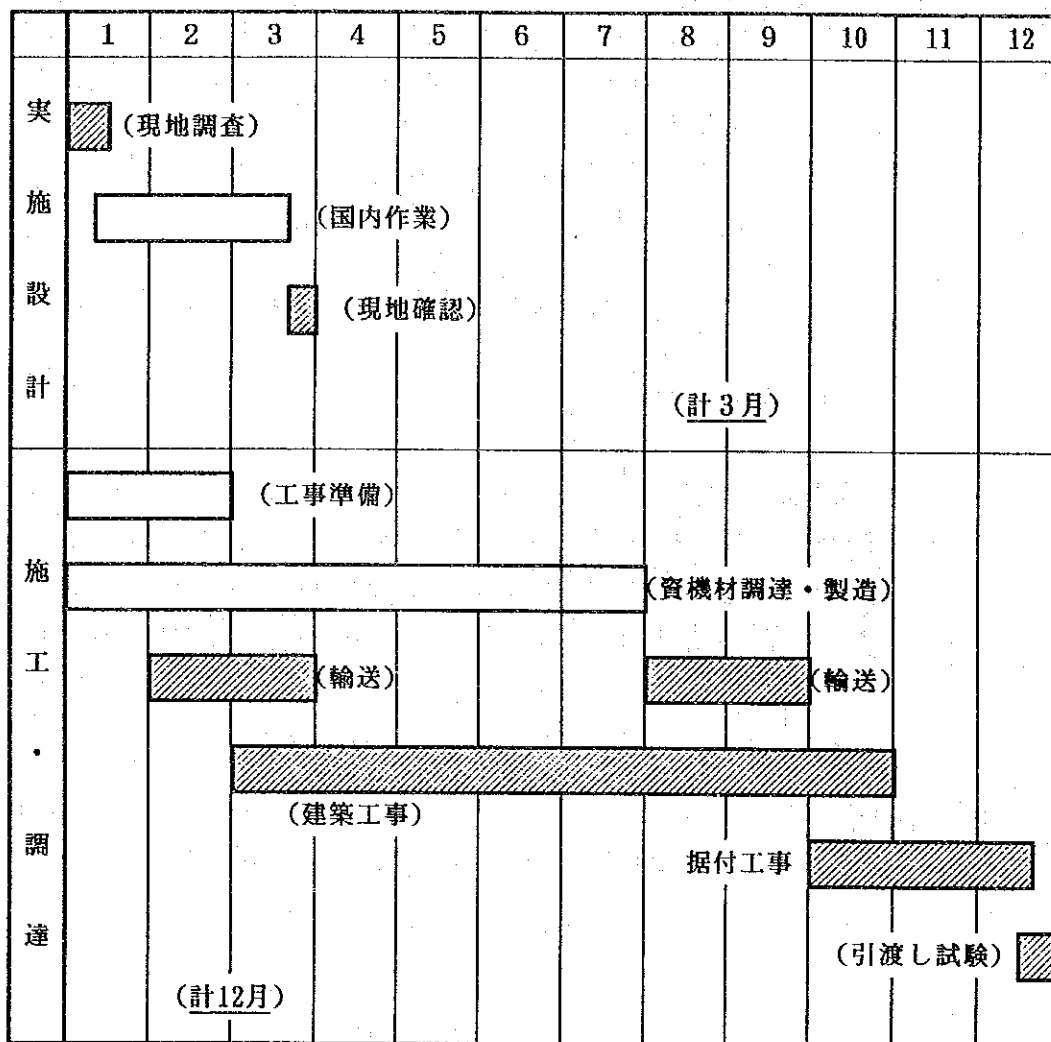
入札から工事契約までに要する期間は2ヶ月と予想される。

(3) 建設工事及び機材整備

業者契約署名後、日本国政府の認証を得て請負業者が調達・工事に着手する。本計画の規模、施設内容から判断し、建設資材の調達が順調に進み、「モ」国側負担範囲の準備工事が円滑に行われるとすれば、本プロジェクトの建設に係わる工期は、実施設計3ヶ月、資機材製作期間7ヶ月、現地工事期間10ヶ月と見込まれる。

なお、コンサルタントは、着工前の打合せを行い、さらに資機材の現地輸送、施工法、工事工程等について、請負会社の指導・監督を実施し、工程管理・品質管理を行い、E/Nに定められている期間内に業務を完了するものとする。

図5-2 実施スケジュール



備考： □ 国内作業 ■ 現地作業

5-4-6 概算事業費

(1) 工事負担区分

1) 日本国政府の負担する範囲

- (a) ディーゼル発電所の建設工事
- (b) 配電線設備資機材の調達・供与
- (c) スペアパーツ等資機材の調達・供与
- (d) OJTの実施

2) 「モ」国が負担する範囲

- (a) 当該建設用地内の既設設備の移設及び撤去並びに整地による建設用地の確保
- (b) 敷地境界線上のフェンス（サンゴブロック）施工
- (c) 配電線設備工事
- (d) 日本国政府の外国為替公認銀行における口座開設費用と支払手数料他、日本国の無償資金協力で含まれない当該プロジェクトに必要なその他全ての費用の負担
- (e) 当該プロジェクトに必要な資機材の迅速な荷降ろし措置及びこれらの輸入並びに再輸出に対する税金、日本国法人会社及び日本人に対する事業税・通関手数料などの免税措置及び派遣された日本人又は外国人に対する便宜供与
- (f) 本計画遂行のための「モ」国政府内の承認作業の円滑な実施
- (g) OJT受講訓練員の任命
- (h) 施設建設工事のための仮設事務所、仮設倉庫並びに仮設資機材置場等の用地及び工事中に発生する廃油及び廃水の廃棄場所の確保
- (i) 施設建設工事期間中の立会いと確認
- (j) 本計画完了後の当該発電設備に対する適切な維持管理の実施と予算の確保

(2) 概算事業費

本計画に要する概算事業費は、下記のとおりと見込まれる。

1) 概算積算条件

- a) 積算時点 1993年10月
- b) 外国為替交換率 1US\$=10.9459ルフィア
(1993年3月～1993年8月、180日間のTTB平均値)
1US\$=108.82円
(1993年4月～1993年9月、180日間のTTS平均値)
- c) 計画実施期間 現地工事開始後12ヶ月
- d) 契約業者 日本国法人である請負業者
- e) その他 当該計画用資機材の輸入に関する関税および日本国法人会社にかかる事業税などの免税事項を含む。

2) 日本側負担概算事業費

事業費 約 5.98億円

3) 「モ」国側負担概算事業費

「モ」国側負担工事費は以下のとおりである。(詳細は添付資料-7参照)

| | |
|-----------------------|--------------|
| - フェンス、ゲート、植栽工事 | US\$ 76,634 |
| - 配電工事 | US\$ 56,983 |
| - 既設発電機撤去工事 (エダフシ島のみ) | US\$ 300 |
| 合 計 | US\$ 133,917 |

上記の他に下記費用が必要である。

- 銀行取極め手数料
- 支払い授權書(A/P)

第 6 章 事業効果と提言

第6章 事業効果と提言

6-1 効 果

本計画の直接効果としては、本計画の実施によりアトールの首都であるナイフェル島とエダフシ島に安定した電力の供給が可能になる。また、間接効果としては電力の安定供給により民生の向上と社会福祉施設、アトール行政事務所等公共施設及び漁船修理工場等の島民生活に不可欠な施設の安定的運用が計れ、首都マレの住民との格差是正の一助となると期待される。

表6-1に本計画が実施されることによる効果を示す。

表6-1 地方環礁島電化の現状と本計画実施後の効果

| | 現 状 と 問 題 点 | 本 計 画 で の 対 策 | 計 画 の 効 果 ・ 改 善 の 程 度 |
|---|---|---|--|
| ナ イ フ ァ ル 島 の 電 化 | <ol style="list-style-type: none"> 1. 電化率；53% 2. 供給時間；18～23時(5時間) 3. 既設発電機；6台有るが古く安定供給が不可能(40, 12.5, 10, 7, 3, 2kVA 計 74.5kVA) 4. 発電容量；潜在需要電力量の約50% 5. 配電網；発電機の同期運転が不可能な為、バラバラに入り乱れている。系統同士の連携は不可能。 6. 電気料金；3Rf/kwhでMEBの倍額である。 7. 住宅のみならず、社会福祉施設、官公庁、工場等への電力供給が満足されていない。 8. 個人所有の発電設備25台が有るが、電力供給はしていない(故障機が多い) | <ol style="list-style-type: none"> 1. 5年後の需要を想定した発電所の建設(100kW 3台、内1台予備)。施設は更に1台追加可能なようにスペースを確保 2. 発電機；24時間運転仕様 3. 配電網の建設 4. 予備品等の整備 | <ol style="list-style-type: none"> 1. 5～8年後の需要予測に対応可能(電化率100%) 2. 更にMEBが発電機を増設すれば10年後の需要にも対応出来る。 3. 24時間供給可能。 4. 住民は公的電力を購入でき、照明用の灯油代の負担が低減される。 5. 電力の安定供給により、民生の向上が計れ、社会福祉施設、官公庁等の安定的運用が計れる。 6. 首都マレとの生活レベル格差の低減が計れる。 |
| エ ダ フ シ 島 の 電 化 | <ol style="list-style-type: none"> 1. 電化率；0% 2. 共同体に依る電化が計画されているが、運転開始のメドが立っていない。 3. 個人所有の発電設備33台が有るが、電力供給はしていない。(故障機が多い) 4. アトール事務所やヘルスセンターも自前で発電機を設備し、運転管理している。 | <ol style="list-style-type: none"> 1. 5年後の需要を想定した発電所の建設(75kW 3台、内1台予備)。施設は更に1台追加可能なようにスペースを確保 2. 発電機；24時間運転仕様 3. 配電網の建設 4. 予備品等の整備 | 同 上 |

6-2 結 論

「モ」国に於ける公的電力による地方環礁島の電化率は、第3章に既述した通り、266の居住島の内僅か9島にしか過ぎず、首都マレへの一極集中の原因となっている。このマレ島への一極集中はマレ島住民と地方環礁島住民との間に大きな生活格差を生じさせているばかりか、市民生活、産業活動等に極めて憂慮すべき事態を生じさせている。

「モ」国政府及びMEBはこうした状況の改善を計るため、1985年の第一次国家開発計画策定時点より、現在実施中の第三次国家開発計画のなかで地方環礁島電化計画を推進してきたが、その実施状況は「モ」国の逼迫した財政事情からアトール行政府の置かれている島でさえ遅々として進んでいないのが現状である。

本計画はラビヤニアトールの首都であるナイファル島とバーアトールの首都であるエダフシ島の電化計画を推進するもので、両島への安定した電力を供給することが可能となり、島民の市民生活の向上と社会・経済活動の活性化が期待出来、併せて「モ」国政府が国家開発計画の内で力点を置いている首都マレと地方環礁島住民との生活格差の是正の一助となることも期待できる。このことは本計画で電化の対象となった二島のみならず、同一アトールの民生の向上、社会・経済活動の活性化も期待出来る。（裨益人口は約17,400人）

また本計画はMEBにより計画が進められている将来の地方環礁島電化計画のモデル電化島となり得る性格を持ち、建設工事期間中に行われる日本の請負業者の技術者からMEBの技術者への技術訓練（技術移転）が他の地方環礁島の電化推進に大きな役割を担うことが出来る。

以上の点から、本計画が日本国政府の無償資金協力により実施される意義は大きく、その妥当性はきわめて高いと判断される。

6-3 提 言

本計画は「モ」国が推進する地方環礁島電化計画の一環をなすものであり、「モ」国側は本計画で建設・整備された施設・設備の機能を長期的に維持・管理するためには以下のごとき対応を図る必要がある。

- (1) 「モ」国側技術者は本計画で建設・整備される施設・機材全体の機能を理解し、安定した信頼性の高い電力供給を図れるよう具体的な運転・維持管理計画を策定する必要がある。

- (2) 「モ」国側は、本計画で建設・整備される施設・機材を効果的に運用し、その目的が達成されるように、運転・維持管理技術者を任命し、本計画で実施されるOJT（実施訓練）に参画させる必要がある。
- (3) OJTを受講する「モ」国側技術者は、日本の技術者よりO&M技術を修得し、工事完了後も独自で技術向上に努めると同時に、地方環礁島電化計画実施に寄与出来るよう、他の技術者にも修得した技術の移転に努める必要がある。
- (4) もし「モ」国側技術者が日本国政府から本計画で整備される機材の運転・維持管理技術の修得のため、日本での訓練に任命された時は、その技術の修得に努め、本計画設備の供用開始後に於いても同国技術者指導を行う必要がある。
- (5) 電気料金は、電力事業として自立発展性を確保し、運転コスト、設備償却費の回収に必要な設定をおこなうべきである。
- (6) 配電線の敷設を遅滞なく行う為に、敷設チームを結成し、本プロジェクトの完工に間に合うよう敷設計画を立案し、実行に移す必要がある。
- (7) 各戸配電の住民への工事費負担については、各戸配電を早期に実現するため、何らかの助成措置を検討すること。
- (8) 電力料金体系は、使用量が多いほど割高になるなどの通増型とし、大口需要者に対しては節電インセンティブが働き、貧困層の負担軽減となるようにするなどを検討する必要がある。

添付資料

- 資料－1 調査団員名簿
- 資料－2 現地調査日程
- 資料－3 相手国関係者リスト
- 資料－4 協議議事録
(Minutes of Discussion)
- 資料－5 フィールドレポート
- 資料－6 カントリーデータ
- 資料－7 「モ」国負担工事費の内訳
- 資料－8 当該発電設備の想定運転収支

資料-1 調査団員名簿

調査団員名簿（基本設計調査）

| 氏名 | 担当業務 | 現職 |
|-------|----------------|------------------|
| 小倉 裕二 | 総括（団長） | 外務省経済協力局 無償資金協力課 |
| 西川 光久 | 業務主任（発電プラント設備） | 八千代エンジニアリング（株） |
| 瀬戸 寛仁 | 発電施設計画 | 八千代エンジニアリング（株） |
| 玉井 昌幸 | 配電設備計画 | 八千代エンジニアリング（株） |

調査団員名簿（ドラフトファイナルレポートの現地説明）

| 氏名 | 担当業務 | 現職 |
|-------|----------------|------------------|
| 鈴木 信也 | 団長 | 外務省経済協力局 無償資金協力課 |
| 西川 光久 | 業務主任（発電プラント設備） | 八千代エンジニアリング（株） |
| 玉井 昌幸 | 配電設備計画 | 八千代エンジニアリング（株） |

資料-2 現地調査日程

1. 基本設計調査

| 日順 | 月/日 | 曜日 | 天候 | 宿泊地 | 移動 | 調査業務の概要 |
|----|------|----|---------------|--------|---------------------------------------|--|
| 1 | 8/19 | 木 | 曇 | コロンボ | 成田発 12:00 UL-457 コロンボ着 19:15 | 調査団東京発 移動 |
| 2 | 8/20 | 金 | 晴 | マーレ | コロンボ発 20:05 UL-101 マーレ着 20:55 | JICA事務所訪問・打ち合わせ 日本大使館訪問・打ち合わせ 移動 |
| 3 | 8/21 | 土 | 晴 | マーレ | | 団内打ち合わせ マーレ島市場調査 |
| 4 | 8/22 | 日 | 晴 | マーレ | | Ministry of Foreign Affairs (MFA) 訪問・打ち合わせ 調査目的・概要の説明 Maldives Electricity Board (MEB) 訪問・打ち合わせ Inception Report, Japan's Grant Aid Program 及び Questionnaire の説明 |
| 5 | 8/23 | 月 | 晴 | マーレ | | MEB 訪問・資料収集 MFA 訪問・Priority 協議 |
| 6 | 8/24 | 火 | 晴 | マーレ | | MEB 訪問・資料収集 MFA 訪問・Priority 協議 |
| 7 | 8/25 | 水 | 晴 | マーレ | | MEB 訪問・資料収集 Ministry of Atoll Administration (MAA) 訪問・Priority 協議 |
| 8 | 8/26 | 木 | 晴 | マーレ | | MEB 訪問・資料収集 MFA 訪問・Priority 協議 |
| 9 | 8/27 | 金 | 曇 晴 一時雨 | フェリバル島 | マーレ発 8:00 スピードボート フェリバル島着 18:30 | Naifaru 及び Hinnavaru 島 踏査・資料収集 |
| 10 | 8/28 | 土 | 曇 | マーレ | フェリバル島発 7:00 スピードボート マーレ着 17:20 | Kan' dholuhudhoo 及び Eydafushi 島 踏査・資料収集 |
| 11 | 8/29 | 日 | 曇 一時雨 | マーレ | | MFA 訪問・現地踏査結果報告及びM/D協議 |
| 12 | 8/30 | 月 | 晴 一時雨 | マーレ | | MFA 訪問・M/D協議・調印 |
| 13 | 8/31 | 火 | 晴 | マーレ | | MEB 訪問・Field Survey Report の作成 小倉団長帰国の途へ |
| 14 | 9/1 | 水 | 曇 一時雨 | マーレ | | MEB 訪問・Field Survey Report の作成 及び資料収集 Ministry of Trade and Industry (MTI) 訪問・資料収集(FPI & FISB) |
| 15 | 9/2 | 木 | 晴 | マーレ | | MEB 訪問・Field Survey Report の作成 及び資料収集 JOCV 訪問・Kelaa 島農業開発計画の情報収集 |
| 16 | 9/3 | 金 | 晴 | マーレ | | Field Survey Report の作成及び資料整理・分析 |
| 17 | 9/4 | 土 | 晴 | マーレ | | MEB 訪問・Field Survey Report の作成 及び資料整理・分析並びに既設発電所調査 HTCC 訪問・輸送、建設に係わる情報収集 |

| 日順 | 月/日 | 曜日 | 天候 | 宿泊地 | 移動 | 調査業務の概要 |
|----|------|----|----------|--------|---|--|
| 18 | 9/5 | 日 | 晴 | ガン島 | マーレ発 15:20 小型飛行機 カドゥド-着 16:45 車 ガン島着 17:00 | MEB 訪問・Field Survey Report の作成 及び資料整理・分析 移動 |
| 19 | 9/6 | 月 | 晴 | マーレ | カドゥド-発 16:00 小型飛行機 マーレ着 17:40 | Gan 島踏査・資料整理・分析 |
| 20 | 9/7 | 火 | 晴 | マーレ | | MEB 訪問・Field Survey Report の作成 及び資料整理・分析 MFA 訪問・Naifaru 島地図の入手 |
| 21 | 9/8 | 水 | 晴 | マーレ | | MEB 訪問・Field Survey Report の作成 及び資料整理・分析 |
| 22 | 9/9 | 木 | 晴 | ハニマド-島 | マーレ発 12:30 小型飛行機 ハニマド-島着 13:15 スピードボート フィドゥ-島着 16:45 フィドゥ-島発 17:50 スピードボート ハニマド-島着 18:20 | MEB 訪問・Field Survey Report の作成 及び資料整理・分析 移動 フィドゥ-島建設中発電所踏査・資料収集 |
| 23 | 9/10 | 金 | 晴 | ハニマド-島 | ハニマド-島発 08:00 スピードボート ケラア島着 09:00 ケラア島発 12:35 スピードボート クルド-フシ島着 16:00 クルド-フシ島発 18:00 スピードボート ハニマド-島着 19:00 | Kelaa 島踏査・資料収集 Kulhuhuffushi 島既設発電所調査・資料収集 |
| 24 | 9/11 | 土 | 晴 | マーレ | ハニマド-島発 14:50 小型飛行機 マーレ着 16:35 | Hanimaadhoo 島既設発電所調査・資料収集 |
| 25 | 9/12 | 日 | 晴 | マーレ | | MEB 訪問・Field Survey Report の作成 及び資料整理・分析 |
| 26 | 9/13 | 月 | 晴 一時雨 | マーレ | | MEB 訪問・Field Survey Report の説明 及び資料整理・分析 |
| 27 | 9/14 | 火 | 晴 | マーレ | | MEB 訪問・Field Survey Report の説明・提出 及び資料整理 MTCC 訪問・資料収集 |
| 28 | 9/15 | 水 | 晴 | コロンボ | マーレ発 14:20 UL-102 コロンボ着 16:10 | 移動 |
| 29 | 9/16 | 木 | 晴 | バンコク | コロンボ発 07:35 UL-422 バンコク着 12:30 | 移動 |
| 30 | 9/17 | 金 | 晴 | 成田着 | バンコク発 11:00 TG-640 成田着 19:00 | 移動 調査団 (コンサルタント) 成田着 |

2. ドラフトファイナルレポート説明調査

| 日順 | 月/日 | 曜日 | 天候 | 宿泊地 | 移動 | 調査業務の概要 |
|----|-------|----|-----------|-------------|--|--|
| 01 | 11/01 | 月 | 晴 | | 成田発 13:00 UL-455 コロンボ着 19:30 | 調査団東京発 移動(成田-コロンボ) |
| 02 | 11/02 | 火 | 曇 | コロンボ マーレ | コロンボ発 16:00 UL-101 マーレ着 16:55 | JICAコロンボ事務所訪問・打合せ 在スリランカ日本大使館訪問・打合せ 移動(コロンボ-マーレ) |
| 03 | 11/03 | 水 | 曇 | マーレ | | Ministry of Foreign Affairs (MFA) 訪問、 打合せ(調査団日程、報告書案の概要、 プロジェクトスケジュール、その他) |
| 04 | 11/04 | 木 | 豪雨 | マーレ | | Maldives Electricity Board (MEB) 訪問、 打合せ(報告書案詳細、現場調査工程) |
| 05 | 11/05 | 金 | 曇時々 豪雨 | | マーレ発 08:00 ヘリコプター ナイファル着 08:45 ナイファル発 10:00 ヘリコプター エダフシ着 10:20 エダフシ発 11:30 ヘリコプター マーレ着 12:00 | ナイファル島現場視察 エダフシ島現場視察 団内打合せ |
| 06 | 11/06 | 土 | 豪雨 | マーレ | | 団内打合せ(豪雨の為、マレ島訪問不可能) |
| 07 | 11/07 | 日 | 曇時々 雨 | | マーレ発 15:30 カドウ着 16:30 カドウ発 17:30 マーレ着 18:30 | MEB訪問・打合せ(報告書案詳細) マンドウ島日本の無償資金協力による漁業基地 現場訪問 |
| 08 | 11/08 | 月 | 曇時々 雨 | マーレ | | MEB訪問・打合せ(報告書案詳細及び技術的内容 の再確認) |
| 09 | 11/09 | 火 | 晴時々 曇 | マーレ | | MFA訪問協議議事録の調印 技術打合せ議事録の確認・調印 |
| 10 | 11/10 | 水 | 晴時々 曇 | | マーレ発 10:40 UL-102 コロンボ着 12:30 団長 コロンボ発 23:50 SQ-123 コンサル団員 コロンボ発 21:20 UL-456 | 移動(マーレ-コロンボ) JICAコロンボ事務所訪問・調査結果報告 在スリランカ日本大使館訪問・調査結果報告 移動(コロンボ-成田) |
| 11 | 11/11 | 木 | 曇時々 雨 | 機内 | 団長 シンガポール着 06:10 シンガポール発 08:10 UA-890 成田着 15:30 コンサル団員 成田着 10:40 UL-456 | 移動(調査団東京帰着) |

