インドネシア共和国
鉱工業プロジェクト選定確認調査
報告書

国際協力事業団
鉱工業開発調査部

インドネシア共和国

鉱工業プロジェクト選定確認調査

報　告　書

1996年1月

国際協力事業団
鉱工業開発調査部

目　　次

Ⅰ．概　　要

Ⅰ．概　　要

１．調査目的

鉱工業分野の開発調査を効率的に実施するため、今後我が国に正式要請される可能性のある案件について、「イ」側及び現地日本側関係者と意見交換・情報収集を行うことを目的とした。

２．調査期間

１９９５年１２月１２日（火）～２０日（水）　９日間
（但し、河邊団員については、１２月１２日（火）～１５日（金）の４日間）

３．団員構成

団長・総括	：長田（オサダ）	直俊（ナオトシ）	通商産業省　通商政策局経済協力部技術協力課長
技術協力政策	：河邊（コウベ）	賢裕（ヤスヒロ）	外務省　アジア局南東アジア第二課
発電行政	：嘉藤（カトウ）	壽郎（ヒサオ）	通商産業省　東北通商産業局公益事業部公益事業課長
調査企画	：丸原（マルハラ）	篤（アツシ）	国際協力事業団　鉱工業開発調査部　計画課

４．調査日程

日順	月　日	曜日	時　間	行　　程　　等
1	１２／１２	火		移動（成田発11:00 →ジャカルタ 着16:10 JL725 ）
2	１３	水	9:00 10:00 11:00 14:30 19:00	日本国大使館（対処方針等説明及び意見交換） ＪＩＣＡ事務所（対処方針等説明及び意見交換） 国家開発企画庁（電力・エネルギー発展局長） 〃　（産業・鉱業局長） ＪＩＣＡ事務所長主催夕食会
3	１４	木	9:00 13:30 19:00	鉱山・エネルギー省（電気・エネルギー総局長） 協同組合・中小企業庁（中小企業部長） ＪＩＣＡ専門家との意見交換・情報収集
4	１５	金	9:00 9:30 13:30	工業省次官表敬 〃　関係部局との個別案件協議 鉱山・エネルギー省（電気・計画局長） （河邊団員のみマレイシアへ移動） （ジャカルタ 発17:00 →シンガポール着19:30 SQ159 ） （シンガポール発20:45 →クアラルンプール着21:40 MH626 ）
5	１６	土		ＪＩＣＡ派遣専門家との意見交換及び資料整理

日順	月　日	曜日	時　間	行　　程　　等
6	１２／１７	日	19:00	団内打合せ及び資料整理 ＪＥＴＲＯ事務所長主催夕食会
7	１８	月		関連施設（チラタ及びジャティルフル水力発電所）の視察
8	１９	火	10:00 13:00 15:00 16:00	国家開発企画庁（電力・エネルギー発展局） 公使主催昼食会 日本国大使館（結果報告等） ＪＩＣＡ事務所（結果報告等） 移動（ｼﾞｬｶﾙﾀ 発23:20 →　　JL725 ）
9	２０	水		移動（　　→成田着 8:30　　）

５．調査対象（平成８年度要請候補）案件

（１）水力発電開発計画（F/S of Development of Kelai-2 HEPP)

①実施機関：鉱山エネルギー省、電力公社

②案件概要

開発の進む東カリマンタンの電力需要に対応すべく、ケライ川流域に水力発電所を建設すべく、Ｆ／Ｓ調査を行うもの。

③その他

１９８３年に世銀の調査を含め、予備調査が実施されている。

（２）ウムシニ、ソロン小規模地熱発電開発計画（仮称）

(F/S for Small Size Geothermal at Umsini and Sorong Irian Jaya)

①実施機関：

②案件概要

イリアンジャヤのウムシニ、ソロンの両地域において、小規模地域発電所を建設すべくＦ／Ｓを行うもの。

（３）ロンボク島石炭火力発電開発計画（仮称）

(F/S of Lombok Base Thermal Power Plant)

①実施機関：鉱山エネルギー省　電力エネルギー開発総局開発局

②案件概要

ロンボク島に石炭火力発電所を建設すべくＦ／Ｓ調査を行うもの。

（４）新型流れ込み式水力技術導入発展計画

(Project for Technology Introduction and Development of Advanced Rub-off River Power Stations)

①実施機関：鉱山エネルギー省　電力エネルギー開発総局開発局

②案件概要

急速な産業発展に伴い、全国的に電力需要が逼迫しており、各地で石炭火力、水力による開発を進めている。特に、水力については、クリーンで使い減りしないことから、「イ」側も力を入れていきたい考えである。

しかしながら、従来の貯水池では住民移転等の問題もあり、限界があるため、「小規模水力」の利用による供給力拡充を西部ジャワインド洋地域をモデルと

して計画を策定し、将来的には円借款による事業実施を行うもの。

（５）地域貿易研修センター開発計画（仮称）
（Development of Regional Export Training Center）
①実施機関
②案件概要
ジャカルタで、無償資金協力・プロ技により協力を実施した貿易研修センターへの協力を地方へも展開することにより、地方センター及び地方センター及び地方中小企業の強化を図るもの。

（６）東部インドネシア非石油輸出産品開発計画（仮称）
（F/S for Development of Non-Oil Export Commodities in the Eastern Part of Indonesia）
①実施機関：工業省大臣官房
②案件概要
貿易振興についても西部に比して遅れをとっている東部インドネシアについて有力産品分布図作成等を含めた輸出振興／貿易センター／情報センターのM／P調査を行うもの。

（７）環境調和型製造工程導入計画
（Application of Eco-Friendly Production Process for Industry ）
①実施機関：工業省研究開発庁
②案件概要
各種の環境付加を抜本的に低減するために、出口処理でなく製造工程そのものの改善を実施する。