資料－3 相手国関係者リスト

面 談 者 リ ス ト

| 所属及び氏名 | 職 位 |
|--|---|
| 外務省 Ministry of Foreign Affairs | |
| Mr. Mohamed Shihab | Director of External Resources |
| Mr. Mohamed Naseer | Assistant Undersecretary |
| Miss. Aishath Azeema | Senior Secretary |
| Mr. Ibrahim Sujad | English Secretary |
| 計画環境省 Ministry of Planning and Environment | |
| Hon. Ismail Shafeeu | Minister |
| Mr. Mohamed Hunaif | Assistant Director |
| 公共事業労働省 Ministry of Public Works and Labour | |
| Hon. Abdulla Kamaldeen | Minister |
| Mr. Ahmed Ashraf | Assistant Undersecretary |
| アトール行政庁 Ministry of Atoll Administration | |
| Mr. Mohamed Latheef, Ph. D | Deputy Minister |
| Mr. Mohamed Fardok | Undersecretary |
| 通商産業省 Ministry of Trade and Industry | |
| Mr. Ahmed Hassem | Deputy Director of; Foreign Investment Services Bureau (FISB) |
| Mr. Ibrahim Shakeer | Director of ; Fisheries Projects Implementation Department (FPID) |
| Mr. Adnan Ali | Technical Manager of FPID |
| モルディヴ電力庁 Maldives Electricity Board | |
| Mr. Abdulla Kamaldeen | Chairman |
| Mr. Mohamed Saeed | Managing Director |
| Mr. Abdul Shakoor | Director |
| Mr. Abdul Fahthah | Deputy Director |
| Mr. Ibrahim Hassan | Deputy Director |
| Mr. Abdulla Wahid | Mechanical Engineer |
| Mr. Ibrahim Athif | Assistant Mechanical Engineer |
| Mr. Hassan Rasheed | Supervisor |
| Mr. Mohamed Qasim | Assistant Manager at Sn. Gan |
| Mr. Ahmed Nazim | Electromechanical Engineer |
| Mr. Moosa Ibrahim | Assistant Mechanical Engineer |

| <u>所属及び氏名</u> | <u>職 位</u> |
|--|---|
| ラーアトール・カンドゥラドゥ島 Kan' Dholhudhoo Island in Raa Atoll | |
| Mr. Easa Moosa Kaleycgefaay | Senior Island Chief |
| ラビヤニアトール・ナイファル島 Naifaru Island in Lhaviyani Atoll | |
| Mr. Ibrahim Rashaad Mr. Abdul Latheef Ibrahim | Chief of Atoll Chief of Island |
| ラビヤニアトール・ヒンナバル島 Hinnavaru Island in Lhaviyani Atoll | |
| Mr. Mohmed Hussein Fulu Mr. Mohamed Ibrahim Mr. Mohamed Ahomed | Chief of Island General Manager of Fiyavahi Enterprises Owner of Generating Plant |
| バーアトール・エダフシ島 Eydhafushi Island in Baa Atoll | |
| Mr. Mohmed Shareef Mr. Ali Waheed | Senior Undersecretary of Atoll Chief of Island |
| フェリバル島缶詰工場 Fish Canning Factory | |
| Mr. Abdul Fathah Hussein | Manager |
| ラームアトール・ガン島 Gan Island in Laamu Atoll | |
| Mr. Ibrahim Zuhair | Chief of Atoll |
| ハーアリファトール・ディドゥ島 Dhidhdhoo Island of Haa Alifu Atoll | |
| Mr. Adam Abdul Abdul Rahman | Chief of Atoll |
| ハーダールアトール・クルドフシ島 Kulhudhuffushi Island of Haa Dhall Atoll | |
| Mr. Ahmed Igbaal Mr. Ahmed Sameer Mr. Adam Mohamed | Chief of Island Chief of Atoll Eng-Chief of Power Station |
| ハーアリファトール・ケラ島 Kela Island of Haa Alifu Atoll | |
| Mr. Abdul Waheed | Chief of Island |
| 在スリランカ日本国大使館 木野本 浩之 氏 | 二等書記官 |
| 在スリランカ J I C A 事務所 坂牧 嘉昭 氏 河崎 充良 氏 | 所長 所員 |
| JOCV Maldives Office 護守(Gonokami) 睦子 氏 河原 勉 氏 | 調整員 Kalaa 島農業協力隊員 |

資料-4 協議議事録
(Minutes of Discussion)

1. 基本設計調査

MINUTES OF DISCUSSIONS
BASIC DESIGN STUDY
ON
ATOLL ISLAND ELECTRIFICATION PROJECT
IN
THE REPUBLIC OF MALDIVES

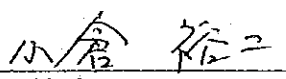
In response to a request from the Government of the Republic of Maldives, the Government of Japan decided to conduct a Basic Design Study on Atoll island electrification project in the Republic of Maldives (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Maldives a study team, which is headed by Mr. Yuji Ogura, Grant Aid Division, Economic Cooperation Bureau, Ministry of Foreign Affairs, and is scheduled to stay in the country from August 20 to September 15, 1993.

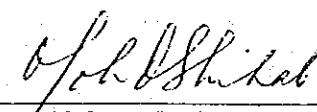
The team held discussions with the officials concerned of the Government of Maldives and conducted a field survey at the study area.

In the course of discussions and field survey, both parties have confirmed the main items described on the attached sheets. The team will proceed to further works and prepare the Basic Design Study report.

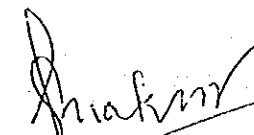
Male', August 30, 1993



Mr. Yuji Ogura
Leader
Basic Design Study Team
Japan International Cooperation
Agency (JICA)



Mr. Mohamed Shihab
Director of External Resources
Ministry of Foreign Affairs
The Republic of Maldives



Mr. Abdul Shakoor
Director
Maldives Electricity Board
(MEB)

ATTACHMENT

1. Title of the Project

The official title of the Project is Atoll island electrification project in the Republic of Maldives.

2. Objective

The objective of the Project are to supply and to install diesel engine generators including their auxiliaries and to construct power distribution networks at Naifaru island, Eydhafushi island and Gan island in order to enable households and buildings to receive public electricity.

3. Project Site

The Project sites are located in Naifaru island, Eydhafushi island and Gan island as shown in Annex-I.

4. Execution Agency

The Ministry of Foreign Affairs, the Republic of Maldives is responsible for execution of the Project of the Maldives side and Maldives Electricity Board (MEB) is implementation agency for the Project.

5. Items Requested by the Government of Maldives

JICA study team carried out field surveys of the following six(6) islands as the objects of the basic design study.

- Naifaru island at Lhaviyani atoll
- Hinnavaru island at Lhaviyani atoll
- Eydhafushi island at Baa atoll
- Gan island at Laamu atoll
- Kan'dholhudhoo island at Raa atoll
- Kelaa island at Haa Alifu atoll

After discussions with the Basic Design Study Team, the following items were finally requested by the Maldives side as the object islands of the Project.

(1) Equipment and Materials

- 1) Supply and installation of three(3) sets of diesel engine generators with output capacity 100 KW including necessary electrical equipment and auxiliaries for Naifaru island.
- 2) Supply and installation of three(3) sets of diesel engine

generators with output capacity 50 KW including necessary electrical equipment and auxiliaries for Eydhafushi island.

- 3) Supply and installation of three(3) sets of diesel engine generators with output capacity 50 KW including necessary electrical equipment and auxiliaries for Gan island.
- 4) Supply of equipment and materials for branch power distribution networks for Naifaru island, Eydhafushi island and Gan island.
- 5) Supply of spare parts and tools for diesel engine generators including their auxiliaries and distribution networks.
- 6) Operation and Maintenance manuals for diesel engine generators and their auxiliaries.

(2) Construction

- 1) Construction of a building(s) and equipment foundations necessary for the Project in Naifaru island.
- 2) Construction of a building(s) and equipment foundations necessary for the Project in Eydhafushi island.
- 3) Construction of a building(s) and equipment foundations necessary for the Project in Gan island.
- 4) Construction of main power distribution network for Naifaru island.
- 5) Construction of main power distribution network for Eydhafushi island.
- 6) Construction of main power distribution network for Gan island.

(3) On-The-Job training(OJT)

OJT for the installation, operation and maintenance techniques of the diesel power plants during construction period.

However, the final components of the Project will be decided after further studies consulted by the officials concerned in Japan.

6. Operation and maintenance of the equipment

- (1) The Maldives side shall allocate personals and the budget sufficient for installation of branch power distribution networks and for operation & maintenance of equipment and materials completed under the Project.
- (2) The Maldives side shall report to Japanese side the conditions and all aspects of the installation, operation and maintenance of the

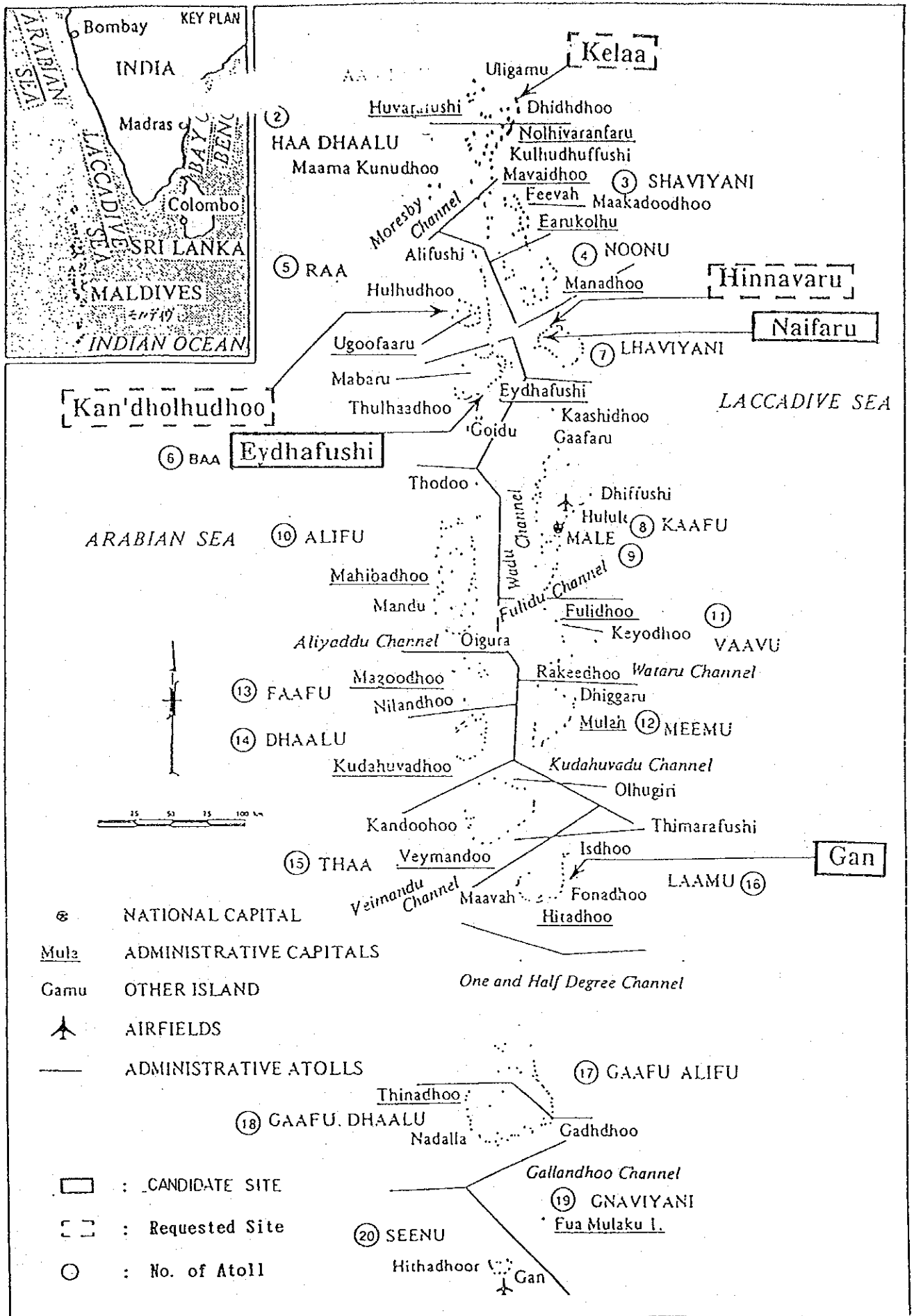
equipment and materials under the Project on every six(6) months from the commencement of the installation by the Maldives side.

7. Japan's Grant Aid System

- (1) The Government of Maldives has understood the system of Japan's Grant Aid explained by the team.
- (2) The Government of Maldives will take the necessary measures described in Annex II for smooth implementation of the Project, on condition that the Grant Aid assistance by the Government of Japan is extended to the Project.

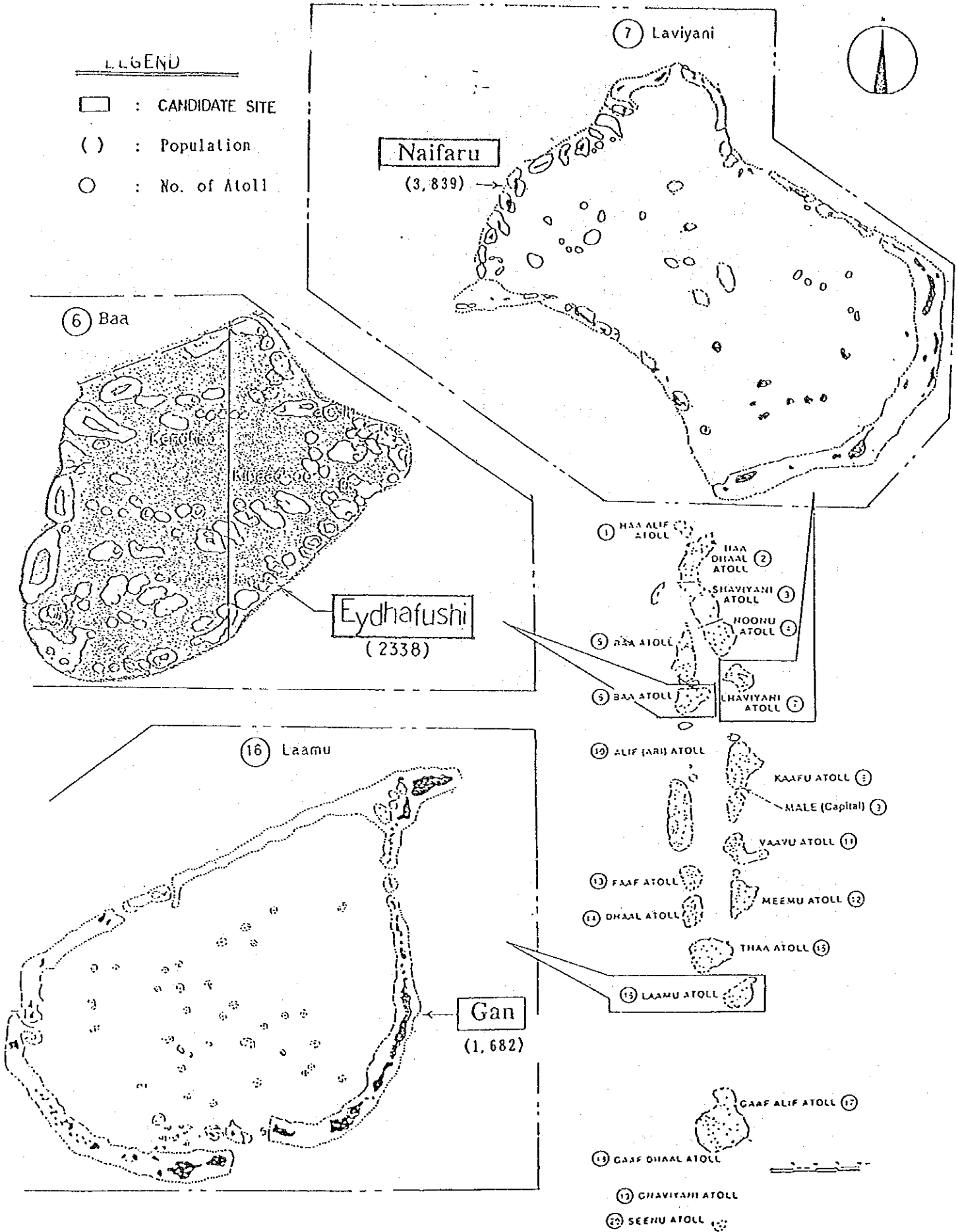
8. Schedule of the Study

- (1) The consultants will proceed to further studies in Maldives until September 15, 1993.
- (2) Based on the Minutes of Discussions and technical examination of the study results, JICA will prepare a final draft report in English and dispatch a mission to Maldives in order to explain its contents by the middle of November, 1993.
- (3) In case that the contents of the report are accepted in principle by the Government of Maldives, JICA will complete a final report and send it to Maldives by the end of February, 1994.



Map for Maldives

Annex-I Location Map Project Site (2/2)



Map for Project Site

Handwritten mark

Handwritten signatures

ANNEX-II

UNDERTAKINGS BY THE GOVERNMENT
OF THE REPUBLIC OF MALDIVES

- a) To secure and provide cleared, embanked and leveled land as well as access road for the project sites prior to the commencement of the construction of the Japanese side.
- b) To provide proper arrangements for unloading and for inland transportation of the equipment and materials necessary for the Project.
- c) To construct boundary fences, gates and plantation for the power stations.
- d) To provide the land for temporary site offices, warehouses and stock yards in the project sites during the implementation period.
- e) To ensure speedy unloading, tax exemption, custom clearance of the goods for the Project at the port and/or airport of disembarkation.
- f) To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contracts such facilities as may be necessary for their entry into the Republic of Maldives and stay therein for the performance of their work.
- g) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the Republic of Maldives with respect to the supply of the products and services under the verified contracts.
- h) To bear commissions to a Japanese foreign exchange bank for the banking services based upon the Banking Arrangement.
- i) To bear all the expenses, other than those to be born by the Grant Aid necessary for the execution of the Project.
- j) To provide proper arrangements for the construction, such as water supply, drainage, etc., if necessary.
- k) To install the equipment and materials supplied by the Japan's Grant Aid for branch power distribution networks according to the proper plan.
- l) To relocate two(2) set of existing diesel engine generators and distribution facilities including cables installed at Eydhafushi island in order to utilize them for another island(s).
- m) To provide necessary arrangement to restrict of environmental pollution such as noise from the diesel engine generator, etc.
- n) To assign exclusive-counterpart engineers and technicians to the Project in order to transfer the operation and maintenance technique for the

Project and to witness and confirm construction when inspection are carried out.

- o) To provide a bench mark at the sites.
- p) To bear the cost for the fuel oil and the lubrication oil during commissioning.
- q) To provide necessary data and information for the detailed design of the Project.
- r) To provide topographical survey maps and if possible, soil investigation reports for the Project sites.
- s) To take necessary measures to expedite the approval for executions of the Project by the Government of Maldives, if necessary.
- t) To control traffic during the inland transportation of the facilities of the Project, if necessary.
- u) To provide the disposal places of the surplus soil during the construction period.
- v) To secure the approval for access to public and private land for the Project, if necessary.
- w) To secure the approval for protection works for the existing facilities, if necessary.

2. ドラフト・ファイナルレポートの現地説明

MINUTES OF DISCUSSIONS

BASIC DESIGN STUDY ON ATOLL ISLAND ELECTRIFICATION PROJECT

IN THE REPUBLIC OF MALDIVES

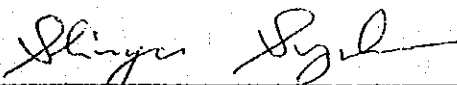
(CONSULTATION ON DRAFT REPORT)

In August 1993, the Japan International Cooperation Agency(JICA) dispatched a Basic Design Study Team on Atoll Island Electrification Project (hereinafter referred to as "the Project") to the Republic of Maldives, and through discussions, field survey, and technical examination of the study results in Japan, has prepared the draft report of the study.

In order to explain and to consult the Maldives side on the components of the draft report, JICA sent to Maldives a study team(hereinafter referred to as "the Team"), which was headed by Mr.Shinya Suzuki, Grant Aid Division, Economic Cooperation Bureau, Ministry of Foreign Affairs, and was scheduled to stay in the country from November 2 to 9, 1993.

As a result of discussions, both parties have confirmed the main items described on the attached sheets.

Male. November 9, 1993



Mr. Shinya Suzuki
Leader
Draft Report Explanation Team
Japan International Cooperation
Agency(JICA)



Mr. Mohamed Shihab
Director of External Resources
Ministry of Foreign Affairs
The Republic of Maldives



Mr. Mohamed Saeed
Managing Director
Maldives Electricity Board(MEB)

ATTACHMENT

1. Components of the Draft Report

The Government of Maldives has agreed and accepted in principle the components of the Draft Report proposed by the Team.

2. Japan's Grant Aid system

- (1) The Government of Maldives has understood the system of Japanese Grant Aid explained by the Team.
- (2) The Government of Maldives will take the necessary measures described in Annex-I for smooth implementation of the Project on condition that the Grant Aid assistance by the Government of Japan is extended to the Project.

3. Further schedule

The Team will make the Final Report in accordance with the confirmed items, and send it to the Government of Maldives by the end of February 1994.

4. Installation, operation and maintenance of the equipment

- (1) The Maldives side shall allocate the personals and budget sufficient for installation of power distribution networks, workshop equipment, etc, and for operation & maintenance of equipment and materials supplied and constructed under the Project.
- (2) The maldives side shall report, monthly, to Japanese side the conditions and all situations related to the installation works of the power distribution networks by the Maldives side from the commencement of the installation.
- (3) The Maldives side shall report to Japanese side the conditions and all aspects of the operation and maintenance of the facilities, equipment and materials supplied and constructed under the Project on every six(6) months from the completion of the Project up to at least 5 years.

5. Items discussed by both parties

- (1) In accordance with the request made by Maldives side, Naifaru island at Lhaviyani atoll and Eydhafushi island at Baa atoll will be electrified under the Project when the Grant Aid assistance by the Government of Japan is extended to the Project.
- (2) Both parties have confirmed and have accepted work items and working shares described in Annex-II for purpose of smooth and effective implementation of the Project.

6, Recommendations

The Maldives side has accepted the Team's recommendations described in ANNEX-III to ensure the long-term proper functioning of facilities and equipment to be provided under the Project.

ANNEX-I

UNDERTAKINGS BY THE GOVERNMENT
OF THE REPUBLIC OF MALDIVES

- a) To secure and provide cleared, embanked and leveled land as well as access road for the project sites prior to the commencement of the construction by Japanese side.
- b) To provide proper arrangements for unloading and for inland transportation of the equipment and materials necessary for the Project.
- c) To construct boundary fences, gates and plantation for the power stations.
- d) To provide the land for temporary site offices, warehouses and stock yards in the project sites during the implementation period.
- e) To ensure speedy unloading, tax exemption, custom clearance of the goods for the Project at the port and/or airport of disembarkation.
- f) To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contracts such facilities as may be necessary for their entry into the Republic of Maldives and stay therein for the performance of their work.
- g) To meet the charge of customs duties, internal taxes and other fiscal levies which may be imposed in the Republic of Maldives with respect to the supply of the products and services under the verified contracts.
- h) To maintain and use properly and effectively the facilities constructed and equipment provided under the Project.
- i) To bear commissions to a Japanese foreign exchange bank for the banking services based upon the Banking Arrangement.
- j) To bear all the expenses, other than those to be born by the Grant Aid necessary for the execution of the Project.
- k) To provide proper arrangements for the construction, such as water supply, drainage, etc.,
- l) To install the equipment and materials supplied by the Japan's Grant Aid for power distribution networks, workshop equipment etc, according to the proper plan.
- m) To relocate two(2) sets of existing diesel engine generators and distribution facilities including cables installed at Eydhafushi island in order to utilize them for another island(s).

- n) To take necessary measures for the prevention of the environmental pollution such as disposal of oil sludge, etc.
- o) To assign exclusive-counterpart engineers and technicians to the Project in order to transfer the operation and maintenance technique for the Project and to witness and confirm construction when inspection is carried out.
- p) To provide a bench mark at the sites.
- q) To bear the cost for the fuel and the lubrication oil during commissioning.
- r) To provide necessary data and information for the detailed design of the Project.
- s) To provide topographical survey maps for the Project sites.
- t) To take necessary measures to expedite the approval for executions of the Project by the Government of Maldives.
- u) To facilitate proper arrangement for inter island transportation of the facilities of the Project.
- v) To provide the disposal places of the surplus soil during the construction period.

ANNEX-II

WORKING SHARE

Both sides have confirmed work items and working shares between Japanese side and Maldives side described in the following table for smooth and effective implementation of the Project on condition that the Grant Aid assistance by the Government of Japan is extended to the Project.

| Work Items | Japanese Side | Maldives Side |
|--|-----------------------|---------------|
| I. Equipment and Materials | | |
| (1) Diesel engine generators (DEG) | Supply & installation | |
| (2) Auxiliary equipment for DEG | Supply & installation | |
| (3) Electrical equipment for DEG | Supply & installation | |
| (4) Fuel oil tanks & fuel supply line | Supply & installation | |
| (5) Main power distribution panel | Supply & installation | |
| (6) Grounding system within the power station | Supply & installation | |
| (7) Main power distribution system | Supply | installation |
| (8) Branch power distribution system | Supply | installation |
| (9) Workshop equipment | Supply | installation |
| (10) Communication equipment | Supply | installation |
| (11) Street lighting | Supply | installation |
| (12) Grounding system for power distribution system | Supply | installation |
| (13) Spare parts and maintenance tools for DEG and its Auxiliaries | Supply | stock |
| (14) Operation and Maintenance Manuals | Supply | |
| (15) On-the-Job Training(OJT) | Execution | attend |
| II. Construction | | |
| (1) Power house building | Execution | |
| (2) Equipment foundations | Execution | |

| | | |
|--|-----------|-----------------------|
| (3) Office building | Execution | |
| (4) Rain water collection and supply | Execution | |
| (5) Well and well water supply system | Execution | |
| (6) Furniture | | Supply & installation |
| (7) Site leveling and plantation | | Execution |
| (8) Boundary fence & Access road | | Execution |
| (9) Water supply & drainage for construction | | Execution |

ANNEX-III

RECOMMENDATIONS

- (1) Engineers in the Maldives must acquire a proper understanding of the general functioning of the facilities and equipment to be provided under the Project, and must also prepare a sound operation and maintenance plan to ensure a constant, highly reliable supply of electricity.
- (2) The Maldives side must appoint operation and maintenance engineers and have these engineers participate in on-the-job training (OJT) provided as part of the Project for the efficient and effective operation of the facilities and equipment to be provided under the Project to achieve the project's objectives.
- (3) The Maldivian engineers undergoing said OJT should learn appropriate operation and maintenance technologies/techniques from the Japanese engineers, devote themselves to improving their technical expertise following completion of the Project, and transfer such expertise to other engineers in order to contribute the electrification of the remaining outlying atoll islands.
- (4) In the case of Maldivian engineers undergoing technical training in Japan to learn operation and maintenance technologies/techniques in relation to the equipment to be provided under the Project by the Government of Japan, these engineers must earnestly try to master such technologies/techniques and then try to educate and train other engineers in the Maldives following the commencement of operation of the new generation facilities.
- (5) The electricity rate to be introduced for the islands should ensure the sustainability and recovery of the operation, maintenance and depreciation costs.
- (6) Work teams should be organized to install the distribution cable without any delay in accordance with the distribution network construction plan, the completion of which is timed to the completion of the Project.
- (7) The provision of a subsidy to cover part of the connection cost for each household should be considered to facilitate distribution to all households.
- (8) The introduction of a progressive rate system, whereby a higher unit rate is imposed for larger consumption, should be considered to provide low cost electricity for the poor and an energy-saving incentive for large users.

資料-5 フィールドレポート

(FLDREP1)
[COVER]

(C2L1)

THE BASIC DESIGN STUDY
ON
ATOLL ISLAND ELECTRIFICATION PROJECT
IN
THE REPUBLIC OF MALDIVES

FIELD REPORT

September 1993

Yachiyo Engineering Co., Ltd.

Basic Design Study Team

CONTENTS

| | <u>Page</u> |
|---|-------------|
| 1. Introduction | 1 |
| 2. Power Demand and Supply in Maldives | 1 |
| 2.1 Power Demand and Supply in Maldives | 1 |
| 2.2 Related Projects under Planning and/or On-going | 2 |
| 2.3 Generating Facility Data by MEB | 2 |
| 3. Present Situation of Candidated Islands | 3 |
| 3.1 Land Acquisition of the Project Sites | 3 |
| 3.2 Present situation of Candidated Islands | 3 |
| 4. Conceptual Plan for the Project | 3 |
| 4.1 General | 4 |
| 4.2 Design Conditions | 5 |
| 4.3 Generating Facility | 6 |
| 4.4 Distribution Facility | 8 |
| 4.5 Spare Parts | 9 |
| 4.6 On-the-Job Training (OJT) | 9 |
| 5. Undertakings by the Government of Maldives | 9 |
| 6. Tentative Implementation Schedule | 9 |

ATTACHMENT

| | |
|--------------|---|
| Attachment-1 | Data of Atolls and Islands |
| Attachment-2 | Power Demand and Supply by MEB (In Maldives, Male, Gan, Khulhudhuffushi, Thinadhoo, Thulhusdhoo, Hanimaadhoo and Foahmulah) |
| Attachment-3 | Transition of power demand by MEB |
| Attachment-4 | Technical Data of Existing Generating Facilities |
| Attachment-5 | Number of Staff |
| Attachment-6 | Data of Electrification Islands |
| Attachment-7 | Statistics of Population and Household (1989-1993) |
| Attachment-8 | Data of Islands |

1. Introduction

This field report has been prepared by JICA basic design study team (hereinafter referred to as 'the Team') for Atoll Island Electrification Project (hereinafter referred to as 'the Project') in the Republic of Maldives based on the field survey and discussions with the authorities concerned of the Maldives Electricity Board (hereinafter referred to as 'MEB'), in order to build mutual understanding of the Project.

This report describes the information obtained during the field survey, as well as the basic concept of the Project components consist of the three (3) candidated islands.

However, all the items and components in this report are subject to the approval of the Japanese Government.

In addition to the above, this report describes some undertakings to be carried out by the Government of Maldives if Grant Aid is extended.

As described in the Minutes of Discussion (M/D), the Team will continue the study in Japan in accordance with this Field Report, data and Informations, collected during the field survey, as well as the consultation by authorities concerned of Japanese Government.

A Final Draft report of the Project will be prepared in consultation with the Japanese authorities concerned, and will be submitted by the middle of November 1993 as mentioned in the Minutes of Discussions (M/D) concluded on 30th of August 1993.

2. Power Demand and Supply in Maldives

2.1 Power Demand and Supply in Maldives

The Government of Maldives had established Male Power House on November 1959 as sole public electricity sector.

In order to meet the electric power demand of the Maldives, Maldives Electricity Board (MEB) was established at 1982 by act of Parliament under the office of the President as the result of the reformation of Male Power House.

Since November 1982, MEB is continuing to construct power stations and distribution lines and to supplying the power to consumers in Male, capital in Maldives, and some of islands, as shown in attachment-1 and attachment-2 shows demand and supply data.

MEB has studied the power demand per consumer from 1988 to 1992 as shown in attachment-3 and also studied power demand forecast for candidated islands as shown in table-1

Table-1 Forecast of Power Demand at Projected islands

| Atoll | Island | 1994 | 1995 | 1996 | 1997 | 1998 |
|-----------|------------|------|------|------|------|------|
| Lhaviyani | Naifaru | 121 | 133 | 146 | 161 | 177 |
| Baa | Eydhafushi | 82 | 90 | 99 | 109 | 120 |
| Laamu | Gan | 57 | 63 | 69 | 76 | 84 |

Remarks : 1) Power demand per consumer is assumed as 200W
2) Annual increasing rate of power demand is 10 %.

2.2 Related Projects under Planning and/or On-going

Based on the strategy of national development plan, Ministry of Atoll Administration (hereinafter referred as 'MAA') formulated various projects under cooperation and financing by Aid countries and organizations. Related electrification project is shown on the table below;

Table-2 Electrification Project

| Atoll | Island | Expected Completion | Donor |
|-----------------|-----------------|---------------------|------------------------|
| On-going | | | |
| Haa Alifu | Dhidhdhoo | Dec. 1993 | Government of Maldives |
| Gaafu Dhaalu | Gadhdhoo | Dec. 1993 | Government of Maldives |
| Gaafu Alifu | Villingili | Dec. 1993 | Government of Maldives |
| Raa | Hulhudhuffaaruu | Dec. 1993 | Government of Maldives |
| Proposed | | | |
| Seenu | Hithadhoo | Dec. 1993 | Italy (Loan) |
| Seenu | Hulhudhoo | Dec. 1993 | Japan (Loan) |
| Seenu | Meedhoo | Dec. 1993 | Japan (Loan) |

Other detail projects are described on Island Electrification Project : February 1993 issued by MAA.

2.3 Generating Facility Data by MEB

There are ten (10) electrified islands including male, and major generating facility data is shown on attachment-4. Attachment-5 shows data of MEB's staff and attachment-6 shows other facility data in each islands.

3. Present Situation of Candidated Islands

3.1 Land Acquisition of the Project Sites

Conditions of the land acquisition for the Project are as follows:

| No. | Atoll | Island | Owner of Land |
|-----|-----------|-----------|------------------------|
| 1. | Lhaviyani | Naifaru | Government of Maldives |
| 2. | Baa | Eydafushi | Government of Maldives |
| 3. | Laamu | Gan | Government of Maldives |

Notes : 1) MEB must obtain the permission of the land use from the MAA, Community and other related sectors and shall inform Japanese side of the permission with area and location by the end of October 1993.

2) MEB must provide the detailed topographic survey map of the Project Sites

3) Location of the Project sites are shown in Attachment-5.

3.2 Present Situation of Candidated Islands

Site reconnaissance was executed by the Team with MEB and MAA, and so many data was corrected.

Attachment-7 shows Statistics of population and household from 1989 to 1992, and islands data is shown on attachment-8.

4. Conceptual Plan for the Project

4.1 General

This section describes the basic concept for the design and installation of the new power stations requested by the Maldives side, as well as the procurement of distribution materials for the Project.

As a result of the field survey on the existing facilities, following items shall be principally be applied for the basic design.

- (1) Power demand forecast shown on the Table-1 in section 2.1
- (2) Power house and administration houses shown on Fig.3
- (3) The capacity of fuel oil storage shall be for one month
- (4) IEC, ISO and Japanese code and standards shall be applied
- (5) Manual and Automatic synchronization of DEG sets
- (6) Continuous power supply (24 hours operation)
- (7) Rain water collection and supply system
- (8) Supply of 2 years spare parts
- (9) Fuel analysis is as per attachment-9

Scope of the works by the Japan's Grant Aid

The following works shall be carried out by the Japanese side as the Japan's Grant Aid for three (3) islands.

The Maldives side shall bear all expenses other than those to be born by the Japan's Grant Aid necessary for the execution of the Project in accordance with Annex-II, in the Minutes of discussions concluded on 30th August 1993 by both parties.

- (1) Supply and installation of the diesel engine generators (two sets for normal operation and one set for standby)
- (2) Supply of spare parts (Necessary for two years) and testing & inspection tools for diesel engine generators and their auxiliaries.
- (3) Construction of power house including equipment foundations and office.
- (4) Construction of main power distribution lines including distribution boards.
- (5) Supply of equipment and materials for branch power distribution lines including WH meter and breaker for the house
- (6) OJT for the installation and O & M technique of the diesel power plant during construction period.

4.2 Design Conditions

As a basis of facilities design, following conditions shall be considered:

(1) Climatic and Site Conditions

Following data sourced from SOME METEOROLOGICAL DATA 1966-1991, Department of Meteorology Male.

| | |
|--------------------------------------|---|
| 1) Altitude | Approximately 1 m from sea level |
| 2) Ambient temperature | Maximum 34.1 °C Minimum 17.2 °C Average 28.0 °C Design Temp. 34 °C |
| 3) Wind : Velocity | Maximum 31.9 m/sec Average 4.9 m/sec |
| : Direction | Spring W to E Wet Monson Summer W to E Wet Monson Autum W to E Wet Monson Winter NE to SW Dry Monson |
| 4) Relative humidity | Mean Annual 95 % |
| 5) Rainfall | Mean Annual 1,943 mm Mean Month 162 mm Max. Day 175.9 mm Max. One Hour 10.0 mm (Assumed) |
| 6) Seismic acceleration | Nil --- gal |
| 7) Thunder days | 34 Times/year |
| 8) Soil bearing capacity | 10 ton/m ² (Assumed) |
| 9) Water level (Ground level minus) | 1 m |
| 10) Other | Near sea coast |
| (2) Power Supply Condition | |
| 1) Power demand forecast | See Table-1 |
| 2) Number of DEG sets | 2-Continuous and 1-Stand-by |
| 3) Fuel system | Diesel oil Storage capacity is for one month |
| 4) System voltage | Generator : AC 415/240V (3-phase, 4-wire) Distribution : AC 400/230V (3-phase, 4-wire) Control AC 200/100V and DC 24V |
| 5) Frequency | 50 Hz |
| 6) Earthing system | Direct earthed to the ground for 400V line Fuel storage tank shall be earthed separately |
| 7) Voltage drop | According to JEAC (Max. less than 10%) |
| (3) Others | |
| 1) Noize level | According to JEAC or equivalent |
| 2) Exhaust gas | Related Japanese code |
| 3) Civil and Buildings | AIJ (exclusion of earthquake) |
| 4) Consideration of future extension | one DEG set and one fuel storage tank |

4.3 Generating Facility

(1) Outline of Major Facilities

Outline of major facilities shown on Plot Plan, One Line Diagram and Fuel Flow Diagram is as follows;

Table -3 : Outline of Major Facilities

| No. | Description | Naifaru | Eydafushi | Gan |
|-----|---|-------------|-------------|-------------|
| 1. | Plot Plan | --- | Fig.1b | --- |
| 2. | One Line Diagram | Fig.2 | Fig.2 | Fig.2 |
| 3. | Fuel Flow Diagram | Fig.3 | Fig.3 | Fig.3 |
| 4. | Diesel Engine Generator | | | |
| | 1) Capacity | 100kW | 75kW | 50kW |
| | 2) Voltage | AC 415/240V | AC 415/240V | AC 415/240V |
| | 3) Number | 2 + (1) | 2 + (1) | 2 + (1) |
| 5. | Fuel System | | | |
| | 1) Storage Tank | | | |
| | - Capacity | 32 m3 | 26 m3 | 26 m3 |
| | - Number | 1 | 1 | 1 |
| | 2) Fuel Transfer pumps | 1 + (1) | 1 + (1) | 1 + (1) |
| | 3) Day Tank | 0.6 m3 | 0.6 m3 | 0.6 m3 |
| | 4) Oil/Water separator around storage tank | Yes | Yes | Yes |
| 6. | Panels and etc. | | | |
| | 1) Control and Dist. board | 1 | 1 | 1 |
| | 2) DC 24V Battery and charger | 1 + (1) | 1 + (1) | 1 + (1) |
| 7. | Houses | | | |
| | 1) Power House (Fig.4) | 1 | 1 | 1 |
| | 2) Office House (Fig.5) | 1 | 1 | 1 |

Remarks : 1) Numerical values in () show stand-by purpose
2) Portable fire extinguisher (ABC type) shall be provided to the power and office house

(2) Diesel Engine Generator (DEG) Set

Outline of the main equipment is as follows:

- 1) Diesel Engine
 - a) Operation duty : Continuous
 - b) Capacity : See Table-3
 - c) Revolution : 1500 or 1000 rpm
 - d) Type : Indoor
 - e) fuel : Diesel Oil
 - f) Starting method : Motor

2) Generator

- | | |
|-------------------|-------------------------------|
| a) Type | : Synchronous |
| b) Capacity (kVA) | : See Table-3 |
| c) Voltage (V) | : 415/240 |
| d) Phase | : 3P4W Neutral solid grounded |
| e) Frequency | : 50 Hz |
| f) Synchronizing | : Auto and Manual |

(3) Fuel System

Brief explanation of this system is as follows:

- 1) The capacity of fuel storage tank is for one month
- 2) The capacity of day tank is for 12 hours
- 3) Automatic fuel transfer system by fuel transfer pump controlled by level switch located in day tank.
- 4) Fuel transfer pump can be used to unloading pump.
- 5) One set of Handy type of fuel pump with 5 meter hose
- 6) Fuel pipings shall be located in the ground, aerial or in the trench.
- 7) Water separator shall be provided on the common delivery line of fuel transfer pump.

(4) DC System

Common DC 24 V system shall be applied for:

- 1) Starter of DEG
- 2) Control Source for control panel
- 3) Power supply for communication facility

4.4 Distribution Facility

(1) Outline of Major Facilities

Outline of major facilities shown on One Line Diagram is as follows;
This facility is also including feeder provision for street lighting system

1. Local Distribution Boards (D/B)

This board consists of following equipment;

- 1) Incoming ELB 100 Amp
- 2) Outgoing MCB : 15 sets of single phase 20 Amp.
and one set of 3-phase 30 Amp.
- 3) Jumper terminal to the next local distribution board
- 4) Type : Outdoor self-standing and polycarbonate
- 5) Location of local D/B is 0.5 meter from the house-wall

2. WH meter panel board

This panel board (Indoor wall mounted) is located inside of each consumers and consists of followings;

- 1) Disconnecting switch with fuses (with sealing)
- 2) Watthour meter (with sealing)
- 3) ELB with (100mA)
- 4) Three switch sockets (BS type)

3. Main and branch power cable

1) Main distribution cable

This cable is applied from discription board located in power house to local distribution panel with following conditions;

- a) Directly buried in the street with approximately 750 mm deep.
- b) Cable location in the street is one third of the road width and any one side of road can be taken for cable installation.

2) Branch cable

This cable is applied from local distribution panel to each consumers with following conditions;

- a) Direct buried to the adequate point to the house and put on the wall to the WH meter panel.
- b) Minimum cable size shall be 5.5 mm²

3) Specification of Cables

a) Main and branch power cables

- Specification : XLPE insulated and corrugated metal armour and PVC sheathed cable for main and branch cable is XLPE insulated PVC sheath.

- Color Identification : 2 cores : Black & White

4 cores : Black, White, Red and Green

4.5 Spare Parts

Following spare parts will be supplied

- 2 years spare

The items and quantities to be supplied will be determined in the final report based on the study results of the field survey.

4.6 On-the-Job Training (OJT)

OJT for operation and maintenance (O & M) will be carried out by the Japanese contractor of the Project during the implementation period.

The program will contain the following items:

- (1) O & M plan of the new DEG set including schedule, record and document control.
- (2) O & M procedure of the new DEG set.
- (3) O & M execution knowhow of the new DEG set.

5. Undertakings by the Government of Maldives

The undertakings by the Government of Maldives are described in the Minutes of Discussions (M/D) concluded on 30th August 1993.

In addition to the above, necessary measures for the following additional notes and/or items shall also be taken by the Government of Maldives if Grant Aid is extended.

- (1) To remove any obstacles in project area.
- (2) To provide and install street lighting facilities if necessary.

6. Tentative Implementation Schedule

The project may be executed in accordance with the attached tentative implementation schedule on condition that Grant Aid is extended to the Project.

Tentative implementation schedule is shown on Table-4.