（８）デザインセンター開発計画
（Development of Industrial Design Center ）
①実施機関：協同組合・中小企業省
②案件概要
小規模企業の商品力向上を目指し、デザイン開発を推進するためにデザインセンターを設立するための支援を行い、デザイン、企業家を対象とした研修の実施及び両者のネットワークの構築を図るもの。

６．主要面会者
（１）在「イ」日本国大使館
神永　善次　公使
粗　　信仁　参事官
豊国　浩治　一等書記官
高島　昌明　二等書記官

（２）ＪＩＣＡ事務所
岡崎　剛一郎　所長
佐々木　弘世　次長
山田　史子　　所員
安藤　寿郎　　所員
大内　日出夫　産業公害防止プロジェクト・チーフアドバイザー
川喜田　英博　　〃　　・コーディネーター
北端　辰昭　　小規模工業開発計画専門家
黒谷　雄二　　電源開発政策専門家

斉藤　芳敬　　電気事業経営専門家
南坊　博司　　石炭開発政策専門家
林　光洋　　工業調査・計画アドバイザー

（３）ＪＥＴＲＯ事務所
大隅　正憲　　所長

（４）国家開発企画庁（ＢＡＰＰＥＮＡＳ）

Mr.Richard Claproth,Ph.D	Head,Bureau of Electricity Power and Energy Development
Dr.Ir.Dipo Alam,MEM	Head,Bureau of Industry and Mining

（５）鉱山エネルギー省（ＭＯＭＥ）

Mr.Ir.Endro Utomo N.	Director of New Resources,Electricity and Energy Dev
Dr.Ir.Yogo Pratomo	Director,Electricity Dev.Planning, Dit.Gen.of Electricity and Energy Dev

（６）協同組合・中小企業省

IR.Siti Soeprapti MBA.	Director of Industrial S.E.Promotion
Mochammad Kasim H.MASE	Industrial S.E.Promotion
Riswanto Ramelan	Director of ADWITIYA DESIGN
Solichin Gunawan,HDII	President P.T.ATELIER ENAM INTERIOR

（７）工業省

A.Fuad Rivai	Secretary General
Toto Sudarmasto	Head Bureau of Planning
Sri Wiya Tiningsih	Chief Section of Leather Production

７．協議概要

（１）リチャード・クラプロス国家開発企画庁・電力エネルギー発展局長への表敬及び意見交換（１３日午前）

当方（長田団長）より、今次訪問の目的を説明するとともに、現在までに国家開発企画庁より当方に寄せられている情報によれば、平成８年度開発調査候補案件の内、電力・エネルギー関係案件は４件あると承知、右の内、ウムシニ、ソロン小規模地熱発電開発計画（仮称）についてはコストパフォーマンス等が良くないと考えられることもあり、当方としては水力発電開発計画（ケライⅡ）、ロンボク島石炭火力発電開発計画（仮称）、新型流れ込み式水力技術導入発展計画の３案件に関心を有しているところ、右に対する国家開発企画庁の見解を伺いたい。また、未だ正式要請が提出されていないが早期に提出願いたい旨述べた。

これに対し、先方（リチャード局長）より、現在「イ」のエネルギー開発においては資源有効利用等の観点から水力発電等に重点を置いている旨説明の上、先方としては、平成８年度案件のプライオリティとしては、第一に水力発電開発計画（ケライⅡ）、第二に新型流れ込み式水力技術導入発展計画、第三にロンボク島石炭火力発電開発計画、第四にウムシニ・ソロン小規模地熱発電開発計画を考えている旨発言があった。

引き続き当方より、新型流れ込み式水力技術導入発展計画に関しては、発電地点（ジャワインド洋側地域）と消費・需要地域（ジャカルタ周辺）が遠距離であり、送電線の整備状況が懸念される旨述べたところ、先方はジャワ島南北を結ぶ送電線

整備プロジェクトがあり、右には我が国ＯＥＣＦも参加を決定している旨述べた。
更に、当方より、ロンボク島石炭火力発電開発案件が通常の石炭火力発電に比してかなり小規模である点を指摘したところ、先方より、ロンボク島は近年観光開発が進んでおり、今後の電力需要の潜在性は大であること、発電規模が小規模である点については　本件と同規模の火力発電所（６５ＭＷ）をカリマンタンに建設した過去の例もあり、右には日本のＯＥＤＦも出資している旨及び発電方式については必ずしも石炭にこだわらない旨発言があった。
また、本案件について、発電規模が小さいことから、配電網の増強をも加えたＦ／Ｓの実施が考えられると指摘したところ、先方は当方意見に同意した。続いて本案件についての早期実施の必要性を問うたところ、本件発電所の完成は２００５年頃を予定しているので、Ｆ／Ｓの実施は必ずしも急がないとのことであった。