Eydhafushi site (1/300)

66,708 (218.00 ft)

≈ 46,200

≈ 43,200

66,736 (218.09 ft)

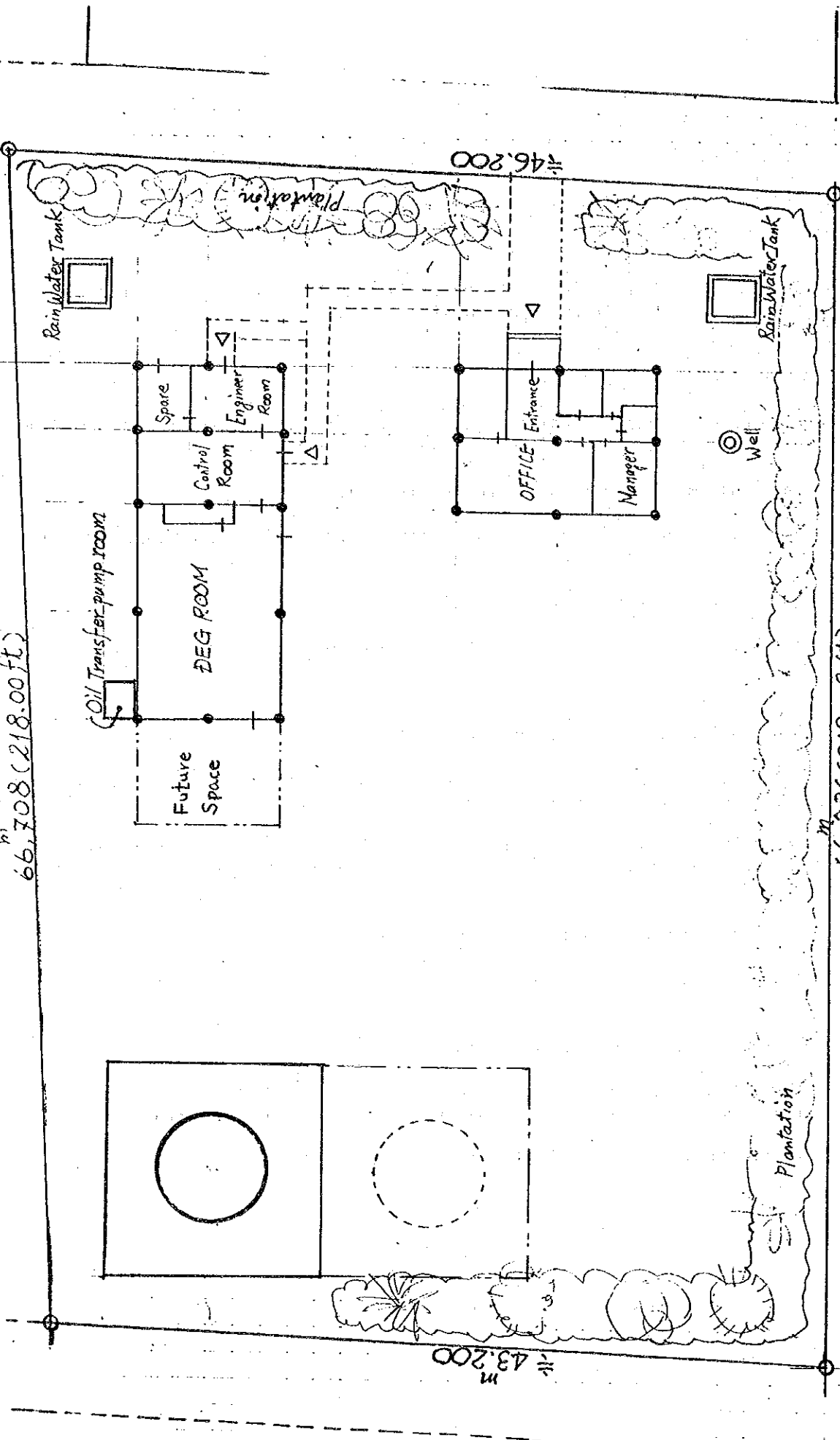
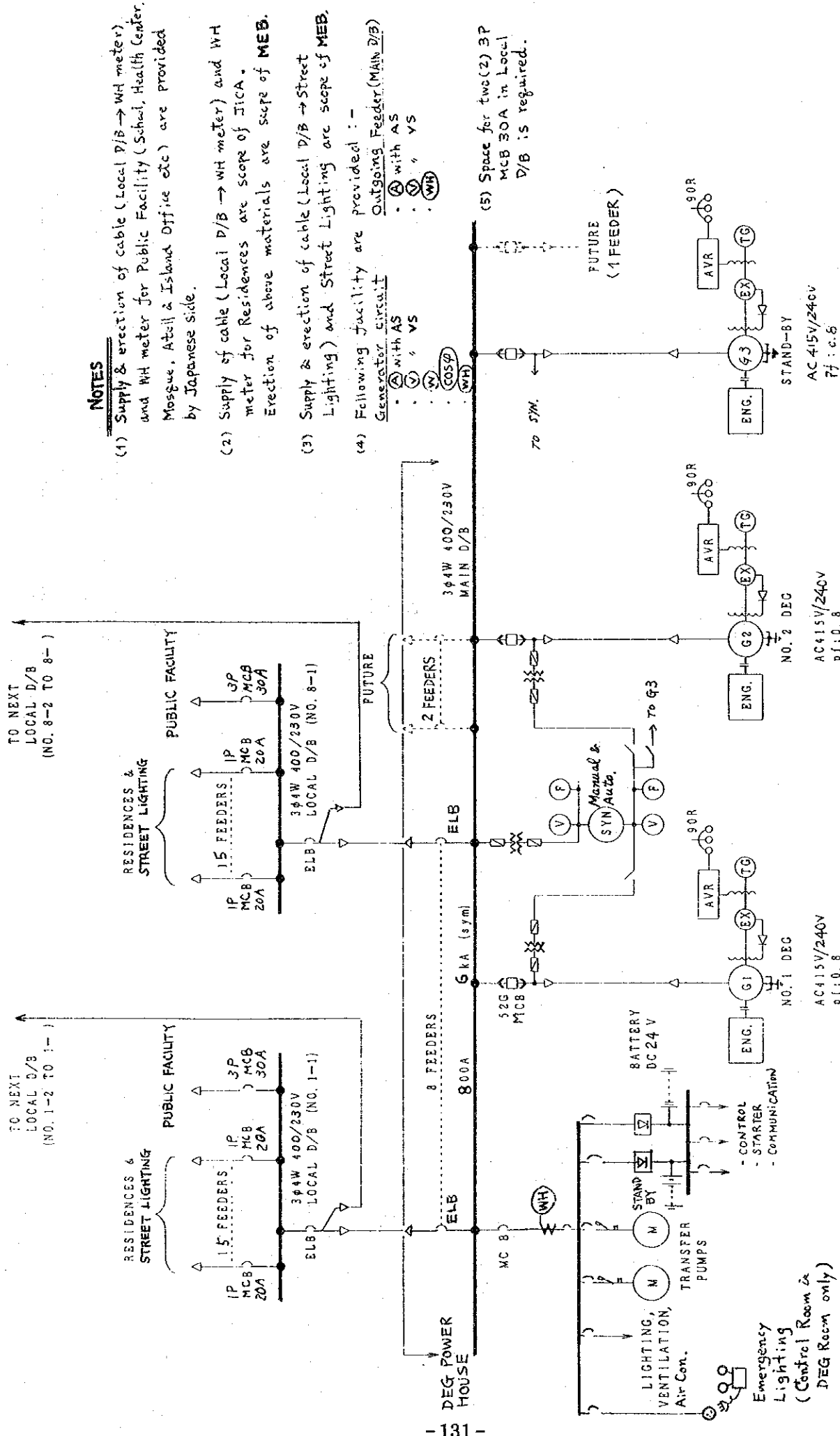


FIG. 16: PLOT PLAN



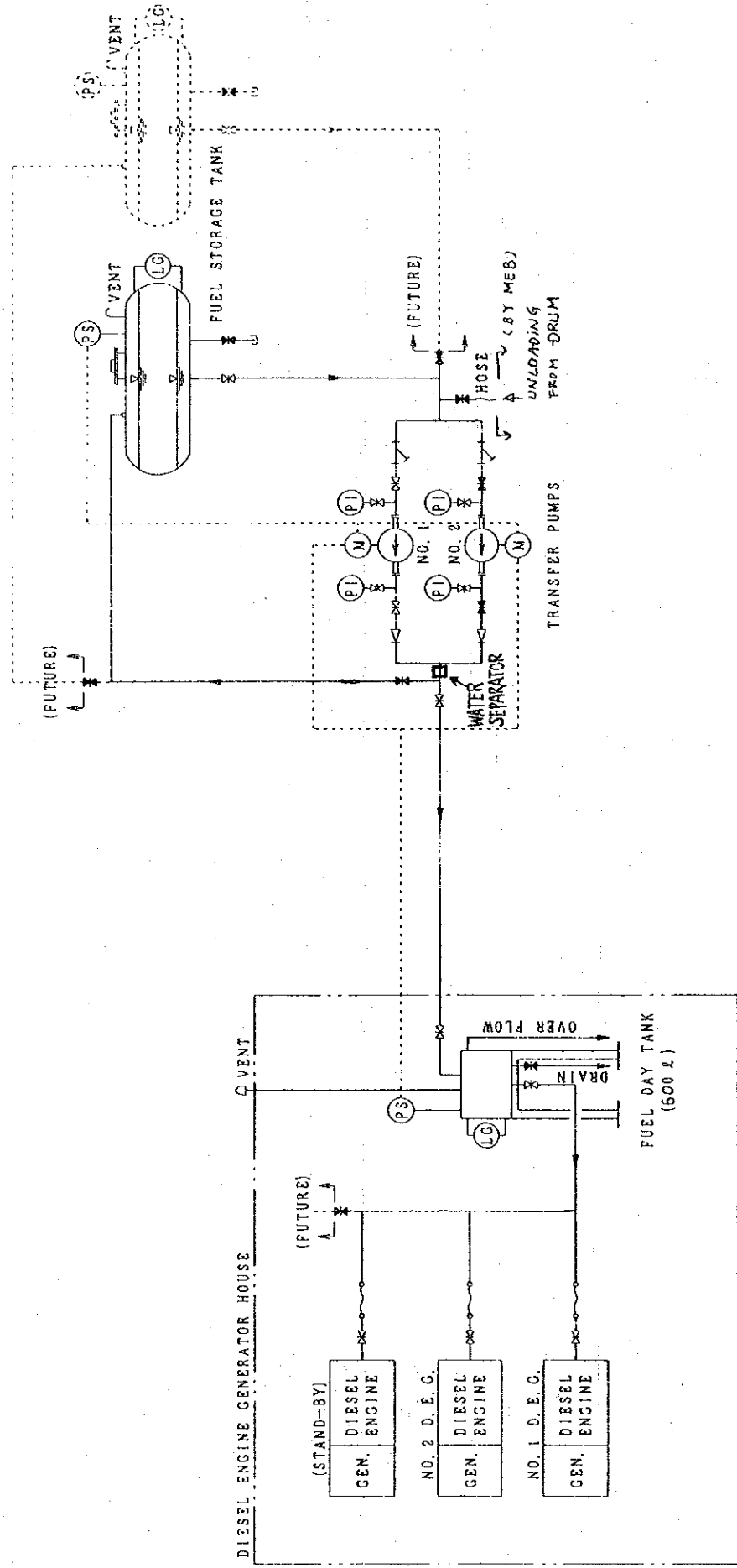
NOTES

- (1) Supply & erection of cable (Local D/B → WH meter) and WH meter for Public Facility (School, Health Center, Mosque, Atoll & Island Office etc) are provided by Japanese side.
- (2) Supply of cable (Local D/B → WH meter) and WH meter for Residences are scope of JICA. Erection of above materials are scope of MEB.
- (3) Supply & erection of cable (Local D/B → Street Lighting) and Street Lighting are scope of MEB.
- (4) Following facility are provided: -
 Generator circuit
 - A with AS
 - V VS
 - WH
 - COSφ
 - WH

(5) Space for two (2) 3P MCB 30A in Local D/B is required.

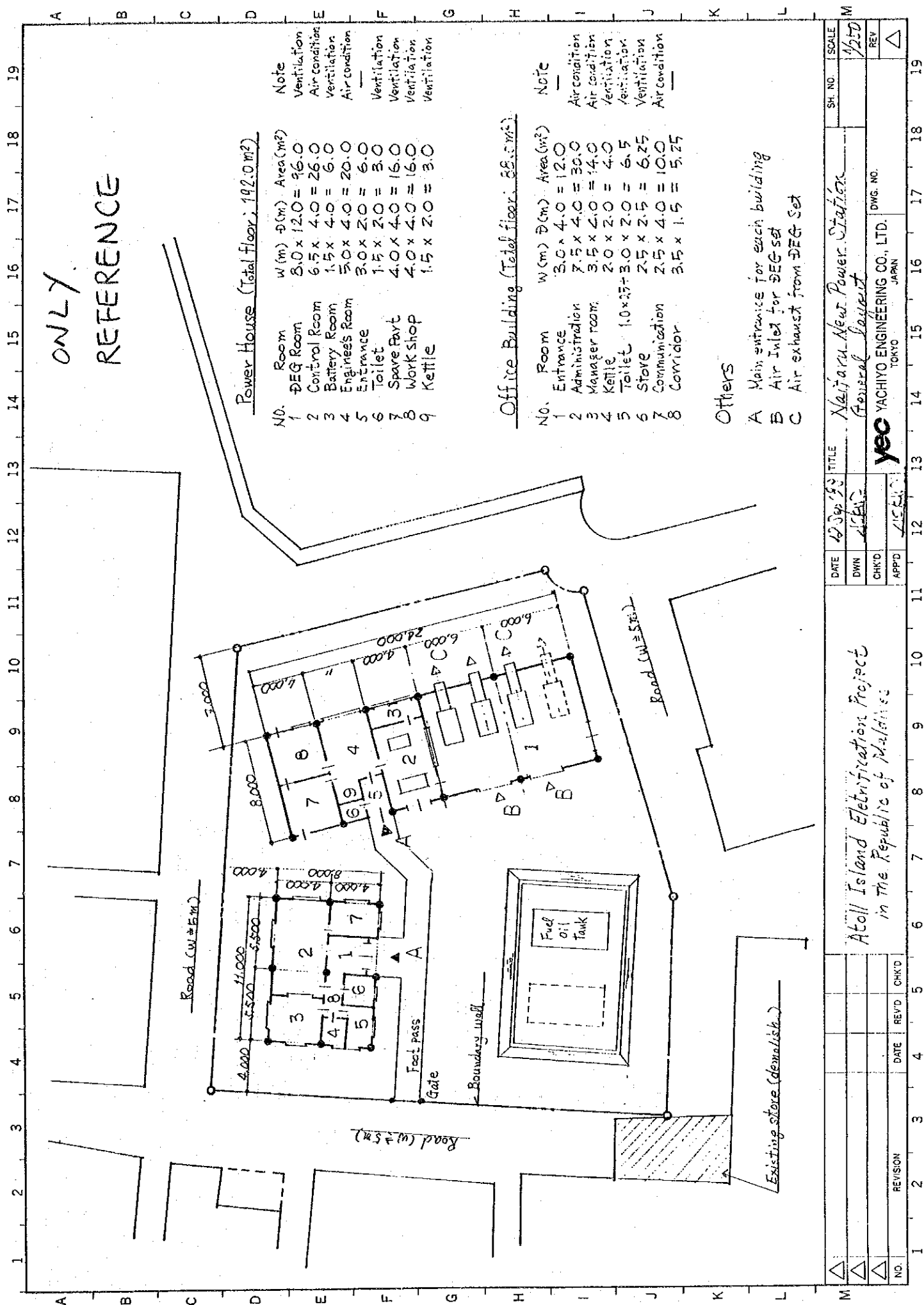
The final drawing will be decided after further study.

FIG.2 ONE LINE DIAGRAM (3 D/G SETS)



Note : The final drawing will be decided after further study.

FIG. 3 FUEL FLOW DIAGRAM (3 D/G SETS)



ONLY
REFERENCE

Power House (Total floor; 192.0 m²)

| No. | Room | W (m) | D (m) | Area (m ²) | Note |
|-----|---------------|-------|-------|------------------------|---------------|
| 1 | DEG Room | 8.0 | 12.0 | 96.0 | Ventilation |
| 2 | Control Room | 6.5 | 4.0 | 26.0 | Air Condition |
| 3 | Battery Room | 1.5 | 4.0 | 6.0 | Ventilation |
| 4 | Engine's Room | 3.0 | 4.0 | 20.0 | Air Condition |
| 5 | Entrance | 3.0 | 2.0 | 6.0 | — |
| 6 | Toilet | 1.5 | 2.0 | 3.0 | Ventilation |
| 7 | Spare Part | 4.0 | 4.0 | 16.0 | Ventilation |
| 8 | Work shop | 4.0 | 4.0 | 16.0 | Ventilation |
| 9 | Kettle | 1.5 | 2.0 | 3.0 | Ventilation |

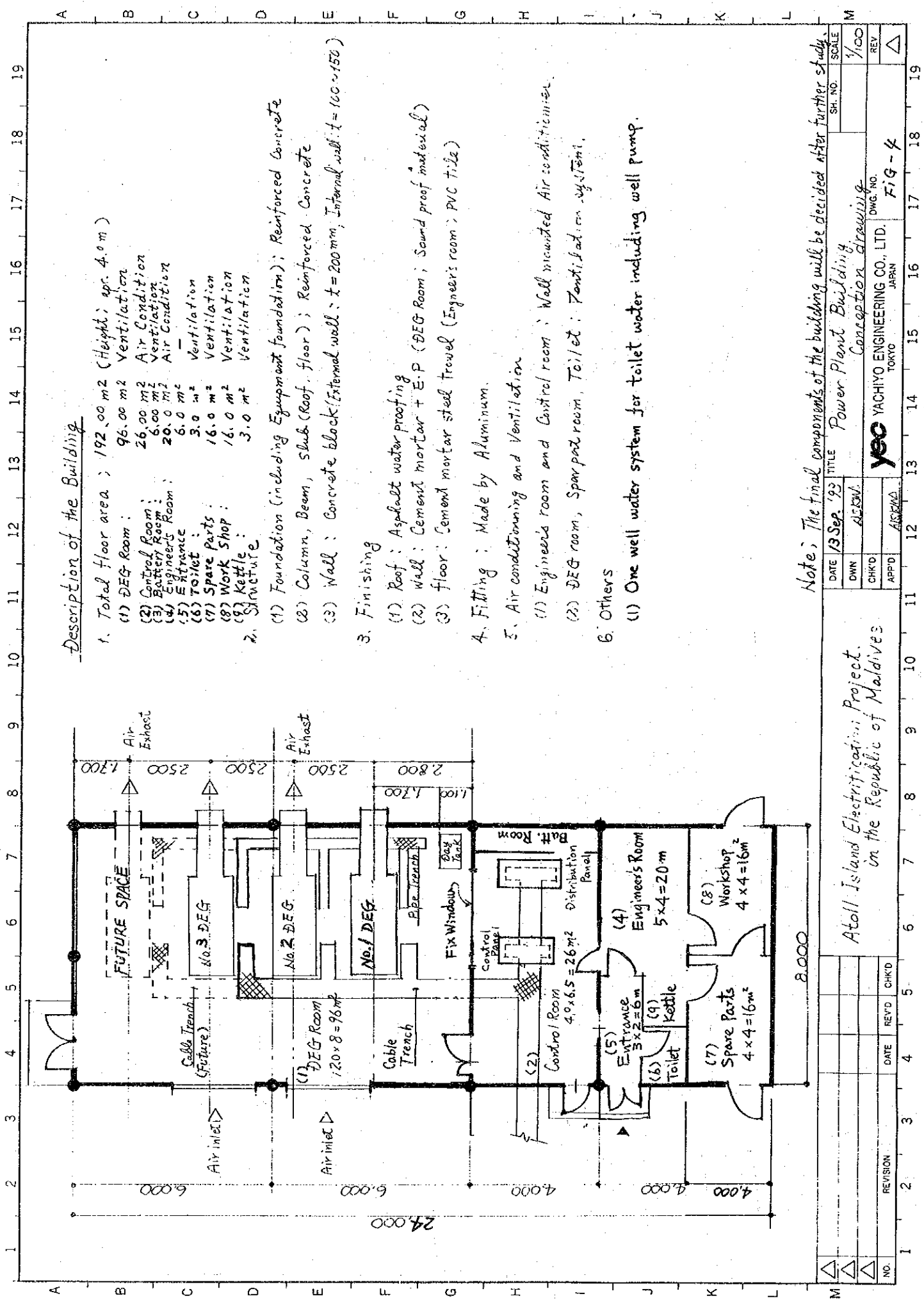
Office Building (Total floor; 88.5 m²)

| No. | Room | W (m) | D (m) | Area (m ²) | Note |
|-----|----------------|-------|-------|------------------------|---------------|
| 1 | Entrance | 3.0 | 4.0 | 12.0 | — |
| 2 | Administration | 7.5 | 4.0 | 30.0 | Air condition |
| 3 | Manager room | 3.5 | 4.0 | 14.0 | Air condition |
| 4 | Kettle | 2.0 | 2.0 | 4.0 | Ventilation |
| 5 | Toilet | 1.0 | 2.5 | 6.5 | Ventilation |
| 6 | Store | 2.5 | 2.5 | 6.25 | Ventilation |
| 7 | Communication | 2.5 | 4.0 | 10.0 | Ventilation |
| 8 | Corridor | 3.5 | 1.5 | 5.25 | Air Condition |

Others

- A Main entrance for each building
- B Air Inlet for DEG set
- C Air exhaust from DEG set

| NO. | REVISION | DATE | REV'D | CHK'D | DATE | CHK'D | APP'D | TITLE | DATE | DRWN | CHK'D | APP'D | SH. NO. | SCALE |
|-----|----------|------|-------|-------|------|-------|-------|---|-----------|------|-------|-------|---------|-------|
| 1 | | | | | | | | Atoll Island Electrification Project in the Republic of Maldives | 12 Sep 93 | AKB | | | 1/250 | |
| 2 | | | | | | | | General Layout | | | | | | |
| 3 | | | | | | | | YACHYO ENGINEERING CO., LTD. TOKYO JAPAN | | | | | | |
| 4 | | | | | | | | Maldivian New Power Station | | | | | | |



Description of the Building

1. Total floor area : 192.00 m² (Height: apr. 4.0 m)
 - (1) DEG Room : 96.00 m² Ventilation
 - (2) Control Room : 26.00 m² Air Condition
 - (3) Battery Room : 6.00 m² Ventilation
 - (4) Engineers' Room : 20.0 m² Air Condition
 - (5) Entrance : 6.0 m² Ventilation
 - (6) Toilet : 3.0 m² Ventilation
 - (7) Spare Parts : 16.0 m² Ventilation
 - (8) Work Shop : 16.0 m² Ventilation
 - (9) Kettle : 3.0 m² Ventilation

2. Structure
 - (1) Foundation (including Equipment foundation) : Reinforced Concrete
 - (2) Column, Beam, Slab (Roof, floor) : Reinforced Concrete
 - (3) Wall : Concrete block (External wall : t = 200 mm, Internal wall : t = 100 ~ 150)
3. Finishing
 - (1) Roof : Asphalt water proofing
 - (2) Wall : Cement mortar + E.P (DEG Room ; Sound proof material)
 - (3) floor : Cement mortar steel trowel (Engineer's room ; PVC tile)
4. Fitting : Made by Aluminium.
5. Air conditioning and Ventilation
 - (1) Engineer's room and Control room : Wall mounted Air conditioner
 - (2) DEG room, Spare part room, Toilet : Fan-tidation system.
6. Others
 - (1) One well water system for toilet water including well pump.

Note: The final components of the building will be decided after further study.

| DATE | TITLE | SH. NO. | SCALE |
|--|----------------------|----------|---------|
| 13 Sep. '93 | Power Plant Building | | 1/100 |
| DWN | ASZKA | | |
| CHK'D | Conception drawing | | |
| APP'D | ASZKA | | |
| YEC YACHIYO ENGINEERING CO., LTD. TOKYO JAPAN | | DWG. NO. | FIG - 4 |

Atoll Island Electrification Project.
in the Republic of Maldives.

| NO. | REVISION | DATE | REV'D | CHK'D |
|-----|----------|------|-------|-------|
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |

Description of the Building

1. Total floor Area : 88.00 m² (Height : apr. 3.6 m)

(1) Manager's Room : 14.00 m²

(2) Office : 30.00 m²

(3) Commu. Equipment R. : 10.00 m²

(4) Entrance Hall : 12.00 m²

(5) Others : 22.00 m²

2. Structure

(1) Foundations, Slab, Column, Beam : Reinforced Concrete

(2) Wall : Concrete block (External ; t = 200mm, Internal ; t = 100~150mm)

3. Finishing

(1) Roof : Asphalt water proofing

(2) Wall : Cement mortar + E.P

(3) Floor : Manager's R, Office, Communication E.R, Entrance hall,

Corridor, Toilet ; PVC or Ceramic Tile

Others : Cement mortar Steel Trowel.

4. Fitting : Made by Aluminum

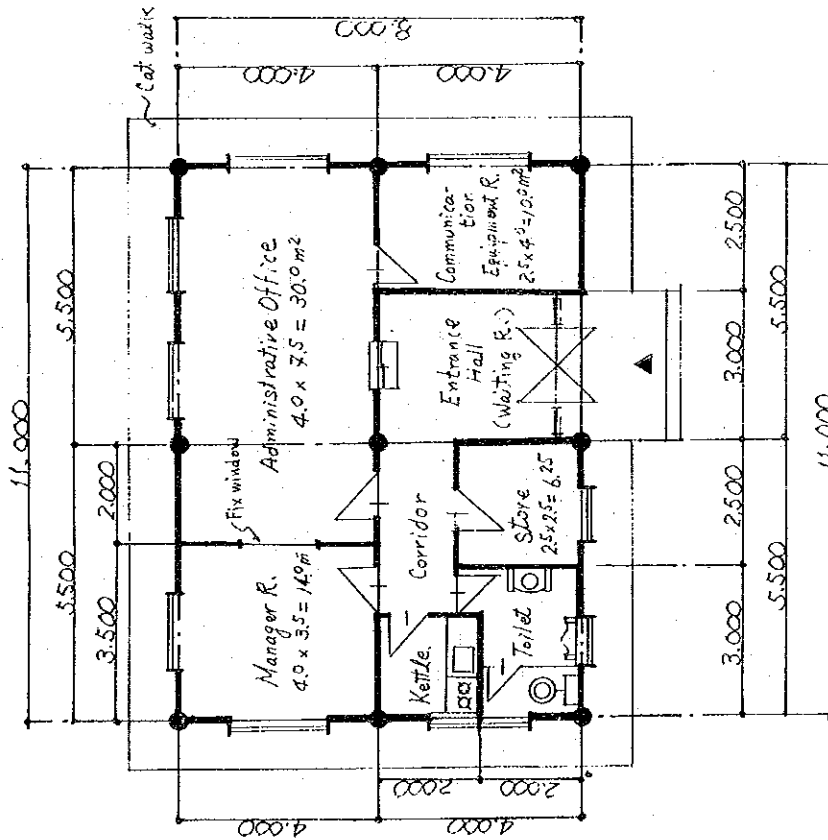
5. Air conditioning and Ventilation.

(1) Manager's R, Office, Communication E.R ; Wall mounted Air conditioner

(2) Toilet, Kettle, Store ; Wall mounted fan.

(3) Entrance hall ; Ceiling fan.

6. Rain water collection system and reservoir (15 m³) for drinking and cooking water



Note: The final components of the building will be decided after further study.

| | | | | | |
|---|-----------|----------------|-----------------|---------|---------|
| DATE | 13 SEP 95 | TITLE | Office Building | SH. NO. | SCALE |
| DWN | YEC | CONCEPT DESIGN | | | 1/100 |
| CHK'D | | | | | REV |
| APP'D | | | | | FIG - 5 |
| YEC YACHIYO ENGINEERING CO., LTD. TOKYO JAPAN | | | | | |

Atoll Islands Electrification Project
in the Republic of Maldives

| NO. | REVISION | DATE | REV'D | CHK'D |
|-----|----------|------|-------|-------|
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |
| 6 | | | | |
| 7 | | | | |
| 8 | | | | |
| 9 | | | | |
| 10 | | | | |
| 11 | | | | |
| 12 | | | | |
| 13 | | | | |
| 14 | | | | |
| 15 | | | | |
| 16 | | | | |
| 17 | | | | |
| 18 | | | | |
| 19 | | | | |

(IMPSCH1)

Table-4. Tentative Implementation Schedule

(COL4)

| Description | Year | 1994 | | | | | | | | | | | | 1995 | | | |
|--|-------|------|---|-------|---|-------|---|---|---|---|---|----|----|------|---|---|---|
| | Month | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 |
| 1.0 Exchange of Notes | | | ▼ | | | | | | | | | | | | | | |
| 2.1 Consulting Services Contract | | | ▽ | | | | | | | | | | | | | | |
| 2.2 Detailed Design/Preparation of T/D | | | | ----- | | | | | | | | | | | | | |
| 2.3 Approval of D/D and T/D by MEB | | | | == | | | | | | | | | | | | | |
| 2.4 Tendering (Including prequalification) | | | | ===== | | | | | | | | | | | | | |
| 2.5 Tender Evaluation | | | | | - | | | | | | | | | | | | |
| 3.1 Construction Contract | | | | | ◆ | | | | | | | | | | | | |
| 3.2 Preparation of Shop Fabrication Drawings | | | | | | ----- | | | | | | | | | | | |
| 3.3 Temporary Works at Sites | | | | | | ----- | | | | | | | | | | | |
| 3.4 Fabrications and Procurement of E/M | | | | | | ----- | | | | | | | | | | | |
| 3.5 Civil and Building Works | | | | | | ----- | | | | | | | | | | | |
| 3.6 Ocean and Inland Transportation | | | | | | ----- | | | | | | | | | | | |
| 3.7 Construction of Main distribution Lines | | | | | | ----- | | | | | | | | | | | |
| 3.8 Installation of Diesel Engine Generator | | | | | | ----- | | | | | | | | | | | |
| 3.9 Test and Commissioning | | | | | | ----- | | | | | | | | | | | ▲ |
| 3.10 On-the-Job Training | | | | | | ----- | | | | | | | | | | | |

- Legend : ▲ : Completion
 T/D : Tender Document
 D/D : Detail Design
 E/M : Equipment and Materials

Attachment-1

(EXDATA2)
[PAGE1]

DATA OF ATOLLS AND ISLANDS (1/3)

(COL0)

| Name of Atoll and Islands | Population (Mar. 1990) | Household | Area (x1000m ²) | F.O. No. | Tank of MEB Cap. (m ³) | No. of Electrification Existing | Is. Ongoing Plan |
|---------------------------|------------------------|-----------|-----------------------------|----------|------------------------------------|---------------------------------|------------------|
| 1. Haa Alifu (16/40) | 13,830 | 1,836 | 16,895 | | | 0 | |
| * Dhidhdhoo | 2,510 | | 144 | | | | 1 |
| (Kela) | 1,348 | 306 | 1,986 | | | | |
| Ihavandhoo | 1,637 | 220 | 600 | | | | |
| Huvarufushi | 2,246 | 180 | 625 | (1)*2 | 50 | | |
| Other | 6,089 | 1,130 | 13,540 | (1)*2 | 50 | | |
| 2. Haa Dhall (17/37) | 15,016 | 2,293 | 20,601 | | | | |
| * Kulhudhuffushi | 5,189 | | 1,675 | 1+(1)*2 | 37+50 | 1 | |
| Hanimaadhoo | 778 | | 2,708 | 1+(1)*2 | 9+50 | 1 | |
| Nolhivaranfaru | 463 | | 1,568 | | | | |
| Other | 9,364 | 2,293 | 14,650 | (1)*2 | 50 | | |
| 3. Shaviyan (15/56) | 9,986 | 1,506 | 15,742 | | | 0 | |
| * Farcolhuffunadhoo | 642 | 73 | 803 | | | | |
| Maakadoodhoo | 310 | | 891 | | | | |
| Other | 9,034 | 1,433 | 14,048 | (1)*2 | 50 | | |
| 4. Noonu (14/79) | 9,909 | 1,408 | 13,982 | | | 0 | |
| * Manadhoo | 1,100 | 170 | 858 | | | | |
| Holhudhoo | 1,514 | 224 | 187 | | | | |
| Velidhoo | 1,654 | 320 | 431 | | | | |
| Other | 5,641 | 694 | 12,506 | (1)*2 | 50 | | |
| 5. Raa (16/90) | 12,987 | | 9,883 | | | 0 | |
| * Ugoofaaruu | 842 | 120 | 275 | | | | |
| (Kaa' dholludhoo) | 504 | 278 | 44 | (1)*2 | 50 | | |
| Arifushi | 1,593 | 283 | 444 | (1)*2 | 50 | | |
| Maduvvari | 1,303 | 213 | 170 | (1)*2 | 50 | | |
| Hulhudhuffaaruu | | | 500 | | | | 1 |
| Other | 8,745 | -894 | 8,450 | | | | |
| 6. Baa (13/80) | 8,908 | 1,145 | 7,709 | | | 0 | |
| * (Eydhafushi) | 2,168 | 249 | 225 | (1)*2 | 50 | | |
| Thulhadhoo | 1,870 | 224 | 100 | | | | |
| Other | 4,870 | 672 | 7,384 | (1)*2 | 50 | | |
| 7. Lhaviyani (7/61) | 8,499 | 1,038 | 5,532 | | | 0 | |
| * (Naifaru) | 3,615 | 586 | 156 | | | | |
| (Hinnavaru) | 3,323 | 430 | 113 | | | 0 | |
| Felivaru | 0 | | 368 | (3)*1 | 1,200 | | |
| Kurendhoo | 1,207 | | 197 | 1 | (Not used) | | |
| Other | 354 | 22 | 4,698 | (1)*1 | 500 | | |
| 8. Kaafu (9/112) | 6,745 | 920 | 6,525 | | | | |
| * Thulusdhoo | 595 | | 300 | | | 1 | |
| Kaashidhoo | 1381 | | 2,445 | | | | |
| Other | 4,769 | 920 | 3,780 | | | | |
| 9. Male | 29,964 | --- | 5,613 | | | 1 | |
| 10. Alifu (17/47) | 5,761 | 560 | 7,490 | | | 0 | |
| * Mahibadhoo | 1,283 | 157 | 168 | | | | |
| Maamigili | 1260 | | 714 | | | | |
| Other | 3,218 | 403 | 6,608 | | | | |
| 11. Vaavu (6/19) | 1,688 | 213 | 652 | | | 0 | |
| * Felidhoo | 398 | 66 | 116 | (1)*2 | 50 | | |
| Keyodho | 532 | | 69 | | | | |
| Other | 758 | 147 | 467 | | | | |

Attachment-1

(EXDATA2)
[PAGE2]

DATA OF ATOLLS AND ISLANDS (2/3)

| Name of Atoll and Islands | Population (Mar. 1990) | Household | Area (m2) | Fuel oil tanks | | No. of Electrification Is. | | |
|------------------------------|---------------------------|-----------|--------------|----------------|---------|----------------------------|---------|------|
| | | | | No. | Cap(m3) | Existing | Ongoing | Plan |
| 12. Faafu (9/25) | 3,013 | 387 | 1,739 | | | | | 0 |
| * Magoodhoo | 409 | 103 | 177 | | | | | |
| Nilandhoo | 986 | | 450 | | | | | |
| Other | 1,618 | 284 | 1,112 | | | | | |
| 13. Meemu (5/34) | 4,957 | 619 | 3,193 | | | | | 0 |
| * Muli | 614 | 90 | 276 | | | | | |
| Mulah | 1015 | | 552 | (1)*2 | 50 | | | |
| Dhiggaru | 960 | | 48 | (1)*2 | 50 | | | |
| Other | 2,368 | 529 | 2,317 | | | | | |
| 14. Dhaalu (8/57) | 4,917 | 647 | 3,482 | | | | | 0 |
| * Kudahuvadhoo | 1,229 | 387 | 600 | (1)*2 | 50 | | | |
| Meedhoo | 771 | | 98 | | | | | |
| Other | 2,917 | 260 | 2,784 | (1)*2 | 50 | | | |
| 15. Thaa (13/68) | 10,180 | 1,176 | 6,718 | | | | | 0 |
| * Veymandoo | 690 | 91 | 423 | | | | | |
| Thimarafushi | 1,784 | 208 | 144 | (1)*2 | 50 | | | |
| Guraidhoo | 1,373 | 148 | 180 | (1)*2 | 50 | | | |
| Vilufushi | 1,350 | 165 | 144 | | | | | |
| Other | 4,983 | 564 | 5,827 | (1)*2 | 50 | | | |
| 16. Laamu (12/84) | 9,793 | 1,430 | 18,867 | | | | | 0 |
| * Fonadhoo | 1,273 | 231 | 1,590 | | | | | |
| (Gan) | 1,667 | 247 | 5,124 | | | | | |
| Kadhoo | 0 | 0 | 846 | | | | | |
| Maandhoo | 0 | 0 | 540 | | | | | |
| Isdhoo | 1,328 | 250 | 2,958 | | | | | |
| Hithdhoo | 663 | | 1,056 | | | | | |
| Maavah | 1,223 | | 318 | | | | | |
| Other | 3,639 | 702 | 6,435 | | | | | |
| 17. Gaafu Alifu (20/91) | 8,287 | 1,246 | 8,851 | | | | | 1 |
| * Vilingili | 2,073 | 171 | 534 | | | | | |
| Kedela | 0 | | 28 | 1 | | | | |
| Dhaandhoo | 1202 | | 127 | | | | | |
| Other | 5,012 | 1,075 | 8,162 | | | | | |
| 18. Gaafu Dhaalu (10/159) | 13,025 | 1,809 | 17,114 | | | | | 1 |
| * Thinadhoo | 4,478 | | 576 | 2 | 78 | | | |
| Gadhoo | 1,904 | 412 | 222 | | | | | |
| Kadohalagolar | 0 | | 45 | (1)*1 | 500 | | | 1 |
| Other | 6,643 | 1,397 | 16,271 | | | | | |
| 19. Gnaviyani (1/1) | 7,052 | 921 | 4,080 | | | | | 1 |
| * Foanulah | 7,052 | 921 | 4,080 | 1 | 40 | | | |

Attachment-1

(EXDATA2)
[PAGE3]

DATA OF ATOLLS AND ISLANDS (3/3)

| Name of Atoll and Islands | Population (Mar. 1990) | Household | Area (m2) | Fuel oil tanks | | No. of Electrification Is. | | | |
|------------------------------|---------------------------|-----------|--------------|----------------|---------|----------------------------|---------|------|---|
| | | | | No. | Cap(m3) | Existing | Ongoing | Plan | |
| 20. Seenu (4/43) | 20,787 | | 2,389 | 244,587 | | | | | |
| * Hithadhoo | 9,398 | | 4,530 | | | | | 1 | |
| Gan | 0 | | 2,454 | 1 | 112 | 1 | | | |
| Feydhoo | 3,455 | | 465 | | | (1) | | | |
| Maradhoo-Feydhoo | 0 | | | | | (1) | | | |
| Maradhoo | 3,315 | | 708 | | | (1) | | | |
| Hulhudhoo | | | | | | | | 1 | |
| Meedhoo | 0 | | | | | | | 1 | |
| Other | 4,619 | | 236,430 | | | | | | |
| Total | 205,304 | 0 | 27,156 | 415,415 | 28 | | 10 | 4 | 3 |

- Remarks :
1. Marked with * shows administrative island
 2. Marked with *1 means existing and *2 means under construction facility
 3. Data with () in the column of existing shows energy come from other island by transmission line.
 4. Number after name of atoll means (Inhabited/Non inhabited islands)
 5. Data with () in the column of Fuel Oil Tanks means for fishary use.
 6. population is registered one.
 7. Source by MEB

Attachment-2

(EXDATA6)

[MALDVI]

POWER DEMAND AND SUPPLY IN MALDIVES BY MEB (1988-1992)

(C1L0)

| No. | Description | Unit | 1988 | 1989 | 1990 | 1991 | 1992 | A. I. R. (%) |
|-----|--------------------|-------|--------|--------|--------|--------|--------|--------------|
| 1. | Installed Capacity | (kVA) | 8,760 | 8,760 | 10,760 | 10,760 | 16,584 | 17.30 |
| 2. | Available Capacity | (kVA) | 2,850 | 2,850 | 9,395 | 9,397 | 13,838 | 48.44 |
| 3. | Peak Demand | (kW) | 4,536 | 4,945 | 4,893 | 5,507 | 6,466 | 9.27 |
| 4. | Average Demand | (kW) | 1,854 | 2,045 | 2,530 | 2,949 | 3,412 | 16.47 |
| 5. | Generated Energy | (MWh) | 19,638 | 21,839 | 26,513 | 28,300 | 30,810 | 11.92 |
| 6. | Power Demand | (MWh) | 16,243 | 17,911 | 22,160 | 25,837 | 29,462 | 16.05 |
| 7. | Power Loss | (MWh) | 3,394 | 3,929 | 4,353 | 2,463 | 903 | -28.19 |
| 8. | Utilization Factor | (%) | 25.6 | 28.5 | 28.1 | 30.0 | 21.2 | -4.59 |

Remarks : ① : A. I. R. is Average Increase Rate

② : (7) = (5) - (6), (8) = (5) / (8760 x (1)) x 100

TRANSITION OF POWER DEMAND AND TARIFF BY SECTOR IN MALDIVES BY MEB (1988-1992)

| No. | Description | Unit | 1988 | 1989 | 1990 | 1991 | 1992 | A. I. R. (%) |
|-----|------------------|-----------|--------|--------|--------|--------|--------|--------------|
| 1. | Power Demand | (MWh) | | | | | | |
| 1) | Residential | | 7,474 | 8,238 | 10,813 | 12,176 | 13,538 | 16.01 |
| 2) | Commercial | | 2,470 | 2,492 | 5,506 | 6,284 | 7,589 | 32.40 |
| 3) | Industrial | | 412 | 347 | 0 | 0 | 0 | -100.00 |
| 4) | Official | | 4,089 | 5,059 | 3,857 | 5,104 | 6,060 | 10.34 |
| 5) | Public (Schools) | | 0 | 0 | 66 | 63 | 100 | 10.95 |
| 6) | Other (Islands) | | 1,798 | 1,775 | 1,918 | 2,210 | 2,175 | 4.87 |
| | Total | | 16,243 | 17,911 | 22,160 | 25,837 | 29,462 | 16.05 |
| 2. | Tariff | (MRf/kWh) | | | | | | |
| 1) | Residential | | 1.16 | 1.06 | 1.78 | 1.81 | 2.35 | 19.30 |
| 2) | Commercial | | 3.50 | 3.50 | 3.50 | 3.50 | 3.94 | 3.00 |
| 3) | Industrial | | 3.50 | 3.50 | 0.00 | 0.00 | 0.00 | -100.00 |
| 4) | Official | | 2.25 | 2.25 | 2.25 | 2.25 | 2.99 | 7.37 |
| 5) | Public (Schools) | | 0.00 | 0.00 | 0.00 | 0.00 | 2.97 | |
| 6) | Other (Islands) | | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.00 |
| | Average | | 1.89 | 1.83 | 2.26 | 2.28 | 2.83 | 10.67 |

Remarks : ① : A. I. R. is Average Increase Rate

Attachment-2

(EXDATA6)
[MALE1]

POWER DEMAND AND SUPPLY IN MALE BY MEB (1988-1992)

(C1L0)

| No. | Description | Unit | 1988 | 1989 | 1990 | 1991 | 1992 | A. I. R. (%) |
|-----|--------------------|-------|--------|--------|--------|--------|--------|--------------|
| 1. | Installed Capacity | (kVA) | 5,272 | 5,272 | 7,272 | 7,272 | 12,672 | 24.51 |
| 2. | Available Capacity | (kVA) | | | 6,545 | 6,547 | 10,622 | 27.39 |
| 3. | Peak Demand | (kW) | 3,992 | 4,391 | 4,177 | 4,830 | 5,569 | 8.68 |
| 4. | Average Demand | (kW) | 1,649 | 1,842 | 2,311 | 2,697 | 3,115 | 17.24 |
| 5. | Generated Energy | (MWh) | 17,189 | 19,558 | 24,000 | 25,500 | 27,439 | 12.40 |
| 6. | Power Demand | (MWh) | 14,445 | 16,136 | 20,242 | 23,627 | 27,287 | 17.24 |
| 7. | Power Loss | (MWh) | 2,744 | 3,422 | 3,758 | 1,873 | 152 | -51.49 |
| 8. | Utilization Factor | (%) | 37.2 | 42.3 | 37.7 | 40.0 | 24.7 | -9.73 |

Remarks : ① : A. I. R. is Average Increase Rate
 ② : (7) = (5) - (6), (8) = (5) / (8760 x (1)) x 100

TRANSITION OF POWER DEMAND AND TARIFF BY SECTOR IN MALE (1988-1992)

| No. | Description | Unit | 1988 | 1989 | 1990 | 1991 | 1992 | A. I. R. (%) |
|-----|------------------|-----------|--------|--------|--------|--------|--------|--------------|
| 1. | Power Demand | (MWh) | | | | | | |
| 1) | Residential | | 7,474 | 8,238 | 10,813 | 12,176 | 13,538 | 16.01 |
| 2) | Commercial | | 2,470 | 2,492 | 5,506 | 6,284 | 7,589 | 32.40 |
| 3) | Industrial | | 412 | 347 | 0 | 0 | 0 | -100.00 |
| 4) | Official | | 4,089 | 5,059 | 3,857 | 5,104 | 6,060 | 10.34 |
| 5) | Public (Schools) | | 0 | 0 | 66 | 63 | 100 | 23.09 |
| 6) | Other | | | | | | | |
| | Total | | 14,445 | 16,136 | 20,242 | 23,627 | 27,287 | 17.24 |
| 2. | Tariff | (MRF/kWh) | | | | | | |
| 1) | Residential | | 1.16 | 1.06 | 1.78 | 1.81 | 2.35 | 19.30 |
| 2) | Commercial | | 3.50 | 3.50 | 3.50 | 3.50 | 3.94 | 3.00 |
| 3) | Industrial | | 3.50 | 3.50 | 0.00 | 0.00 | 0.00 | -100.00 |
| 4) | Official | | 2.25 | 2.25 | 2.25 | 2.25 | 2.99 | 7.37 |
| 5) | Public (Schools) | | 0.00 | 0.00 | | | 2.97 | |
| 6) | Other | | | | | | | |
| | Average | | 1.94 | 1.86 | 2.33 | 2.35 | 2.94 | 10.99 |