（２）ディポ・アラム国家開発企画庁・産業鉱業局長への表敬及び意見交換（１３日午後）

当方（長田団長）より、本件調査団の訪問目的等を説明するとともに、現在までに国家開発企画庁より当方に寄せられている情報によれば、平成８年度開発調査候補案件の内、電力・エネルギー以外の鉱工業関係案件としては、地域貿易研修センター開発計画（仮称）、東部インドネシア非石油輸出産品開発計画（仮称）、環境調和型製造工程導入計画、デザインセンター開発計画の４案件があると承知するが、右のプライオリティを伺いたい、また、「イ」側より未だ正式要請が提出されていないところ、早期提出を願いたい旨述べた。
これに対し、先方（ディポ・アラム局長）より、「イ」としては、電力関係のインフラ整備を通じて、電力・エネルギー産業（Power Industry）を発展させていきたいと考えており、また、「イ」の輸出品目を従来の石油中心からエンジニアリング関連へ今後徐々に移行させていきたいと考えていることから、電力・エネルギー関連の案件にプライオリティを置きたいと考えている旨、更に、「イ」では大理石等の鉱物産業（Mining Industry）（先方は原石から置き物等の装飾品に加工する「イ」の伝統的産業を意図していた趣）は零細であり、例えば近年の建築ブームで大理石等の需要が高いにもかかわらず、その零細性及び加工技術の低さ故にイタリアから多くを輸入している有様であるが、今後、技術力を高めて高付加価値製品を生産することにより発展する可能性があると考えており、鉱物産業関連の案件にもプライオリティを置きたいと考えている旨発言があった。
これに対し、当方より、ディポ・アラム局長の鉱物産業に関連して発言された内容はＪＩＣＡプログラムの一つである金属鉱業事業団（ＭＭＡＪ）に関連することでもあり、当方より、ＭＭＡＪの関係者に局長のお考えを伝えることとしたい旨述べるとともに、当方としては、既実施の鉱工業案件の内サポーティング・インダストリー振興計画を重視しており、今後周辺情報が整い、貴国より正式な要請があれば、開発調査からプロジェクト方式技術協力案件へ発展させることを検討したいと考えている旨発言しおいた。

（３）エンドロ・ウトモ鉱山エネルギー省・電気エネルギー総局長への表敬（１４日午前）

先方（エンドロ総局長）が長田団長と旧知の仲であったこともあり、以前両人が共に公務で調査・視察したことのあるロンボク島の近年の観光産業による発展ぶり及び最近同総局長が手がけている再生エネルギー関係のプロジェクト等につき意見交換を行い、当方の訪問目的を説明の上、今後一層、鉱山・エネルギー省とＪＩＣＡの関係を強化していくことを双方で確認し、表敬を了した。

（４）シティ・スエプラプティ協同組合中小企業省・中小企業開発課長他との意見交換（１４日午後）

当方（長田団長）より、今次調査団の訪問目的等につき説明するとともに、デザインセンター開発計画の詳細について説明を伺いたい、また、本案件に関しては実際に開発調査を実施する際に、デザインという特殊分野のコンサルタントを見つけ得るかが一つの問題となり得ると考えている旨述べた。

先方（シティ課長他）より、本件デザインセンターの関連資料（別添１）を配布の上、右資料に沿い、本センター構想の①背景（８４％の中小企業がデザインセンターを必要と考えていること等）、②目的（内外市場における中小企業の競争力を高めるために製品デザインを改善すること等）、③支援機関（工業省、教育文化省、国家開発企画庁、デザイナー協会、日本デザイン基金他）、④主要業務内容（デザイン関連情報の収集・目録作成、中小企業へのカウンセリング、訓練プログラムの実施、外国企業製品のデザイン調査等、デザインコンテスト等の実施等）、⑤組織構造に関する説明があった。

引き続き当方より、本件と同様のデザインセンターは既に「イ」国内に存在するか否か照会したところ、先方より本件が唯一のものであるとの発言があった。また、当方より本デザインセンターは、かなり大規模な計画と見受けられるが、技術協力の枠組みで行えることは専門家の派遣や開発調査、プロ技等に限られること、個人的な印象では、本件をプロ技要請するには成熟度が未だ低く時期尚早と思われ、また、開発調査対象案件としても提出越した資料のみでは不十分であると思われること等を指摘した上で、「イ」側における本件構想の進捗状況及び日本側からいかなる支援を希望するか照会した。右に対し、先方より、本センター構想の具体化に向け政府関係者等からなる理事会を既に組織済みであること（センターの建物も確保済みであったが先般火災で消失した由）、また、日本側よりいかなる支援でも歓迎するが、現段階では特に長期専門家派遣を希望している旨発言があった（既に国家開発企画庁に対しては長期専門家派遣及びプロ技を要請済みである由）。その後、当方より、技術協力の制度的枠組みにつき説明した上（先方の技術協力制度に関する理解に混乱が見受けられたため）、個人的には、本件をプロ技要請するのは時期尚早であり、現段階では長期専門家派遣、開発調査の対象案件としての可能性を探ることが得策ではないかと考える旨指摘したところ、先方は右に納得し、国家開発企画庁に対してはプロ技に代えて開発調査を要請し直す旨の（長期専門家派遣については既に要請済）発言があった。なお、先方より、仮に本件が長期専門家派遣の対象となった場合、可能であれば以前本件の短期専門家として派遣されたミトベ氏の再派遣を希望する旨述べるところがあった。

（５）フアド・リーバイ工業省次官への表敬（１５日午前）

当方（長田団長）より、今次訪問の目的を説明するとともに、工業省と商業省の合併の影響について質したところ、先方（リーバイ次官）より、歓迎の挨拶の後、両省の合併については今般突然に発表されたものであり、未だ新体制は確定していない。通常の状態に戻るまでは、今しばらく時間を要するであろう旨述べられた。

引き続き先方より、我が国が現在開発調査により協力を実施している「裾野産業育成Ｍ／Ｐ」について評価するとともに、今後プロ技等により更なる協力の拡大を期待している旨発言があった。

最後に先方より、ＪＩＣＡ及び役所としてのカウンターパートである我が国通産省との協力を拡大していきたい旨繰り返し発言がなされた。

（６）トト・スダルマスト工業省計画局長他との意見交換（１５日午前）

当方（長田団長）より、今次訪問の目的及び開発調査スキームにつきパンフレットを手交の上、説明を行った。また、裾野産業育成計画の進展について期待している旨表明した。

先方（トト局長他）より、現在実施中の技術協力案件（プロ技１件及び開発調査案件３件）について、現状説明を受けた後、来年度我が国に要望する開発調査の案

件リスト（リスト中にはセクター別を中心に約３０の案件が存在）が提示され、その内次の４案件についてその概要説明を受けた。

①林産品開発計画
②皮革産業開発計画
③無機化学産業開発計画
④環境調和型製造工程技術導入計画

これに対し当方より、①については、当調査団が直接担当する分野でないことから関係部局にその主旨を伝えること、②については我が国国内産業との関連もあり協力の可能性が小さいこと、③については④とうまく組み合わせることが可能であれば一部協力の可能性があること、⑤については今後詳細（対象業種・工場等　）について条件が整い、他国（米国等）が実施中の案件との調整がつけば、協力の可能性がある旨述べた。