Remarks : ① : A. I. R. is Average Increase Rate

Attachment-2

(EXDATA6)

[GAN1]

POWER DEMAND AND SUPPLY IN GAN BY MEB (1988-1992)

(C1L0)

| No. | Description | Unit | 1988 | 1989 | 1990 | 1991 | 1992 | A. I. R. (%) |
|-----|--------------------|-------|-------|-------|-------|-------|-------|--------------|
| 1. | Installed Capacity | (kVA) | 2.700 | 2.700 | 2.700 | 2.700 | 2.700 | 0.00 |
| 2. | Available Capacity | (kVA) | 2.160 | 2.160 | 2.160 | 2.160 | 2.160 | 0.00 |
| 3. | Peak Demand | (kW) | 446 | 370 | 475 | 406 | 406 | -2.32 |
| 4. | Average Demand | (kW) | 181 | 161 | 161 | 169 | 189 | 1.18 |
| 5. | Generated Energy | (MWh) | 2,128 | 1,805 | 1,870 | 1,900 | 2,170 | 0.49 |
| 6. | Power Demand | (MWh) | 1,584 | 1,413 | 1,411 | 1,484 | 1,660 | 1.18 |
| 7. | Power Loss | (MWh) | 544 | 392 | 459 | 416 | 510 | -1.60 |
| 8. | Utilization Factor | (%) | 9.0 | 7.6 | 7.9 | 8.0 | 9.2 | 0.49 |

Remarks : ① : A. I. R. is Average Increase Rate
 ② : (7) = (5) - (6), (8) = (5) / (8760 x (1)) x 100

TRANSITION OF POWER DEMAND AND TARIFF BY SECTOR IN GAN (1988-1992)

| No. | Description | Unit | 1988 | 1989 | 1990 | 1991 | 1992 | A. I. R. (%) |
|-----|----------------|-----------|-------|-------|-------|-------|-------|--------------|
| 1. | Power Demand | (MWh) | | | | | | |
| | 1) Residential | | | | | | | |
| | 2) Commercial | | | | | | | |
| | 3) Industrial | | | | | | | |
| | 4) Official | | | | | | | |
| | 5) Public | | | | | | | |
| | 6) Other | | 1,584 | 1,413 | 1,411 | 1,484 | 1,215 | -6.42 |
| | Total | | 1,584 | 1,413 | 1,411 | 1,484 | 1,215 | -6.42 |
| 2. | Tariff | (MRf/kWh) | | | | | | |
| | 1) Residential | | | | | | | |
| | 2) Commercial | | | | | | | |
| | 3) Industrial | | | | | | | |
| | 4) Official | | | | | | | |
| | 5) Public | | | | | | | |
| | 6) Other | | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.00 |
| | Average | | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.00 |

Remarks : ① : A. I. R. is Average Increase Rate

Attachment-2

(EXDATA6)
[KULHU1]

POWER DEMAND AND SUPPLY IN KULHUGHUFUSHI BY WEB (1988-1992)

(C1L0)

| No. | Description | Unit | 1988 | 1989 | 1990 | 1991 | 1992 | A. I. R. (%) |
|-----|--------------------|-------|------|------|------|------|------|--------------|
| 1. | Installed Capacity | (kVA) | 300 | 300 | 300 | 300 | 300 | 0.00 |
| 2. | Available Capacity | (kVA) | 270 | 270 | 270 | 270 | 270 | 0.00 |
| 3. | Peak Demand | (kW) | 69 | 85 | 126 | 145 | 152 | 21.83 |
| 4. | Average Demand | (kW) | 7 | 15 | 24 | 38 | 48 | 61.20 |
| 5. | Generated Energy | (MWh) | 103 | 183 | 290 | 420 | 510 | 49.29 |
| 6. | Power Demand | (MWh) | 62 | 129 | 210 | 332 | 420 | 61.20 |
| 7. | Power Loss | (MWh) | 40 | 54 | 80 | 88 | 90 | 22.11 |
| 8. | Utilization Factor | (%) | 3.9 | 6.9 | 11.0 | 16.0 | 19.4 | 49.29 |

Remarks : ① : A. I. R. is Average Increase Rate
 ② : (7) = (5) - (6), (8) = (5) / (8760 x (1)) x 100
 ③ : Commercial operation is from April 1988

TRANSITION OF POWER DEMAND AND TARIFF BY SECTOR IN KULHUGHUFUSHI (1988-1992)

| No. | Description | Unit | 1988 | 1989 | 1990 | 1991 | 1992 | A. I. R. (%) |
|-----|--------------------|-----------|------|------|------|------|------|--------------|
| 1. | Power Demand | (MWh) | | | | | | |
| | 1) Residential | | | | | | | |
| | 2) Commercial | | | | | | | |
| | 3) Industrial | | | | | | | |
| | 4) Official | | | | | | | |
| | 5) Public | | | | | | | |
| | 6) Other (Average) | | 62 | 129 | 210 | 332 | 420 | 61.20 |
| | Total | | 62 | 129 | 210 | 332 | 420 | 61.20 |
| 2. | Tariff | (MRF/kWh) | | | | | | |
| | 1) Residential | | | | | | | |
| | 2) Commercial | | | | | | | |
| | 3) Industrial | | | | | | | |
| | 4) Official | | | | | | | |
| | 5) Public | | | | | | | |
| | 6) Other | | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.00 |
| | Average | | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.00 |

Remarks : ① : A. I. R. is Average Increase Rate

Attachment-2

(EXDATA6)

[THINA1]

POWER DEMAND AND SUPPLY IN THINADHOO BY MEB (1988-1992)

(C1L0)

| No. | Description | Unit | 1988 | 1989 | 1990 | 1991 | 1992 | A. I. R. (%) |
|-----|--------------------|-------|------|------|------|------|------|--------------|
| 1. | Installed Capacity | (kVA) | 300 | 300 | 300 | 300 | 300 | 0.00 |
| 2. | Available Capacity | (kVA) | 270 | 270 | 270 | 270 | 270 | 0.00 |
| 3. | Peak Demand | (kW) | 0 | 63 | 66 | 76 | 82 | 9.25 |
| 4. | Average Demand | (kW) | 8 | 16 | 19 | 26 | 37 | 46.75 |
| 5. | Generated Energy | (MWh) | 108 | 139 | 180 | 290 | 390 | 37.85 |
| 6. | Power Demand | (MWh) | 69 | 136 | 171 | 228 | 320 | 46.75 |
| 7. | Power Loss | (MWh) | 39 | 3 | 9 | 62 | 70 | 15.75 |
| 8. | Utilization Factor | (%) | 4.1 | 5.3 | 6.8 | 11.0 | 14.8 | 37.85 |

Remarks : ① : A. I. R. is Average Increase Rate
 ② : (7) = (5) - (6) . (8) = (5) / (3760 x (1)) x 100
 ③ : Commercial operation is from April 1988

TRANSITION OF POWER DEMAND AND TARIFF BY SECTOR IN THINADHOO (1988-1992)

| No. | Description | Unit | 1988 | 1989 | 1990 | 1991 | 1992 | A. I. R. (%) |
|-----|----------------|-----------|------|-------|-------|-------|-------|--------------|
| 1. | Power Demand | (MWh) | | | | | | |
| | 1) Residential | | | | | | | |
| | 2) Commercial | | | | | | | |
| | 3) Industrial | | | | | | | |
| | 4) Official | | | | | | | |
| | 5) Public | | | | | | | |
| | 6) Other | | 69.0 | 135.8 | 170.8 | 228.2 | 320.0 | 46.75 |
| | Total | | 69.0 | 135.8 | 170.8 | 228.2 | 320.0 | 46.75 |
| 2. | Tariff | (MRf/kWh) | | | | | | |
| | 1) Residential | | | | | | | |
| | 2) Commercial | | | | | | | |
| | 3) Industrial | | | | | | | |
| | 4) Official | | | | | | | |
| | 5) Public | | | | | | | |
| | 6) Other | | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.00 |
| | Average | | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.00 |

Remarks : ① : A. I. R. is Average Increase Rate

Attachment-2

(EXDATA6)

[THUL1]

POWER DEMAND AND SUPPLY IN THULUSDHOO BY WEB (1988-1992)

(C1LO)

| No. | Description | Unit | 1988 | 1989 | 1990 | 1991 | 1992 | A.I.R. (%) |
|-----|--------------------|-------|------|------|------|------|------|------------|
| 1. | Installed Capacity | (kVA) | 188 | 188 | 188 | 188 | 188 | 0.00 |
| 2. | Available Capacity | (kVA) | 150 | 150 | 150 | 150 | 150 | 0.00 |
| 3. | Peak Demand | (kW) | 29 | 36 | 48 | 50 | 52 | 15.92 |
| 4. | Average Demand | (kW) | 9 | 11 | 14 | 19 | 19 | 19.63 |
| 5. | Generated Energy | (MWh) | 110 | 155 | 173 | 190 | 242 | 21.83 |
| 6. | Power Demand | (MWh) | 83 | 97 | 126 | 166 | 170 | 19.63 |
| 7. | Power Loss | (MWh) | 27 | 58 | 47 | 24 | 72 | 27.92 |
| 8. | Utilization Factor | (%) | 6.7 | 9.4 | 10.5 | 11.5 | 14.7 | 21.83 |

Remarks : ① : A.I.R. is Average Increase Rate
 ② : (7) = (5) - (6). (8) = (5) / (8760 x (1)) x 100

TRANSITION OF POWER DEMAND AND TARIFF BY SECTOR IN THULUSDHOO (1988-1992)

| No. | Description | Unit | 1988 | 1989 | 1990 | 1991 | 1992 | A.I.R. (%) |
|-----|----------------|-----------|------|------|------|------|------|------------|
| 1. | Power Demand | (MWh) | | | | | | |
| | 1) Residential | | | | | | | |
| | 2) Commercial | | | | | | | |
| | 3) Industrial | | | | | | | |
| | 4) Official | | | | | | | |
| | 5) Public | | | | | | | |
| | 6) Other | | 83 | 97 | 126 | 166 | 170 | 19.63 |
| | Total | | 83 | 97 | 126 | 166 | 170 | 19.63 |
| 2. | Tariff | (MRf/kWh) | | | | | | |
| | 1) Residential | | | | | | | |
| | 2) Commercial | | | | | | | |
| | 3) Industrial | | | | | | | |
| | 4) Official | | | | | | | |
| | 5) Public | | | | | | | |
| | 6) Other | | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.00 |
| | Average | | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.00 |

Remarks : ① : A.I.R. is Average Increase Rate

Attachment-2

(EXDATA6)

[HANI1]

POWER DEMAND AND SUPPLY IN HANIMAADHOO BY WEB (1988-1992)

(C1L0)

| No. | Description | Unit | 1988 | 1989 | 1990 | 1991 | 1992 | A.I.R. (%) |
|-----|--------------------|-------|------|------|------|------|------|------------|
| 1. | Installed Capacity | (kVA) | --- | --- | --- | --- | 74 | |
| 2. | Available Capacity | (kVA) | --- | --- | --- | --- | 66 | |
| 3. | Peak Demand | (kW) | --- | --- | --- | --- | 20 | |
| 4. | Average Demand | (kW) | --- | --- | --- | --- | 2 | |
| 5. | Generated Energy | (MWh) | --- | --- | --- | --- | 15 | |
| 6. | Power Demand | (MWh) | --- | --- | --- | --- | 10 | |
| 7. | Power Loss | (MWh) | --- | --- | --- | --- | 5 | |
| 8. | Utilization Factor | (%) | --- | --- | --- | --- | 1.4 | |

Remarks : ① : A.I.R. is Average Increase Rate
 ② : (7) = (5) - (6). (8) = (5) / (8760 x (1)) x 100
 ③ : Commercial operation is from August 1992

TRANSITION OF POWER DEMAND AND TARIFF BY SECTOR IN HANIMAADHOO (1988-1992)

| No. | Description | Unit | 1988 | 1989 | 1990 | 1991 | 1992 | A.I.R. (%) |
|-----|--------------|-----------|------|------|------|------|------|------------|
| 1. | Power Demand | (MWh) | | | | | | |
| 1) | Residential | | --- | --- | --- | --- | 0 | |
| 2) | Commercial | | --- | --- | --- | --- | 0 | |
| 3) | Industrial | | --- | --- | --- | --- | 0 | |
| 4) | Official | | --- | --- | --- | --- | 0 | |
| 5) | Public | | --- | --- | --- | --- | 0 | |
| 6) | Other | | --- | --- | --- | --- | 10 | |
| | Total | | --- | --- | --- | --- | 10 | |
| 2. | Tariff | (MRf/kWh) | | | | | | |
| 1) | Residential | | --- | --- | --- | --- | | |
| 2) | Commercial | | --- | --- | --- | --- | | |
| 3) | Industrial | | --- | --- | --- | --- | | |
| 4) | Official | | --- | --- | --- | --- | | |
| 5) | Public | | --- | --- | --- | --- | | |
| 6) | Other | | --- | --- | --- | --- | 1.50 | |
| | Average | | --- | --- | --- | --- | 1.50 | |

Remarks : ① : A.I.R. is Average Increase Rate

Attachment-2

(EXDATA6)
[FOAH1]

POWER DEMAND AND SUPPLY IN FOAHMULAH BY MEB (1988-1992)

(C110)

| No. | Description | Unit | 1988 | 1989 | 1990 | 1991 | 1992 | A. I. R. (%) |
|-----|--------------------|-------|------|------|------|------|------|--------------|
| 1. | Installed Capacity | (kVA) | --- | --- | --- | --- | 350 | |
| 2. | Available Capacity | (kVA) | --- | --- | --- | --- | 300 | |
| 3. | Peak Demand | (kW) | --- | --- | --- | --- | 185 | |
| 4. | Average Demand | (kW) | --- | --- | --- | --- | 2 | |
| 5. | Generated Energy | (MWh) | --- | --- | --- | --- | 43 | |
| 6. | Power Demand | (MWh) | --- | --- | --- | --- | 40 | |
| 7. | Power Loss | (MWh) | --- | --- | --- | --- | 3 | |
| 8. | Utilization Factor | (%) | --- | --- | --- | --- | 0.6 | |

Remarks : ① : A. I. R. is Average Increase Rate
 ② : (7) = (5) - (6). (8) = (5) / (8760 x (1)) x 100
 ③ : Commercial operation is from October 1992

TRANSITION OF POWER DEMAND AND TARIFF BY SECTOR IN HOAHMULAH (1988-1992)

| No. | Description | Unit | 1988 | 1989 | 1990 | 1991 | 1992 | A. I. R. (%) |
|-----|--------------|-----------|------|------|------|------|------|--------------|
| 1. | Power Demand | (MWh) | | | | | | |
| 1) | Residential | | --- | --- | --- | --- | | |
| 2) | Commercial | | --- | --- | --- | --- | | |
| 3) | Industrial | | --- | --- | --- | --- | | |
| 4) | Official | | --- | --- | --- | --- | | |
| 5) | Public | | --- | --- | --- | --- | | |
| 6) | Other | | --- | --- | --- | --- | 40 | |
| | Total | | --- | --- | --- | --- | 40 | |
| 2. | Tariff | (MRf/kWh) | | | | | | |
| 1) | Residential | | --- | --- | --- | --- | | |
| 2) | Commercial | | --- | --- | --- | --- | | |
| 3) | Industrial | | --- | --- | --- | --- | | |
| 4) | Official | | --- | --- | --- | --- | | |
| 5) | Public | | --- | --- | --- | --- | | |
| 6) | Other | | --- | --- | --- | --- | 1.50 | |
| | Average | | --- | --- | --- | --- | 1.50 | |

Remarks : ① : A. I. R. is Average Increase Rate

Attachment-3

(EXDATA6)

[INCRE1]

TRANSITION OF POWER DEMAND BY MEB (1988-1992) (1/2)

(C1L0)

| No. | Description | Unit | 1988 | 1989 | 1990 | 1991 | 1992 | A. I. R. (%) |
|--------------------------|--------------------|------|----------|-------|-------|-------|--------|--------------|
| 1. Maldives | | | | | | | | |
| 1) | No. of Consumer | No. | 7,875 | 8,280 | 9,280 | 9,490 | 12,106 | 11.35 |
| 2) | Population | Man | | | | | 48,056 | |
| 3) | Power per Consumer | | | | | | | |
| a) | Peak | (W) | 1,795 | 1,868 | 2,057 | 2,007 | 2,061 | 3.51 |
| b) | Average | (W) | 695 | 707 | 776 | 877 | 834 | 4.68 |
| 2. Male | | | | | | | | |
| 1) | No. of Consumer | No. | 5,778 | 6,130 | 7,090 | 7,244 | 7,744 | 7.60 |
| 2) | Population | Man | | | | | 29,964 | |
| 3) | Power per Consumer | | | | | | | |
| a) | Peak | (W) | 691 | 716 | 589 | 667 | 719 | 1.01 |
| b) | Average | (W) | 285 | 300 | 326 | 372 | 402 | 8.96 |
| 3. Thulusdhoo | | | | | | | | |
| 1) | No. of Consumer | No. | 89 | 96 | 97 | 113 | 112 | 5.91 |
| 2) | Population | Man | | | | | 595 | |
| 3) | Power per Consumer | | | | | | | |
| a) | Peak | (W) | 324 | 375 | 495 | 446 | 464 | 9.44 |
| b) | Average | (W) | 106 | 115 | 148 | 168 | 173 | 12.95 |
| 4. Gan | | | | | | | | |
| 1) | No. of Consumer | No. | 645 | 654 | 670 | 679 | 1,366 | 20.63 |
| 2) | Population | Man | | | | | | |
| 3) | Power per Consumer | | | | | | | |
| a) | Peak | (W) | 692 | 565 | 709 | 599 | 298 | -19.03 |
| b) | Average | (W) | 280 | 247 | 240 | 249 | 139 | -16.13 |
| 5. Kulhudhuffushi | | | | | | | | |
| 1) | No. of Consumer | No. | 778 | 807 | 828 | 855 | 919 | 4.25 |
| 2) | Population | Man | | | | | 5,189 | |
| 3) | Power per Consumer | | | | | | | |
| a) | Peak | (W) | 88.68894 | 105 | 153 | 169 | 165 | 12.01 |
| b) | Average | (W) | 9 | 18 | 29 | 44 | 52 | 54.63 |
| 6. Thinadhoo | | | | | | | | |
| 1) | No. of Consumer | No. | 585 | 593 | 595 | 599 | 663 | 3.18 |
| 2) | Population | Man | | | | | 4,478 | |
| 3) | Power per Consumer | | | | | | | |
| a) | Peak | (W) | 0 | 107 | 112 | 127 | 124 | 3.92 |
| b) | Average | (W) | 13 | 26 | 33 | 43 | 55 | 42.23 |

Attachment-3

(EXDATA6)

[INCRE2]

TRANSITION OF POWER DEMAND BY MEB (1988-1992) (2/2)

(C110)

| No. | Description | Unit | 1988 | 1989 | 1990 | 1991 | 1992 | A. I. R. (%) |
|-----|--------------------|------|------|------|------|------|-------|--------------|
| 8. | Foahmulah | | | | | | | |
| 1) | No. of Consumer | No. | 0 | 0 | 0 | 0 | 1,147 | |
| 2) | Population | Man | | | | | 7,052 | |
| 3) | Power per Consumer | | | | | | | |
| a) | Peak | (W) | 0 | 0 | 0 | 0 | 161 | |
| b) | Average | (W) | 0 | 0 | 0 | 0 | 2 | |
| 9. | Feydhoo | | | | | | | |
| 1) | No. of Consumer | No. | | | | | | |
| 2) | Population | Man | | | | | 3,455 | |
| 3) | Power per Consumer | | | | | | | |
| a) | Peak | (W) | | | | | | |
| b) | Average | (W) | | | | | | |
| 10. | Maradhoo-Feydhoo | | | | | | | |
| 1) | No. of Consumer | No. | | | | | | |
| 2) | Population | Man | | | | | | |
| 3) | Power per Consumer | | | | | | | |
| a) | Peak | (W) | 0 | 0 | 0 | 0 | | |
| b) | Average | (W) | 0 | 0 | 0 | 0 | | |
| 11. | Maradhoo | | | | | | | |
| 1) | No. of Consumer | No. | | | | | | |
| 2) | Population | Man | | | | | 3,315 | |
| 3) | Power per Consumer | | | | | | | |
| a) | Peak | (W) | 0 | 0 | 0 | 0 | | |
| b) | Average | (W) | 0 | 0 | 0 | 0 | | |

Remarks : Power supply for item No.9, 10 and 11 is made from Gan island

Attachment - 4

(EXDATA1)
[MALE1]