先方より、我が国が過去に実施したプロ技協、特定産業分野研修センター事業を他産業にも拡大・発展させ、フェーズⅡを行いたい旨表明があったのに対し、現在、貴国とのプロ技協候補案件は少なくとも既に２件あり、例え条件が整ったとしても本件実施は相当先になろう旨コメントしおいた。

いずれの案件にせよ、国家開発企画庁を通じた正式要請書の提出が我が国が協力の可能性を検討するに当たって最低限必要であり、併せてＴＯＲの提出が必要不可欠である旨説明し、先方はこれを了した。

（７）ヨゴ・プラトモ鉱山エネルギー省・電気計画局長との意見交換（１５日午後）

当方（長田団長）より、今次訪問の目的及び開発調査のスキームにつきパンフレットを手交の上、説明を行った。また、平成８年度開発調査候補案件の内、電力・エネルギー関係案件は４件あると承知しているところ、貴局長の見解を伺いたい旨述べた。

これに対し、先方（ヨゴ局長）は、「新型流れ込み式水力技術導入発展計画」以外の３案件については、その案件内容を承知していないようであり、右１案件についてその必要性につき述べるとともに、我が国の協力を期待する旨発言があった。

これに対し、当方より、右案件については日本側も関心を有しており、右案件及び他の３案件に関し、関連資料の提出を促したところ、先方はこれを了した。

（８）デディ・プリアトナ国家開発企画庁・電力課長への結果報告（１９日午前）

当方より、鉱山エネルギー省との意見交換等を踏まえ、今次調査団としては、既出の４案件の平成８年度候補案件としての仮のプライオリティを貴局の提示したプライオリティと同様に、①水力発電開発計画（ケライⅡ）、②流れ込み式水力技術導入発展計画、③ロンボク島石炭火力発電開発計画、④小規模地熱発電開発計画とするとの意見を述べ、但し、正式な検討を行うに当たっては、正式要請書及びＴＯＲの提出が不可欠である旨述べたところ、先方は当方検討結果に満足の意を表し、重要プロジェクトの正式要請書の提出を約すとともに、非公式にＴＯＲを提供越した。

８．総合所見

（１）今次調査に関しては、来年度技術協力実施要望案件について、国家開発企画庁より、正式要請が未だ提出されていないため、非公式な入手情報を基に８つの有力候補案件を抽出し、国家開発企画庁及び関連省庁と協議を行った。なお、今次調査直前に唐突に工業省及び商業省の統合が発表され、これら２省庁は若干混乱の中にあり（工業省での情報による）、全候補案件について必ずしも十分な案件説明等はなされなかった。

（２）要請が予想された８候補案件を担当省庁別に見ると、鉱山・エネルギー省４件、

工業省１件、協同組合・中小企業省１件、商業省２件（推定）であったが、商業省関連案件２件（「地域貿易研修センター開発計画」「東部インドネシア非石油輸出産品開発計画」）は現地で商業省の担当分野であることが判明した一方、工業省・商業省統合問題等により担当部局のアポイントメントが取得困難であったこと、国家開発企画庁では当方よりこれら２案件について言及したにもかかわらず、先方より何らコメントされず、情報も得られなかったこと等により、今次調査の対象とすることはできなかった。各省別に見た候補案件に関する所見及び関連する感想等は次のとおり。

（３）（鉱山・エネルギー省関連）

鉱山・エネルギー省関連では、４発電候補案件（水力２件、火力１件、地熱１件）があり、これらについての今次調査団のプライオリティは国家開発企画庁が指摘したのと同様以下の順である。

①水力発電開発計画（Ｋｅｌａｉ－Ⅱ）
②流れ込み式水力技術導入発展計画
③ロンボク島石炭火力発電開発計画
④ウムシニ、ソロン小規模地熱発電開発計画

これらについて、「イ」側及びＪＩＣＡ専門家により、入手した情報の内特筆すべき点は次の通り。

①比較的高い需要増加への対応、既存のディーゼル発電への代替効果、周辺地域の電力系統連係による効果、水力発電所としては比較的早い運転予定等により、本案件が候補案件の内現段階では最も高いプライオリティを有する。
②本件は、未利用資源活用の点からは有力プロジェクトと考えられていたものの、立地の関係により現状では主要消費地域と隔絶されているため、その効果が危ぶまれていたところ、主要消費地域の電力系統と近年接続される見通しがつき、その実現性が増大した。
③想定される出力が小さく石炭火力に適していないのではないかという問題及び開発調査としてカバーする対象が小さいという問題が存在したが、前者については必ずしも石炭に拘泥しないこと、また、「イ」には既に同規模の石炭火力が存在していること、後者については配電網の増強をも加味したＦ／Ｓとすることが可能ということとなり、実施の必要性は高まったと考えられる。但し、完成予定時期が火力として比較的遅いところから現時点での実施必要性は比較的小さい。
④本件地熱発電所については、開発調査に要する費用及び建設費用が大きいと見込まれる反面、効果が小さいという問題が存在する。「イ」側としてはこの点は認めつつも、再生可能エネルギーとして地熱開発は推進していきたいとの方針。

全体として発電案件は開発に関する周辺状況、実施予定時期等が明確に定まっており、比較検討は十分可能。また、当然ながら関係者に開発調査スキームも十分認識されており、調査実施に特段の困難はないと考えられる。

（４）（工業省案件）

工業省との意見交換は、トト局長及び長田団長が共同議長となり、「イ」側より２０名弱の参加者を得て、会議形式で行われた。当方においては、事前に環境調和型製造工程技術導入計画のみを候補案件として検討していたが、先方よりは約３０件にも及ぶリストが提示され、その内開発調査案件については４件の案件が説明された。会議自体は活発になされ、説明された案件の一部にはＴＯＲとしてもまとめられたものがあり、先方の熱意は感じられた。

一方、個別担当部局の政策策定への欲求は強くは感じられたものの、工業省全体として又は計画局としての優先順位は検討されておらず、個別案件の全体の中での位置付けはなされていない状況にあり、リストアップされた案件の実施見込みもたっていない。ＮＥＷ　ＡＩＤ　ＰＬＡＮ策定後時日が経過し、周辺状況が変化した

こともあり、ＡＰＥＣによる２０２０年自由化の目標を考慮した新しい産業構造への展望等を再度検討し、必要な個別セクターの検討を行う必要があると考えられる。また、セクターを越えた横断的な課題を取り上げていくことの重要性も感じられた。技術協力の実施に関し、工業省は重要なカウンターパートでもあるので、今後日本人専門家等を通じてこうした案件形成努力を促進していく必要性がある。

環境調和型製造工程技術導入計画については、担当者は細部については必ずしも熟知していなかったが、今後対象業種等を明確にしたＴＯＲを提出したいと言っており、提出の暁にはできるだけ前向きに対応することが望まれる。

裾野産業育成については、先方の関心も高く、開発調査実施後プロ技協を行いたいとのことであった。

なお、工業省においては、我が国技術協力スキームへの理解、特に開発調査とプロ技協の差が余り明確には認識されていないように見受けられた。従って、個別協力スキームの説明を行い理解を得ることに努めた。

工業省と商業省との合併の話は関係者にとっても唐突であったようであり、上層部を中心にそれへの対応に追われているといった感じであり、一部混乱を生じている模様であった。

（５）（協同組合・中小企業省案件）

協同組合・中小企業省においては、先方課長及び他関係者（民間人も含む）より、デザインセンター開発計画について、その概要説明と協力依頼が熱心になされたが、構想は必ずしも詳細が明確ではなかった。

また、当方協力スキームの理解も十分ではなかった。しかしながら、本件センター設立に関する予算をすでに一部確保し、理事会も既に組織し、建物まで確保していた（過日火災により消失したとのこと）ことに加えて、更に過去に派遣した我が国短期専門家に大きな信頼を寄せており、我が国よりの協力を真摯に望んでいる点を考慮すると、何らかの形態で引き続き協力することが適当と考えられる。

当方より考えられる協力の形態を説明したところ、先方よりは長期専門家の派遣及び開発調査の実施を強く要望し、国家開発企画庁に早速にも手続きをとるとしたところ、長期専門家の派遣を軸として、正式要請書及びＴＯＲが提出された折りには開発調査の実施も前向きに検討して然るべしと考える。

（６）今次調査全体を通じて感じられたことは、①国家開発企画庁及び鉱山エネルギー省を除き、当方技術協力スキームが必ずしも十分に理解されているとは言えず、種々の機会を得てその理解を深める必要があること、②エネルギーを除く分野（工業、商業分野等）では個別の政策需要にはそれぞれの担当部局が対応しているものの、全体としてのグランド・デザインに欠けるきらいがあり、我が国派遣専門家等を通じて常時適切なアドバイスを行うことが有効と考えられること、等であった。

（７）全体として、急速に工業化が進展しつつある「イ」国事情を考慮に入れると、鉱工業分野において定期的な対話を実施することは非常に重要と考えられ、今後とも毎年プロジェクト選定確認調査団を継続して派遣することが必要と感じられた。

以　上

INDONESIA DESIGN CENTRE (IDC)

Organized by : Directorate of Small Scale Industrial Development,Directorate General of Small Enterprises Development

MINISTRY OF COOPERATIVES AND SMALL ENTERPRISES (MOCSE)

ADDRESS :JL.HR,RASUNA SAID,3-5 JAKARTA, PH/FAX: 5204384/5204389

I. BACKGROUND

- The Idea of IDC establishment started since 1975 introduced by many agengies.
- Based on survey conducted by ITB concluded that 84% of SMEs needed Design Centre to improve their product.
- To anticipate the implementation of global market required high quality of products produced.

II. OBJECTIVE:

The objective of IDC is to improve the quality of design products of SMEs in Indonesia in order to increase their competition ability in the market : domistics and export market.

III. SUPPORTING INSTITUTIONS

1. Institute of Technology Bandung (ITB)
2. Designer Association , Design Development Foundation
3. Chambers of Commers and Industry
4. Technical Ministries : Ministry of Industry and Trade, Ministry of Education and Culture, Ministry of Research and Technology, Ministry of National Development Planning/Bappenas.
5. Japan Design Foundation (JDF)

IV. MAIN PROGRAMME

1. Inventory of Design Potentials :

   a. Design potentials and their human resources

   b. Inventory of Institution involved in design develoment.

   c. Mapping of Traditional design

   d. Mapping of Industrial product export.