TECHNICAL DATA OF EXISTING GENERATING FACILITIES

(COLO)

| Name of Island | Ope. Year | Specification of Engine | | Specification of Generator | | | Voltage (V) | Method of Synchro. |
|---|-----------|-------------------------|------|----------------------------|----------------|---------------------|-------------|--------------------|
| | | Manufacturer | RPM | Manufacturer | Capacity (kVA) | Installed Available | | |
| 1. Male (Note : Unit #4, 7 and 10 are out of order) | | | | | | | | |
| #1 | 1978 | Mirrlees Blackstone | 750 | Brush | 186.25 | 149 | 400 | Man. |
| #2 | 1978 | Mirrlees Blackstone | 750 | Brush | 186.25 | 149 | 400 | Man. |
| #3 | 1962 | Ruston & Hornsby | 600 | Lancashire | 298.00 | 207 | 400 | Man. |
| #5 | 1978 | Yanmar | 1000 | Taiyo | 625.00 | 469 | 400 | Man. |
| #6 | 1978 | Yanmar | 1000 | Taiyo | 625.00 | 469 | 400 | Man. |
| #8 | 1972 | Mirrlees Blackstone | 750 | Brush | 291.50 | 231 | 400 | Man. |
| #9 | 1972 | Mirrlees Blackstone | 750 | Brush | 291.50 | 231 | 400 | Man. |
| #11 | 1984 | Yanmar | 1000 | Taiyo | 625.00 | 469 | 400 | Man. |
| #12 | 1986 | Mirrlees Blackstone | 1000 | Markon | 656.00 | 491 | 400 | Man. |
| #13 | 1987 | Mirrlees Blackstone | 1000 | Markon | 1,487.00 | 1,055 | 11,000 | Man/Auto |
| #14 | 1989 | Cummins | 1500 | Marathon Electric | 1,000.00 | 851 | 400 | Man. |
| #15 | 1989 | Cummins | 1500 | Marathon Electric | 1,000.00 | 851 | 400 | Man. |
| #16 | 1991 | Wartsila | 750 | Leroy Somer | 2,700.00 | 2,500 | 11,000 | Man. |
| #17 | 1991 | Wartsila | 750 | Leroy Somer | 2,700.00 | 2,500 | 11,000 | Man. |
| Sub-total | | | | | 12,671.50 | 10,622 | | |
| 2. Gon (Seenu atoll) : #2 was manufactured at 1959 and others were 1956 | | | | | | | | |
| #1 | Aug. 1985 | Crossely | 428 | Brush | 675 | 540 | 3,300 | Man. |
| #2 | Aug. 1985 | Crossely | 428 | Brush | 675 | 540 | 3,300 | Man. |
| #3 | Aug. 1985 | Crossely | 428 | Brush | 675 | 540 | 3,300 | Man. |
| #4 | Aug. 1985 | Crossely | 428 | Brush | 675 | 540 | 3,300 | Man. |
| Sub-total | | | | | 2,700 | 2,160 | | |
| 3. Kulhuffushi (Haa Dhaalu) | | | | | | | | |
| #1 | Apr. 1988 | Cummins | 1500 | Markon | 100 | 90 | 400 | Man/Auto |
| #2 | Apr. 1988 | Cummins | 1500 | Markon | 100 | 90 | 400 | Man/Auto |
| #3 | Apr. 1988 | Cummins | 1500 | Markon | 100 | 90 | 400 | Man/Auto |
| Sub-total | | | | | 300 | 270 | | |
| 4. Thinadhoo (Gaafu Dhaalu) | | | | | | | | |
| #1 | Apr. 1988 | Cummins | 1500 | Markon | 100 | 90 | 400 | Man/Auto |
| #2 | Apr. 1988 | Cummins | 1500 | Markon | 100 | 90 | 400 | Man/Auto |
| #3 | Apr. 1988 | Cummins | 1500 | Markon | 100 | 90 | 400 | Man/Auto |
| Sub-total | | | | | 300 | 270 | | |
| 5. Thulusdhoo (Kaafu) : (#3 unit is now out of order which is same size as #1) | | | | | | | | |
| #1 | Jul. 1984 | Guizho | 1500 | No name plate | 94 | 75 | 400 | Man. |
| #2 | Jul. 1984 | Guizho | 1500 | No name plate | 94 | 75 | 400 | Man. |
| Sub-total | | | | | 188 | 150 | | |
| 6. Hanimaadhoo (Haa Dhaalu) | | | | | | | | |
| #1 | Jul. 1992 | Cummins | 1500 | Markon | 37.5 | 33 | 400 | Man. |
| #2 | Jul. 1992 | Cummins | 1500 | Markon | 37.5 | 33 | 400 | Man. |
| Sub-total | | | | | 75 | 66 | | |
| 7. Fuahmulah (Gnaviyani) | | | | | | | | |
| #1 | Oct. 1992 | Cummins | 1500 | Leroy Somer | 175 | 150 | 400 | Man. |
| #2 | Oct. 1992 | Cummins | 1500 | Leroy Somer | 175 | 150 | 400 | Man. |
| Sub-total | | | | | 350 | 300 | | |

Attachment-5

(EXDATA1)

[STAFF]

NUMBER OF STAFF

(C111)

| Atoll | Island | ① | ② | ③ | ④ | ⑤ | Total | |
|------------------------------|------------------|----------------------------|----|-----|-----|----|-------|---|
| A. Existing Facility | | | | | | | | |
| 1. Male | Male | 46 | 28 | 118 | 153 | 22 | 367 | |
| 2. Seenu | Gan | 9 | 0 | 12 | 31 | 2 | 54 | |
| 3. Seenu | Feydhoo | -----Staff from Seenu Gan | | | | | ----- | 0 |
| 4. Seenu | Maradhoo-Feydhoo | -----Staff from Seenu Gan | | | | | ----- | 0 |
| 5. Seenu | Maradhoo | -----Staff from Seenu Gan | | | | | ----- | 0 |
| 6. Haa Dhaalu | Kulhudhuffushi | 2 | 2 | 5 | 9 | 5 | 23 | |
| 7. Gaafu Dhaalu | Thinadhoo | 3 | 1 | 3 | 11 | 3 | 21 | |
| 8. Kaafu | Thulusdhoo | -----Under Male's Resister | | | | | ----- | 0 |
| 9. Haa Dhaalu | Hanimaadhoo | 4 | 3 | 3 | 11 | 1 | 22 | |
| 10. Gnaviyani | Foahmulah | 6 | 5 | 13 | 21 | 5 | 50 | |
| | Sub-total | 70 | 39 | 154 | 236 | 38 | 537 | |
| B. Under Construction | | | | | | | | |
| 1. Haa Alifu | Dhidhdhoo | 3 | 2 | 3 | 12 | 4 | 24 | |
| 2. Gaafu Dhaalu | Gadhdhoo | 3 | 2 | 3 | 12 | 4 | 24 | |
| 3. Gaafu Alifu | Villingili | 3 | 2 | 3 | 12 | 4 | 24 | |
| 4. Raa | Hulhudhuffaaruu | 3 | 2 | 3 | 12 | 4 | 24 | |
| | Sub-total | 12 | 8 | 12 | 48 | 16 | 96 | |
| | Grand Total | 82 | 47 | 166 | 284 | 54 | 633 | |

Remarks : ① : Administrative Section

② : Accounting Section

③ : Electrical Section

④ : Engine Room Section

⑤ : General Section

Attachment-8

(EXDATA1)

[ELECT1]

DATA OF ELECTRIFICATION ISLANDS (1/2)

| Atoll | Name of Island | Plant Area (m ²) | Put-into Commercial Operation | Facility data | | | Condition | | |
|------------------------------|------------------|------------------------------|-------------------------------|----------------|----------------------------|------------|-----------|------|---------|
| | | | | Capacity (kVA) | Q'ty | Volt (V) | Ope. | Stop | Standby |
| A. Existing Facility | | | | | | | | | |
| 1. Male | Male : Old | | | 7,272 | | 11 kV/600V | | | |
| | : New | | .06.1991 | 5,400 | | 11,000 | | | |
| 2. Seenu | Gan | 1,260 | 31.08.1985 | 675 | 4 | | 2 | 0 | 2 |
| 3. | Feydhoo | | 02.02.1988 | --- | --- | --- | --- | --- | --- |
| 4. | Maradhoo-Feydhoo | | 27.07.1992 | --- | --- | --- | --- | --- | --- |
| 5. | Maradhoo | | 27.07.1992 | --- | --- | --- | --- | --- | --- |
| 6. Haa Dhaalu | Kulhudhuffushi | 792 | 13.04.1988 | 100 | 3 | 400/231 | 2 | 0 | 1 |
| 7. Gaafu Dhaalu | Thinadhoo | 707 | 01.04.1988 | 100 | 3 | 415/240 | 2 | 0 | 1 |
| 8. Kaafu | Thulusdhoo | | 18.07.1984 | 94 | 3 | 415/240 | 2 | 1 | 0 |
| 9. Haa Dhaalu | Hanimaadhoo | 900 | 27.07.1992 | 37.5 | 2 | 400/231 | 2 | 0 | 0 |
| 10. Gnaviyani | Foahmulah | 3,600 | ---.10.1992 | 175 | 2 | 415/240 | 2 | 0 | 0 |
| Sub-total | | 7,259 | | 11,279 | | | | | |
| B. Under Construction | | | | | | | | | |
| 1. Haa Alifu | Dhidhdhoo | | Dec 1993 | 100 | 2 | 415/240 | 1 | 0 | 1 |
| | | | | 75 | 1 | 415/240 | 1 | 0 | 0 |
| 2. Gaafu Dhaalu | Gadhdhoo | | Dec 1993 | 100 | 2 | 415/240 | 1 | 0 | 1 |
| | | | | 75 | 1 | 415/240 | 1 | 0 | 0 |
| 3. Gaafu Alifu | Villingili | | Dec 1993 | | Design is not finished yet | | | | |
| 4. Raa | Hulhudhuffaaruu | | Dec 1993 | 100 | 2 | 415/240 | 1 | 0 | 1 |
| | | | | 80 | 1 | 415/240 | 1 | 0 | 0 |
| Sub-total | | | | 557 | | | | | |

Attachment-8

(EXDATA1)

[ELECT1]

DATA OF ELECTRIFICATION ISLANDS (2/2)

(COL1)

| Atoll | Name of Island | Rain Water Tank | | | Well Water Tank | | | Category of Works | | | |
|------------------------------|---------------------|-----------------|-------|-------|-----------------|-------|-------|-------------------|---|---|---|
| | | Q'ty | U/Cap | Total | Q'ty | U/Cap | Total | ① | ② | ③ | ④ |
| | | | (m3) | (m3) | | (m3) | (m3) | | | | |
| A. Existing Facility | | | | | | | | | | | |
| 1. Male | Male : Old : New | | | | | | | | | | ○ |
| 2. Seenu | Gan | 1 | 112 | 112 | | | | ○ | | | |
| 3. | Feydhoo | | | | | | | | | | △ |
| 4. | Maradhoo-Feydhoo | | | | | | | | | | △ |
| 5. | Maradhoo | | | | | | | | | | △ |
| 6. Haa Dhaalu | Kulhudhuffushi | 1 | 37 | 37 | 2 | 0.2 | 0.4 | ○ | | | ○ |
| 7. Gaafu Dhaalu | Thinadhoo | | | | | | | ○ | | | ○ |
| 8. Kaafu | Thulusdhoo | | | | | | | | | | |
| 9. Haa Dhaalu | Hanimaadhoo | 2 | 1+2 | 3 | | | | | | ○ | |
| 10. Gnaviyani | Foahmulah | | | | | | | | | ○ | |
| Sub-total | | | | | | | | | | | |
| B. Under Construction | | | | | | | | | | | |
| 1. Haa Alifu | Dhidhdhoo | | | | | | | ○ | | | ○ |
| 2. Gaafu Dhaalu | Gadhdhoo | | | | | | | | | | |
| 3. Gaafu Alifu | Villingili | | | | | | | ○ | | | |
| 4. Raa | Hulhudhuffaaruu | | | | | | | | | | |
| Sub-total | | | | | | | | | | | |

Legend : ① : Fishery ② : Agriculture ③ : Industry ④ : Coral Stone and etc.

Attachment - 7

(EXDATA3)
[PAGE1]

STATISTICS OF POPULATION (1989-1992)

(C1L0)

| Name of Atoll and Island | 1989 Mar. | 1990 Mar. | 1991 Mar. | 1992 Mar. | 1993 Jun. | Growth Rate |
|--------------------------|--------------|--------------|--------------|--------------|--------------|----------------|
| 1. Lhaviyani | 6,414 | 8,499 | | | 9,741 | |
| - Naifaru | 3,588 | 3,615 | 3,769 | 3,839 | 3,938 | 2.21 |
| - Hinnavaru | 3,447 | 3,323 | 3,710 | 3,785 | 3,933 | 3.15 |
| 2. Baa | 7,446 | 8,908 | | | 10,031 | |
| - Eydhafushi | 2,173 | 2,168 | 2,303 | 2,338 | 2,408 | 2.45 |
| 3. Laamu | 8,782 | 9,793 | | 9,101 | 11,227 | |
| - Gan | | 1,667 | | 1,862 | 1,961 | |
| 4. Raa | 10,907 | 12,987 | | 11,303 | 15,314 | |
| - Kan' dholhudhoo | 2,336 | 2,393 | 2,630 | 2,635 | 2,847 | 4.76 |
| 5. Haa Alifu | 11,610 | 13,830 | | 12,031 | 16,144 | |
| - Kelaa | 1,386 | 1,348 | 1,476 | 1,543 | 1,615 | 3.66 |

Note : Population is resistered one.

(EXDATA3)

STATISTICS OF HOUSEHOLD (1989-1992)

| Name of Atoll and Island | 1989 Mar. | 1990 Mar. | 1991 Mar. | 1992 Mar. | 1993 Jun. | Growth Rate |
|--------------------------|--------------|--------------|--------------|--------------|--------------|----------------|
| 1. Lhaviyani | | | | 1,038 | 1,322 | |
| - Naifaru | 476 | 502 | 502 | 586 | 583 | 4.89 |
| - Hinnavaru | 421 | 462 | 462 | 430 | 453 | 1.74 |
| 2. Baa | | | | 1,145 | 1,692 | |
| - Eydhafushi | 275 | 275 | 275 | 249 | 386 | 8.30 |
| 3. Laamu | | | | 1,430 | 1,717 | |
| - Gan | | | | 266 | 275 | |
| 4. Raa | | | | 1,847 | 2,815 | |
| - Kan' dholhudhoo | 298 | 298 | 298 | 278 | 340 | 3.15 |
| 5. Haa Alifu | | | | 1,836 | 2,930 | |
| - Kelaa | 238 | 249 | 279 | 306 | 319 | 7.14 |

Attachment-8

(EXDATA5)

DATA OF ISLANDS (1/2)

| Description | Laame Gan Mukulimagu | Mathimaradhoo | Thundi | Haa Alifu Kelaa |
|----------------------------------|-------------------------|----------------------|---------|----------------------|
| 1. No. of Populations | 683 | 556 | 742 | 1,630 |
| 2. No. of Households | 122 | 79 | 90 | 315 |
| 1) Without Electric | 44 | 13 | 0 | 285 |
| 2) With Electric | 78 | 66 | 90 | 30 |
| 3. Access from Male | ----- | Air or Sea | ----- | Air & Sea |
| 4. Landing Facility | | | | |
| 1) Materials | --- | Jetty | --- | Wooden & Concrete |
| 2) Depth (m) | --- | Concrete | --- | 1.5 |
| 3) Length (m) | --- | 4 | --- | |
| 4) Width (m) | --- | 45 | --- | 2 |
| 5) Max. Loading Cap. (kG) | --- | 4 | --- | |
| 5. Public Facilities | | | | |
| 1) School & Kindergarten | 1 | 1 | 1 | 1 |
| 2) Health Center | --- | (1) | --- | Clinic |
| 3) Public Office | | | | |
| a) Atoll Office | No | No | No | No |
| b) Island Office | 1 | 1 | 1 | Yes |
| 4) Telephone Office | --- | 1 | --- | No |
| 5) Island Court | 1 | 1 | 1 | Yes |
| 6) Police Office | --- | --- | --- | No |
| 7) Post Office | --- | --- | --- | No |
| 8) Water Supply | --- | --- | --- | ----- |
| 9) Mosque | 2 | 1 | 1+ (1) | 6 |
| 10) Club House | --- | --- | --- | Yes |
| 11) Library | --- | --- | --- | in school |
| 6. Personal Facility | | | | |
| 1) No. of DEG Sets | 4 | 2 | 4 | 5 |
| 2) Boat House | 7 | 2 | 2 | No |
| 3) Handicraft | --- | --- | --- | Some |
| 4) Work Shop for fisher | --- | --- | --- | No |
| 5) Car | --- | 2+2 lorries | 1 Van | 1 pick-up |
| 7. Average income (MRf/Month) | 700-800 | 700-800 | 700-800 | 1500-2000 |
| 8. Power supply | | | | |
| 1) Owner | --- | Community + Personal | --- | Personal |
| 2) Total Capacity (kVA) | | 28 | 27.5 | 27 |
| 3) Operating Time | 18 - 23 | 18 - 23 | 18 - 23 | 18 - 23 |
| 4) Service voltage (V) | 230 | 230 | 230 | |
| 5) Tariff (MRf/kWh) | --- | 1 or 1.5 MRf/Watt | --- | |
| 9. Development Plan | Yes | | | Yes |
| 10. Availability of project area | Yes | Yes | Yes | Yes |
| 11. Other | | | | |

Remarks : 1.No. of population and household is as of July 1993
2. Numerical values in () means under construction or planning
3. Income is only for workman only

Attachment-8

(EXDATA5)

DATA OF ISLANDS (2/2)

(C1L0)

| Description | Baa Eydafushi | Lhaviyani Naifaru | Lhaviyani Hinnabaru | Raa Kan' dholhudhoo |
|----------------------------------|----------------------|----------------------|-------------------------|------------------------|
| 1. No. of Populations | 2,436 | 3,985 | 3,980 | 2,865 |
| 2. No. of Households | 318 | 650 | 450 | 419 |
| 1) Without Electric | 318 | 303 | 80 | 0 |
| 2) With Electric | 0 | 347 | 370 | 419 |
| 3. Access from Male | Sea | Sea | Sea | Sea |
| 4. Landing Facility | Jetty | Quay | Quay | Jetty |
| 1) Materials | Wooden & Concrete | Concrete | Concrete | Concrete |
| 2) Depth (m) | 1.5 | 2.0 | 2.0 | 3.0 |
| 3) Length (m) | | 50 | 20 | 15 |
| 4) Width (m) | 2 | - | - | 2 |
| 5) Max. Loading Cap. (kG) | | | | |
| 5. Public Facilities | | | | |
| 1) School & Kindergarten | Yes | 3 + (1) | Yes | Yes |
| 2) Health Center | Yes | Yes | (Yes) | (Yes) |
| 3) Public Office | | | | |
| a) Atoll Office | Yes | Yes | No | No |
| b) Island Office | Yes | Yes | Yes | (Yes) |
| 4) Telephone Office | | Yes | Yes | Yes |
| 5) Island Court | | Yes | | |
| 6) Police Office | | Yes | Yes | Yes |
| 7) Post Office | | Yes | Yes | Yes |
| 8) Water Supply | Rain Water | | | |
| 9) Mosque | | Yes | Yes (3) | Yes |
| 10) Club House | | Yes | | Yes |
| 11) Library | No | No | No | Yes |
| 6. Personal Facility | | | | |
| 1) No. of DEG Sets | 33 | 25 | 6 | 7 |
| 2) Boat House | 28 | Yes | | 302 |
| 3) Handicraft | Yes | | | |
| 4) Work Shop for fisher | Yes | Yes | Yes | Yes |
| 5) Car | No | No | 1 | No |
| 7. Average income (MRf/Month) | | 700-800 | | |
| 8. Power supply | | | | |
| 1) Owner | Community | Community | Personal | Personal |
| 2) Total Capacity (kVA) | (90) | 78.5 | 277.5 | 302 |
| 3) Operating Time | (18 - 23) | 18 - 23 | 0 - 24 | 18 - 24 |
| 4) Service voltage (V) | 400/230 | 400/230 | 400/230 | 400/230 |
| 5) Tariff (MRf/kWh) | | By Facility | 3 | 4 |
| 9. Development Plan | No | No | No | No |
| 10. Availability of project area | Yes | Yes | Yes | Yes |
| 11. Other | | | 2-independent system | Over head Line |

Remarks : 1.No. of population and household is as of July 1993
2. Numerical values in () means under construction or planning
3. Income is only for workman only

資料-6 カントリーデータ

I. 基礎指標

- ① モルディヴ共和国 首都 マレ 60,105人 (1992年推定)
- ② 国土・人口
面積：280km² 人口：230,819人 (1992年推定)
人口密度：824人/km² 人口増加率：3.4% (1985-1990)
都市人口比率：26% (1990年)
平均寿命：67歳 (1992年)
- ③ 政体 共和制であり、大統領を元首とする一院制の議院内閣制。
大統領：マウムーン・アブドゥル・ガユーム (1978年5月就任)
1993年10月1日に行われた国民投票で、90%以上の支持を受けて
信任された。
- ④ 宗教 イスラム教 (100%)
- ⑤ 言語 モルディヴ語 (ディヴェヒ語)
- ⑥ 民族 モルディヴ人
- ⑦ 教育 識字率 98% (年齢15~45歳、1990年)
- ⑧ 通貨・レート 通貨単位：モルディヴルフィア
レート：10.9459ルフィア (対US\$)
(1993年3年~1993年8月の6ヶ月間平均)
- ⑨ 気候 熱帯モンスーン気候に属す。11~4月は北東モンスーンの季節で乾燥し、風も穏やかで雨量は少ない。5~10月は南西モンスーンの季節で、強風多雨であり、雷雨を伴う。気温および湿度は年間を通じてそれぞれ25℃~32℃、73%~85%と変化は少なく、年間降雨量 (1988-1992) は平均1,745mmである。
- ⑩ 地勢 火山活動等によってできた浅海にサンゴが生息した結果小島が複数環状につながった環状礁島および分離島からなり、一般に海拔1~2mの平坦な地形を構成している。
- ⑪ 経緯度 東経72° 32' 30" ~ 東経73° 45' 54"
北緯 7° 6' 30" ~ 南緯 0° 41' 48"

II. 社会・経済指標

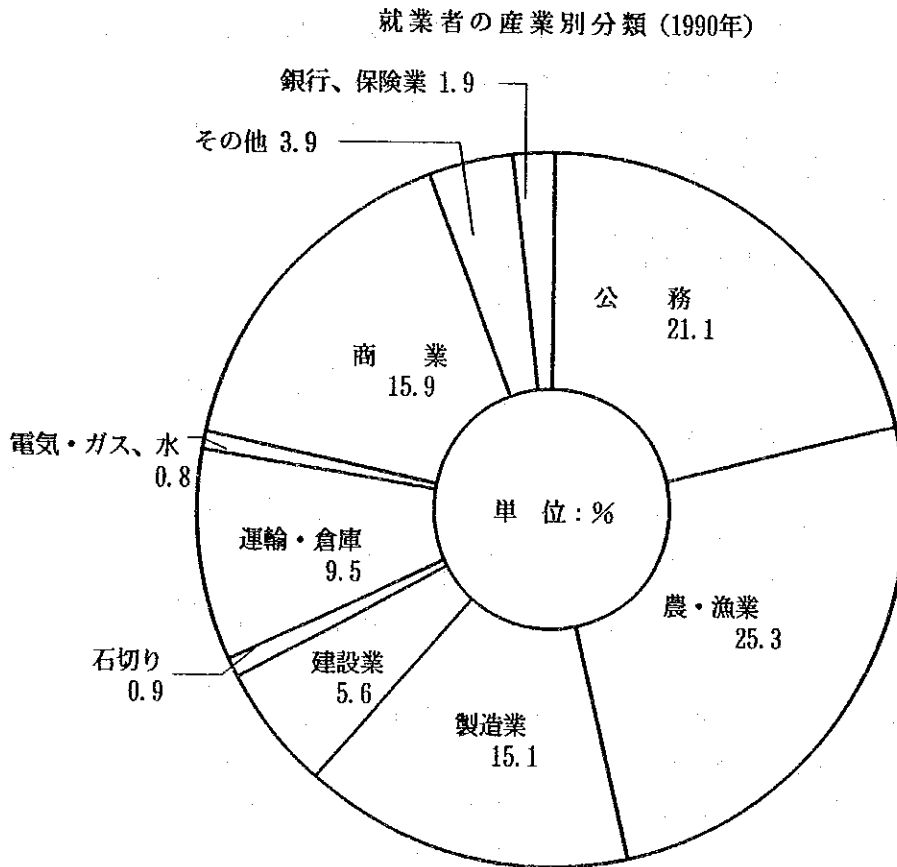
① 国内総生産

GDP 15,790万ドル 一人当りGDP 684.3ドル
1992年実績

② 国民所得

GNP 10,330万ドル 就業者一人当りGNP 1,846ドル
1991年実績

③ 産業構成



④ 就労人口

就労人口 55,949人 (1990年)