IV. Main Programme:

2. Design Development and Counselling:
   a. Design Services
   b. Consultation and Counselling
   c. Training Program
   d. Research and Development

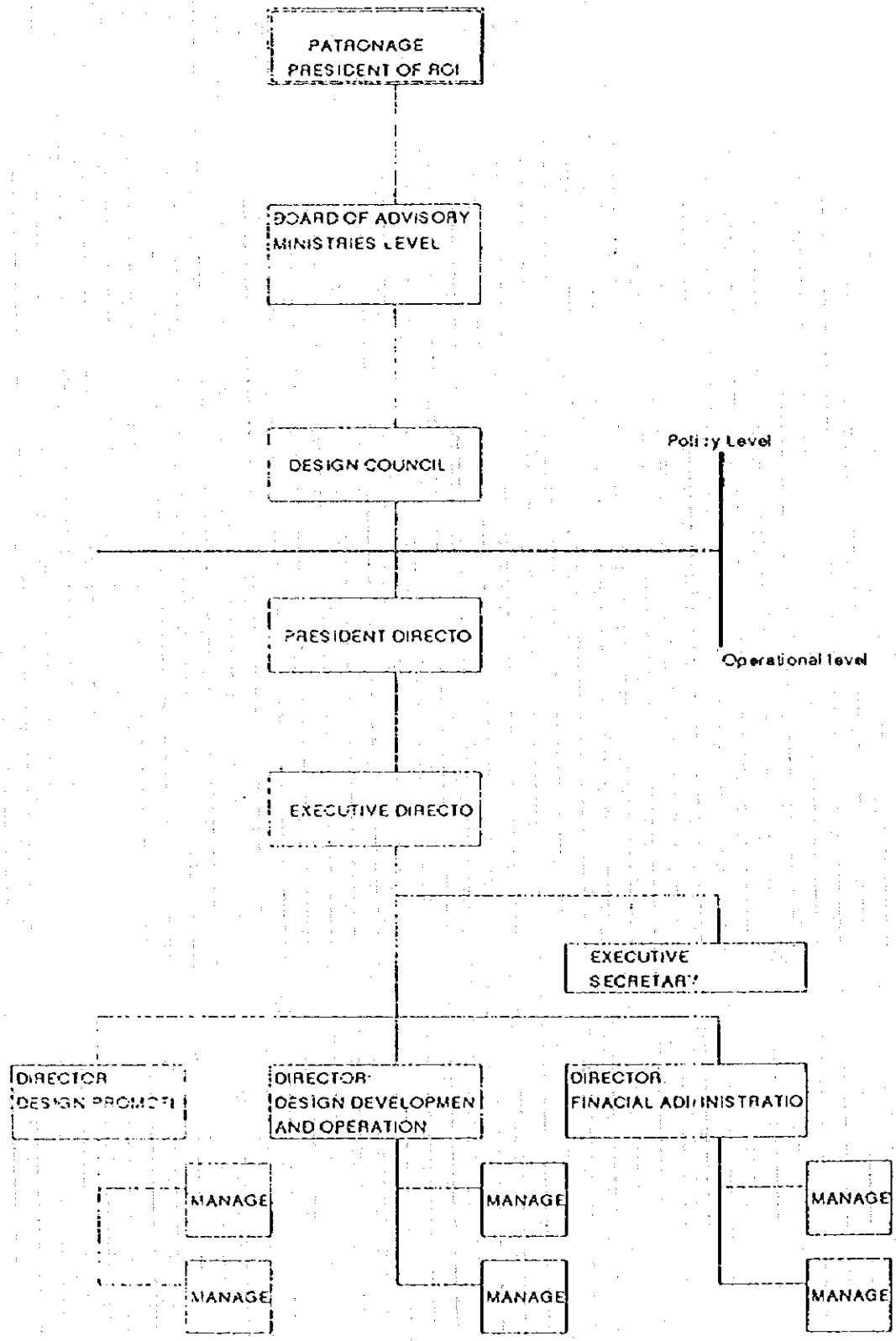
IV. Main Programme:

3. Promotion Development:
   a. Campaign Good Design
   b. Design Award and Competition
   c. Design Information

V. ORGANIZATIONAL STRUCTURE

1. PATRONAGE
2. BOARD OF ADVISORY
3. DESIGN COUNCIL: Representatives of Agencies concerned
4. EXECUTIVE DIRECTOR:
   a. Director : Design Development
   b. Director : Design Promotion
   c. Director : Financial Administration

ORANIZATIONAL STRUCTURE OF
INDONESIA DESIGN CENTRE (IDC)



II．インドネシアの電力事情

Ⅱ.インドネシアの電力事情

1．まえがき

インドネシアにおける電力供給は、インドネシア電力公社（ＰＬＮ：Perusa-haan Umun Listrik Negara）によって主に行われている。（１９９２／９３年　ＰＬＮ発電設備　１０，８５３MW）

一般家庭の電化率は、３９．０％と周辺のアセアン諸国と比較しても低い水準に留まっている。

これは、１９７０年代の財政難の時代に、発電設備への十分な投資ができなかったことが最大の原因であるが、広大な国土と多くの島々からなるインドネシアにとって、発電所を建設し、送配電網を整備するのに膨大な資金と多大な労力を要することが、その困難さに拍車をかけている。

他方、鉱工業部門をはじめとする民間セクターでは、ＰＬＮによる電力供給不足から自家用発電設備の設置を余儀なくされた。この結果、現在まで自家発電設備の割合が、ＰＬＮの電力供給を上回る状況が続いている。（１９９２／９３年　自家発電設備　１１，１５５MW）

１９９４年４月から新たにスタートした、第２次２５カ年長期開発計画（ＰＪＰⅡ）並びに第６次国家開発５カ年計画（ＲＥＰＥＬＩＴＡⅥ）では、現在のＰＬＮによる電力独占体制では開発能力、特に資金調達能力に限界のあることを明確にし、不足する電力を民間企業、民間資金によるＢＯＯ方式(Build Operate Own) の電力供給を前提とした、電力開発計画を推進しようとしている。

2．ＰＬＮの経営状況及び供給区域

ＰＬＮの１９９２／９３年における経営状況を表－１に、供給区域を図－１に示す。

表－１　ＰＬＮの経営状況

発電設備容量	（MW）１０，８５３	全資産	（１０億Ｒｐ）２４，５４４
送電線長	（ｋｍ）１７，００７	資本金	（１０億Ｒｐ）１３，０６６
変電所容量	（ＭＶＡ）２１，１３２	営業収入	（１０億Ｒｐ）　４，９１７
発受電電力量	（ＧＷｈ）４１，９５８	運用費用	（１０億Ｒｐ）　３，９９２
販売電力量	（ＧＷｈ）３４，９６４	従業員数	（人）５５，７３７
需要家数	（千人）１３，４８７		

（注）１０億Ｒｐ＝５千万円
出典：電力・エネルギー開発総局年度報　１９９２／９３

3．電力需給

１）ＰＬＮの電力需給バランス

１９９２／９３年におけるＰＬＮの設備容量は１０，８５３MWであり、これに対し最大電力は６，４１４MWである。

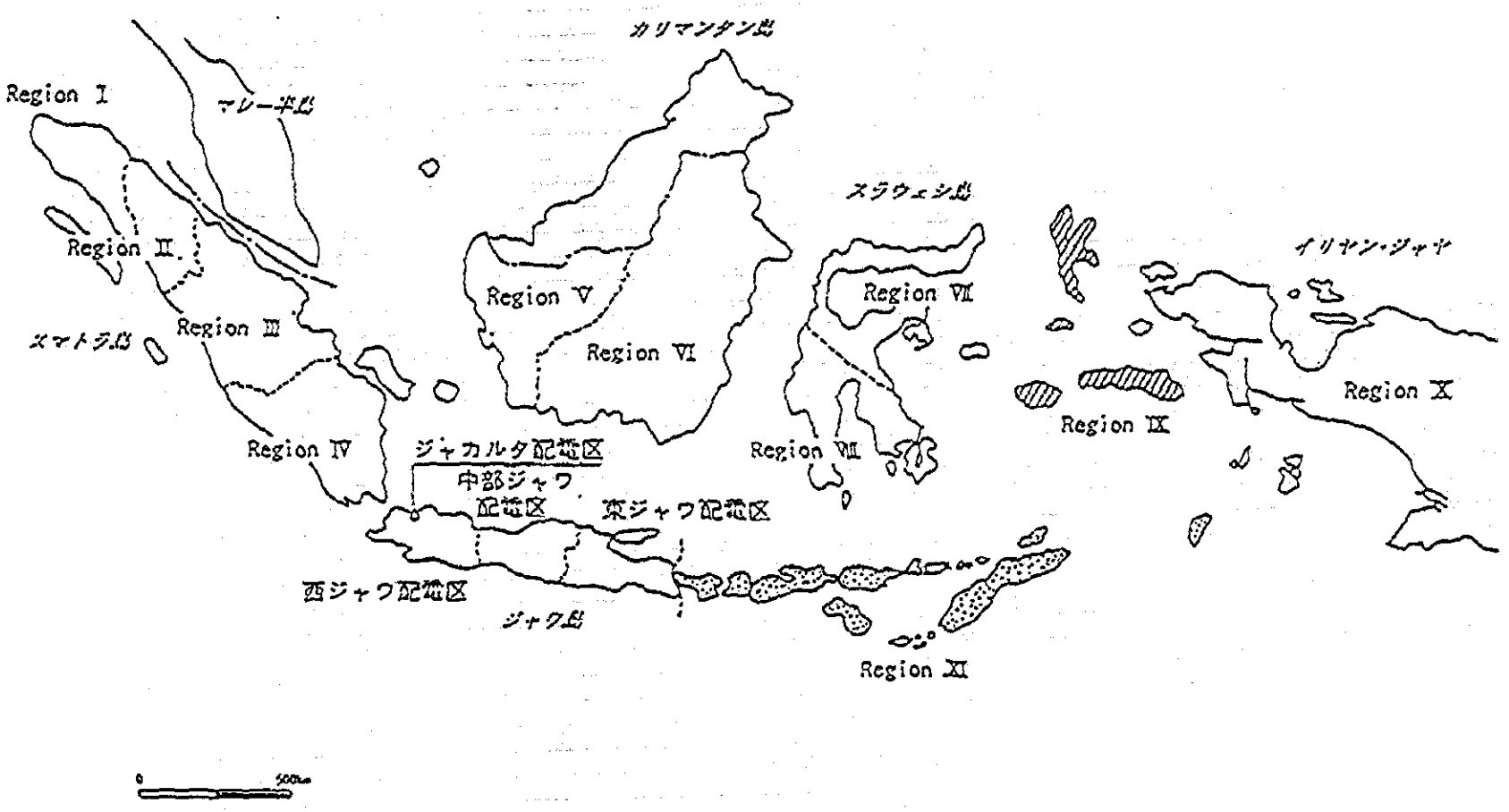
なお、ジャワ島の最大電力は、インドネシアの全体の約７４％を占めている。

インドネシアにおける電力バランスを表－２に示す。

１９９２／９３年における供給電力量は約４２０億ｋＷｈで、自家発からの購入電力量１１億ｋＷｈを含む。これに対し販売電力料は、供給電力量から所内及び送電ロスを引いた約３５０億ｋＷｈである。

電力量バランスを表－３に示す。

図－1　ＰＬＮの供給区域


カリマンタン島
Region I
マレー半島
Region II
Region III
スマトラ島
Region IV
Region V
Region VI
スラウェシ島
Region VII
Region VIII
イリヤン・ジャヤ
Region IX
Region X
ジャカルタ配電区
中部ジャワ
配電区
東ジャワ配電区
西ジャワ配電区
ジャワ島
Region XI

表－2　電力バランス（１９９２／９３）

	設備容量（MW）	最大電力（MW）	設備率（%）
全インドネシア （全　国）	１０，８５３ （１００）	６，４１４ （１００）	１．７
ジャワ　島内	７，６１０ （７０．１）	４，７２２ （７３．６）	１．６
ジャワ　島外	３，２４３ （２９．９）	１，６９２ （２６．４）	１．９