⑤ インフレ率

消費者物価指数 (1981年=100)

| | | | |
|------|--------|------|--------|
| 1985 | 130.09 | 1989 | 179.48 |
| 1986 | 143.39 | 1990 | 186.03 |
| 1987 | 157.32 | 1991 | 213.40 |
| 1988 | 167.47 | 1992 | 249.34 |

インフレ率 1991-1992 16.8%

(出典 : STATISTICAL YEAR BOOK OF MALDIVES 1993)

⑥ 国際収支

モルディヴ共和国の輸出入 (1992) (単位 : 千ルフィア)

| | <u>1992</u> |
|-------------|-------------|
| <u>輸 入</u> | |
| 消費財 | |
| 米および食料 | 379,832 |
| 飲料および煙草 | 109,769 |
| 石油製品 | 242,132 |
| 工業製品 | 507,892 |
| 小計 | 1,239,625 |
| 資本財 | |
| 原材料 | 26,218 |
| 化学、セメント、鉄、紙 | 267,238 |
| 機械および輸送用機器 | 468,444 |
| 小計 | 761,900 |
| 輸入合計 | 2,001,525 |
| <u>輸 出</u> | |
| 生鮮・加工魚貝類 | 329,276 |
| 衣類 | 84,065 |
| 銅、鉄スクラップ | 460 |
| 熱帯魚 | 3,156 |
| 輸出合計 | 416,957 |

(出典 : STATISTICAL YEAR BOOK OF MALDIVES 1993)

⑦ 対日貿易

(単位：千ルフィア)

| | <u>1992</u> |
|---------|-------------|
| 日本からの輸入 | 76,596 |
| 日本への輸出 | 13,797 |

⑧ 財政収支

モルディヴ共和国政府財政収支 (1991~1993) (単位：百万ルフィア)

| | <u>1991</u> | <u>1992(*1)</u> | <u>1993(*2)</u> |
|---------------|-------------|-----------------|-----------------|
| <u>歳入合計</u> | 844.5 | 905.9 | 994.9 |
| | (100%) | (100%) | (100%) |
| 外国からの贈与 | 226.2 | 185.9 | 124.2 |
| | (27%) | (21%) | (12%) |
| 国内収入 | 618.3 | 720.0 | 870.7 |
| | (73%) | (79%) | (88%) |
| (内訳) 税金 | 374.2 | 443.1 | 500.0 |
| その他収入 | 244.1 | 276.9 | 370.7 |
| <u>歳出合計</u> | 1,068.4 | 1,288.5 | 1,495.3 |
| 公務 | 299.4 | 423.5 | 518.2 |
| 社会福祉 | 372.6 | 377.1 | 432.0 |
| 教育 | 176.2 | 219.0 | 237.9 |
| 保健 | 130.4 | 96.9 | 115.8 |
| 社会福祉サービス | 21.0 | 19.1 | 20.0 |
| 共同体 | 45.0 | 42.1 | 58.3 |
| 経済 | 361.9 | 440.3 | 463.8 |
| 農業・漁業 | 53.7 | 85.2 | 144.2 |
| 運輸 | 277.1 | 331.3 | 228.1 |
| 観光 | 8.5 | 6.9 | 7.0 |
| 貿易・工業 | 2.0 | 5.9 | 11.0 |
| 電気 | 20.6 | 11.0 | 73.5 |
| 借金利子 | 21.4 | 26.3 | 47.3 |
| 融資 | 13.1 | 21.3 | 34.0 |
| <u>差引収入不足</u> | 223.9 | 382.6 | 500.4 |

(備考) *1: 暫定値

*2: 見積値

(出典：STATISTICAL YEAR BOOK OF MALDIVES, 1993)

Ⅲ. 開発指標

① 国家開発計画

現ガユーム政権は、「モ」国全体の経済的、社会的発展を促すための一貫した戦略を策定することを目的として、1978年に国家計画庁 (National Planning Agency) を設置した。同庁は、1982年に計画開発省 (Ministry of planning and Development) と改名し、「モ」国における最初の3ヶ年国家開発計画 (1985~1987) を策定し、引き続き、第2次国家開発計画 (1988~1990) が策定され実施された。現在、計画環境省 (Ministry of Planning & Environment) と改名し、第3次国家開発計画を実施中である。

この計画書は、2巻より成り、第1巻第1部において経済社会開発のマクロ的な展望を、また第1巻第2部において、部門別の展望をより詳細に既述している。第2巻には、1991年から1993年までの3年間の開発プロジェクトの詳細が記されている。この計画書の中には以下に示した開発目標および重点政策がうたわれている。

開発目標

1. 国民の生活水準と質の改善を図る。
2. 国家開発による恩恵が公平に国民に分配されるように図る。
3. 将来の成長のための強い自立性の達成

重点政策

1. 経済運営および国家開発
2. インフラ開発
3. 社会開発整備
4. 公共機関整備
5. 環境社会

② 国家開発予算

「モ」国の3ヶ年（1991～1993）国家開発計画における部門別国家予算は、下記のとおりである。

（単位：百万ドル）

| 部 門 | 国内資金 | 国外資金 | 計 |
|---------------|------|-------|-------|
| 農業 | 0.1 | 2.1 | 2.2 |
| 漁業 | 0.6 | 47.1 | 47.7 |
| 製造業 | 0.1 | 1.5 | 1.6 |
| 電力 | 2.6 | 22.0 | 24.6 |
| 観光 | 0.09 | 0.7 | 0.8 |
| 運輸・通信・メディア | 4.1 | 28.1 | 32.2 |
| 飛行場建設 | 13.8 | 80.7 | 94.5 |
| 教育 | 7.0 | 22.8 | 29.8 |
| 保健・衛生・スポーツ・文化 | 19.7 | 59.2 | 78.9 |
| 環境開発 | 0.4 | 5.5 | 5.9 |
| 公共機関開発 | 0.5 | 4.6 | 5.1 |
| 都市開発 | 3.6 | 44.0 | 47.6 |
| 地方環礁開発 | 1.7 | 7.1 | 8.8 |
| 合 計 | 54.3 | 325.4 | 379.7 |

（出典：NATIONAL DEVELOPMENT PLAN 1991-1993, Vol.2）

IV. 産業部門別特性

「モ」国における産業は、下記のような特性を有する。

① 部門別特性

(1) 漁業

漁業は「モ」国経済の柱である。国土が狭く、ほとんど天然資源のない同国にとっては、漁業が最も重要な資源となっている。漁船（ドーニ）の機械化、魚の採集、冷凍設備、缶詰工場の近代化や冷凍魚および鮪の缶詰を国際市場向けに開発することで漁獲高の増加を促進している。

1991年の漁獲量は8.07万トンで、対前年比5.6%の増加を示した。漁獲量の種別内訳を見ると、カツオが73%、キハダマグロが9.6%、その他マグロが5.6%、珊瑚礁内および沿海魚が11.8%となっている（1993年の資料による）。

(2) 観光業

漁業に次ぐ「モ」国の重要産業は観光で、国際収支における貿易外収支の中心となっている。

同国にとっては今後、観光資源の開発とその有効活用が重要な経済課題となっており、現ガユーム政権は観光客の増大を図って環境整備を進めている。また観光業の開発は、マレ島以外の島およびさらにその他地方環礁の開発のための一戦略として期待がかけられている。

(3) 海運業

海運業は、1967年に設立された国営のモルディヴ海運会社（Maldives Shipping Line）を中心に、MSLの関連子会社10社で運営されてきた。

1981年以前は、海運業は貴重な外貨獲得手段であり、重要な財政収入源であった。しかし、1982年以降、モルディヴ国海運会社（Maldives National Ship Management Ltd）は損失を計上するに至っている。理由は、第1に世界経済不況に端を発する海運不況。第2にイラン・イラク戦争の勃発。第3にUNCTADが「40：40：20決議」を採択した。このためMNSMLは保有貨物船数を削減、雇用者の削減、運送料の引き下げを計ってきた。この結果、1986年以降MNSMLは利潤を計上するに至っているが、その規模は小さく、かつてのような経済発展のリーディング・セクターとしての役割を果たす力はもうないと見られる。

(4) 農業

前述の3産業に対し、農業は、地方漁民の兼業産業であり、漁業の補充的位置に置かれているマイナーな産業分野となっている。珊瑚礁であるモルディヴは耕作適地が狭く、国土の10%にも満たない上、土壌は砂質で水分の保持性が悪く、ひどいアルカリ性となっているなど農業に必要な自然条件にも恵まれていないため、今後の開発に関しても障害は大きい。しかし、米をはじめとする食料品は輸入に大きく頼っており、貿易赤字さらには国際収支赤字の縮小のためにも、農業開発、国内での食料品生産の増大は、「モ」国経済開発の重要課題のひとつとなっている。

農業生産の主要作物はバナナ、タロイモ、レモン等である。

(5) 製造業

「モ」国の製造業は、年間13,000トンを製造する鮪の缶詰工場（フェリバル島）、輸出用衣服工場、炭酸飲料ビン詰工場、PVCパイプ、石けん、セメントブロック、家具、小規模な食料製造等で成立している。主要輸出製品はフェリバル島で製造された鮪の缶詰である。

② 産業別就業人口

| 部 門 | 就業人口（千人） | 就業人口比率（%） |
|---------|----------|-----------|
| 農 業 | 2.6 | 4.7 |
| 漁 業 | 11.5 | 20.6 |
| 製造業 | 8.9 | 15.9 |
| 建設業 | 3.2 | 5.7 |
| 商 業 | 8.8 | 15.7 |
| 電気、ガス、水 | 0.4 | 0.7 |
| 運輸業 | 5.3 | 9.5 |
| 銀行、保険業 | 1.1 | 2.0 |
| 公 務 | 11.9 | 21.3 |
| その他 | 2.2 | 3.9 |
| 計 | 55.9 | 100 |

注：就業人口は、1990年のデータである。

V. その他

① 国民の休日

政府公認の祝祭日以外に、イスラム教関係の祭日が年18日あるが、イスラム暦のため毎年変わる。また、国会の開会日と毎週金曜日はイスラム教の安息日のため休日となる。1993年の休日は以下の通りである。

| | | |
|--------|------------|-------------------------------------|
| 1月 1日 | - 元旦 | New Year Holiday |
| 1月 2日 | - 臨時休暇 | Extra Holiday |
| 1月24日 | - イスラム教関係 | Matyr's Day |
| 2月23日 | - イスラム教関係 | Beginning of Fasting Month |
| 3月24日 | - イスラム教関係 | Fith'r Eid Day |
| 3月25日 | - イスラム教関係 | On the Occasion of Fith'r Eid Day |
| 3月26日 | - イスラム教関係 | On the Occasion of Fith'r Eid Day |
| 3月27日 | - イスラム教関係 | Extra Holiday |
| 5月31日 | - イスラム教関係 | Hajj Day |
| 6月 1日 | - イスラム教関係 | Al'h'aa Eid Day |
| 6月 2日 | - イスラム教関係 | On the Occasion of Al'h'aa Eid Day |
| 6月 3日 | - イスラム教関係 | On the Occasion of Al'h'aa Eid Day |
| 6月 4日 | - イスラム教関係 | On the Occasion of Eid Day |
| 6月 5日 | - イスラム教関係 | Extra Holiday |
| 6月21日 | - イスラム教関係 | Islamic New Year Holiday |
| 7月26日 | - 独立記念日 | Independence Day |
| 7月27日 | - 独立記念日祝日 | On the Occasion of Independence Day |
| 8月19日 | - イスラム教関係 | National Day |
| 8月20日 | - イスラム教関係 | On the Occasion of National Day |
| 8月21日 | - イスラム教関係 | Extra Holiday |
| 8月30日 | - イスラム教関係 | Prophet Mohammed's Birthday |
| 11月 3日 | - 勝利記念日 | Victory Day |
| 11月11日 | - 共和制記念日 | Republic Day |
| 11月12日 | - 共和制記念日祝日 | On the Occasion of Republic Day |
| 11月13日 | - 臨時休暇 | Extra Holiday |
| 11月17日 | - イスラム教関係 | Huravee Day |

② オフィスタイム

8:00~13:00

金曜日は休日

資料－7 「モ」国負担工事費の内訳

「モ」国側負担事業費

1. 「モ」国側負担事業費

合 計 US\$133,917

2. 内 訳

① フェンス工事 (コンクリートブロック t=150mm H=1.2m)

| | |
|--------|---|
| ナイファル島 | 134m × 1.2m × 111.73US\$/m ² = US\$ 17,966 |
| エダフシ島 | 223m × 1.2m × 111.73US\$/m ² = US\$ 29,898 |

小 計 US\$ 47,864

② ゲート工事 (steel)

| | |
|--------|---------------------------------|
| ナイファル島 | 1ヶ所 × 3,000US\$/ヶ所 = US\$ 3,000 |
| エダフシ島 | 1ヶ所 × 3,000US\$/ヶ所 = US\$ 3,000 |

小 計 US\$ 6,000

③ 植栽工事

| | | | |
|--------|-----|---------------------------|---------------|
| ナイファル島 | 材 料 | 43本 × 200US\$/本 | = US\$ 8,600 |
| | 労務費 | 43本 × 15US\$/人・日 × 2人・日/本 | = US\$ 1,290 |
| エダフシ島 | 材 料 | 56本 × 200US\$/本 | = US\$ 11,200 |
| | 労務費 | 56本 × 15US\$/人・日 × 2人・日/本 | = US\$ 1,680 |

小 計 US\$ 22,770

④ 配電工事 (資材は日本供与)

ケーブル工事 (埋設)

| | | |
|--------|---|---------------|
| ナイファル島 | 1,906m × 0.375m ³ /m × 1.05人・日/m ³ × 15US\$/人・日 | = US\$ 11,257 |
| エダフシ島 | 2,586m × 0.375m ³ /m × 1.05人・日/m ³ × 15US\$/人・日 | = US\$ 15,273 |

小 計 US\$ 26,530

配電盤工事

基礎コンクリート

ナイファル島 $55\text{個} \times 0.125\text{m}^3/\text{個} \times 592\text{US}\$/\text{m}^3 = \text{US}\$ 4,070$

エダフシ島 $52\text{個} \times 0.125\text{m}^3/\text{個} \times 592\text{US}\$/\text{m}^3 = \text{US}\$ 3,848$

据付・調整

ナイファル島 $55\text{個} \times (0.3\text{人}\cdot\text{日}/\text{個} \times 21\text{US}\$/\text{人}\cdot\text{日} + 0.3\text{人}\cdot\text{日}/\text{個} \times 15\text{US}\$/\text{人}\cdot\text{日}) = \text{US}\$ 594$

エダフシ島 $52\text{個} \times (0.3\text{人}\cdot\text{日}/\text{個} \times 21\text{US}\$/\text{人}\cdot\text{日} + 0.3\text{人}\cdot\text{日}/\text{個} \times 15\text{US}\$/\text{人}\cdot\text{日}) = \text{US}\$ 561$

小 計 US\$ 9,073

各戸引込線

ナイファル島 $650\text{軒} \times 20\text{US}\$/\text{軒} = \text{US}\$ 13,000$

エダフシ島 $419\text{軒} \times 20\text{US}\$/\text{軒} = \text{US}\$ 8,380$

小 計 US\$ 21,380

⑤ 既設発電機撤去工事 (エダフシ島)

$2\text{機} \times 15\text{US}\$/\text{人}\cdot\text{日} \times 10\text{人}\cdot\text{日}/\text{機} = \text{US}\$ 300$

資料－８ 当該発電設備の想定運転収支

ナイフアールの想定運転収支

| 項目 | 単位 | 稼働率 | | | | | 稼働率 | |
|-------------------|---------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| | | 60% | 70% | 80% | 85% | 90% | 80% | 90% |
| I. 収入 | | | | | | | | |
| 1. 設備容量 | kW | 200 | 200 | 200 | 200 | 200 | 300 | 300 |
| 2. 年間運転時間 | hr | 5,184 | 6,048 | 6,912 | 7,344 | 7,776 | 6,912 | 7,776 |
| 3. 発電電力量 | kWh | 1,036,800 | 1,209,600 | 1,382,400 | 1,468,800 | 1,555,200 | 2,073,600 | 2,332,800 |
| 4. 所内電力損失率 | | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| 5. 送電損失率 | | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| 6. 売電電力量 | kWh | 881,280 | 1,028,160 | 1,175,040 | 1,248,480 | 1,321,920 | 1,762,560 | 1,982,880 |
| 7. 平均売電単価 (住宅・公共) | Rf/kWhr | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 8. 売電収入 | Rf | 2,643,840 | 3,084,480 | 3,525,120 | 3,745,440 | 3,965,760 | 5,287,680 | 5,948,640 |
| II. 支出 | | | | | | | | |
| 1. 燃料費 | Rf | 1,140,480 | 1,330,560 | 1,520,640 | 1,615,680 | 1,710,720 | 1,520,640 | 1,710,720 |
| 2. 潤滑油費 | Rf | 57,600 | 67,200 | 76,800 | 81,600 | 86,400 | 115,200 | 129,600 |
| 3. 冷却水費 | Rf | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4. 労務費 | Rf | 180,000 | 180,000 | 180,000 | 180,000 | 180,000 | 180,000 | 180,000 |
| 5. 保守費 | Rf | 301,811 | 301,811 | 301,811 | 301,811 | 301,811 | 301,811 | 301,811 |
| 6. 管理費 | Rf | 528,768 | 616,896 | 705,024 | 749,088 | 793,152 | 1,057,536 | 1,189,728 |
| 7. 減価償却費 | Rf | 670,691 | 670,691 | 670,691 | 670,691 | 670,691 | 670,691 | 670,691 |
| 8. 支出合計 | Rf | 2,879,350 | 3,167,158 | 3,454,966 | 3,598,870 | 3,742,774 | 3,845,878 | 4,182,550 |
| III. 運転収支 | | | | | | | | |
| | Rf | -235,510 | -82,678 | 70,154 | 146,570 | 222,986 | 1,441,802 | 1,766,090 |

エダフシの想定運転収支

| 項目 | 単位 | 稼働率 | | | | | 稼働率 | |
|-------------------|---------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| | | 60% | 70% | 80% | 85% | 90% | 80% | 90% |
| I. 収入 | | | | | | | | |
| 1. 設備容量 | kW | 150 | 150 | 150 | 150 | 150 | 225 | 225 |
| 2. 年間運転時間 | hr | 5,184 | 6,048 | 6,912 | 7,344 | 7,776 | 6,912 | 7,776 |
| 3. 発電電力量 | kWh | 777,600 | 907,200 | 1,036,800 | 1,101,600 | 1,166,400 | 1,555,200 | 1,749,600 |
| 4. 所内電力損失率 | | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| 5. 送電損失率 | | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| 6. 売電電力量 | kWh | 660,960 | 771,120 | 881,280 | 936,360 | 991,440 | 1,321,920 | 1,487,160 |
| 7. 平均売電単価 (住宅・公共) | Rf/kWhr | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 8. 売電収入 | Rf | 1,982,880 | 2,313,360 | 2,643,840 | 2,809,080 | 2,974,320 | 3,965,760 | 4,461,480 |
| II. 支出 | | | | | | | | |
| 1. 燃料費 | Rf | 917,568 | 1,070,496 | 1,223,424 | 1,299,888 | 1,376,352 | 1,223,424 | 1,376,352 |
| 2. 潤滑油費 | Rf | 43,200 | 50,400 | 57,600 | 61,200 | 64,800 | 86,400 | 97,200 |
| 3. 冷却水費 | Rf | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4. 労務費 | Rf | 180,000 | 180,000 | 180,000 | 180,000 | 180,000 | 180,000 | 180,000 |
| 5. 保守費 | Rf | 241,449 | 241,449 | 241,449 | 241,449 | 241,449 | 241,449 | 241,449 |
| 6. 管理費 | Rf | 337,090 | 393,271 | 449,453 | 477,544 | 505,634 | 674,179 | 758,452 |
| 7. 減価償却費 | Rf | 536,553 | 536,553 | 536,553 | 536,553 | 536,553 | 536,553 | 536,553 |
| 8. 支出合計 | Rf | 2,255,859 | 2,472,169 | 2,688,478 | 2,796,633 | 2,904,788 | 2,942,005 | 3,190,005 |
| III. 運転収支 | | | | | | | | |
| | Rf | -272,979 | -158,809 | -44,638 | 12,447 | 69,532 | 1,023,755 | 1,271,475 |

検討上の仮定条件：

- (1) 売電単価は、MEBがマレ島で採用している平均売電単価（2.85Rf/kwh）にほぼ等しい3.0Rf/kwhとした。
- (2) 所内電力損失率及び送電損失率は仮定した。
- (3) 燃料価格は5Rf/ℓとした。
- (4) 潤滑油価格は25Rf/ℓとした。
- (5) 冷却水は雨水を使用するので価格は0とした。
- (6) 各消費量は以下のとおりとした。

燃料消費量：0.2kg/kwh

潤滑油消費量：0.0010g/kwh

- (7) 労務費は計25名とし、計21名の人件費を見込んだ。
- (8) 保守費は、年間消耗部品費とし機器費（ナイファル1億円、エダフシ8千万円）の3%とした。
- (9) 管理費は売電収入の2%とした。
- (10) 原価償却費は、当該発電設備の耐用年数を15年、残存価格を零とし定額法により算定した。

JICA