（注）設備率＝設備容量（MW）／最大電力（MW）
出典：電力・エネルギー開発総局年度報

表－３　電力量バランス（１９９２／９３）

	供給電力量（GWh）			送配電ロス	販売電力量
		発電電力量	購入電力量	（%）	（GWh）
全　国	41,958 (100)	40,900 (100)	1,085 (100)	12.4	34,964 (100)
ジャワ島内	33,901 (80.8)	32,861 (80.3)	1,040 (98.3)	——	27,837 (79.6)
ジャワ島外	8,057 (19.2)	8,040 (19.7)	18 (1.7)	——	7,127 (20.4)

出典：電力・エネルギー開発総局年度報

２）発電設備の現状

インドネシアにおいて、全国レベルで電力供給を行っているのはＰＬＮのみであるが、それ以外にアルミ精錬工場、製鉄所から大型ビル、マンションに至まで、自家用発電設備を所有する企業が相当数ある。

ＰＬＮの発電設備として、ジャワ島内に全発電設備容量の約７０％が設置されており、汽力（４６％、２４発電所）、水力（２５％、９２発電所）が主要電源である。

ジャワ島外ではディーゼル（６０％、２，９９０発電所）、ガスタービン（１７％１９発電所）が主要電源である。

即ち、ジャワ島内では電力需要が大きく、電力系統も比較的整備されていることから、大型で経済性の高い汽力、水力発電所が設置されており、ジャワ島外では需要が小さくしかも分散されているため、ほとんど電力系統が構成されておらず、小容量のディーゼル、ガスタービン発電所が設置されているという現状にある。

インドネシアの発電設備を表－４に示す。

３）電力需要の現状

ＰＬＮの１９９２／９３年の全販売電力量は３５０億ｋＷｈであり、用途別に見ると、工業用５１％、住宅用３３％、商業用９％、公共用７％となっており、工業用、住宅用で全体の８５％を占めている。

地域別で見ると、全販売電力量の約８０％をジャワ島が占めており、ジャワ島内で

は工業用の比率が高くなっている。
ＰＬＮの販売電力量を表－５に示す。

表－４　インドネシアの発電設備　（１９９３．３現在）

ＰＬＮの発電設備（MW）

	汽　力	水　力	ディーゼル	コンバインド	ガスタービン	地　熱	合　計
全　　国	3,940 (36.3)	2,178 (20.1)	2,060 (19.0)	1,312 (12.1)	1,223 (11.3)	140 (1.3)	10,853 (100)
ジャワ島内	3,500 (46.0)	1,879 (24.7)	113 (1.5)	1,312 (17.2)	667 (8.8)	140 (1.8)	7,610 (100)
ジャワ島外	440 (13.6)	300 (9.3)	1,947 (60.0)	0 (0.0)	556 (17.1)	0 (0.0)	3,243 (100)

NON-ＰＬＮ（民間セクター）の発電設備（MW）

	汽　力	水　力	ディーゼル	ガスタービン	地　熱	木　材	合　計
全　　国	1,224 (11.0)	1,276 (11.4)	6,772 (60.7)	1,511 (13.5)	0 (0.0)	373 (3.3)	11,155 (100)
ジャワ島内	923 (18.0)	197 (3.9)	3,969 (77.6)	4 (0.1)	0 (0.0)	22 (0.4)	5,115 (100)
ジャワ島外	301 (5.0)	1,079 (17.9)	2,803 (46.4)	1,507 (24.9)	0 (0.0)	351 (5.8)	6,041 (100)

政府管理下のNON-ＰＬＮの発電設備（MW）

	汽　力	水　力	ディーゼル	ガスタービン	地　熱	木　材	合　計
全　　国	151 (2.5)	880 (14.8)	3,269 (55.0)	1,433 (24.1)	0 (0.0)	214 (3.6)	5,947 (100)
ジャワ島内	0 (0.0)	197 (8.6)	1,533 (66.6)	554 (24.1)	0 (0.0)	18 (0.7)	2,302 (100)
ジャワ島外	151 (4.1)	684 (18.8)	1,736 (47.6)	879 (24.1)	0 (0.0)	196 (5.4)	3,646 (100)

ＰＬＮの発電所数

	汽　力	水　力	ディーゼル	コンバインド	ガスタービン	地　熱	合　計
全　　国	34	149	3,126	12	45	3	3,369
ジャワ島内	24	92	136	12	26	3	293
ジャワ島外	10	57	2,990	0	19	0	3,076

表－５　ＰＬＮの販売電力量（ＧＷｈ）

	住宅用	商業用	工業用	公共用	合　計
全　　国	11,671	3,185	17,755	2,353	34,964
	(33.4)	(9.1)	(50.8)	(6.7)	(100)
ジャワ島内	8,574	2,471	15,089	1,704	27,837
	(30.8)	(8.9)	(54.2)	(6.1)	(100)
ジャワ島外	3,097	715	2,666	649	7,127
	(43.5)	(10.0)	(37.4)	(9.1)	(100)

出典：電力・エネルギー開発総局年度報

４）流通設備の現状

インドネシアの電力系統は１１系統あるが、大規模なものはジャワ島内の１系統のみで、他の１０系統は極めて小規模である。ジャワ島外の内訳はスマトラ島の系統、カリマンタン島・スラウェシ島の各２系統、アンボン島・イリヤンジャヤ島の各１系統となっている。

ＰＬＮの送電、変電、配電設備を表－６に，ジャワ島の送電系統を図－２に示す。

表－６　ＰＬＮの送電、変電、配電設備（１９９２／９３）

送電線回線延長 (km) [500kV 再計]	変電所容量 (MVA)	配電線回線延長 (km) [低圧100 ～400V]	配電用変圧器容量 (MVA)
17,007 [1,143]	21,132	242,175 [141,138]	14,737

４．開発計画

１９９４年４月からスタートした第２次２５カ年長期開発計画並びに第６次国家開発５カ年計画の概要は以下のとおりである。

１）第２次２５カ年計画（ＰＪＰ　Ⅱ）

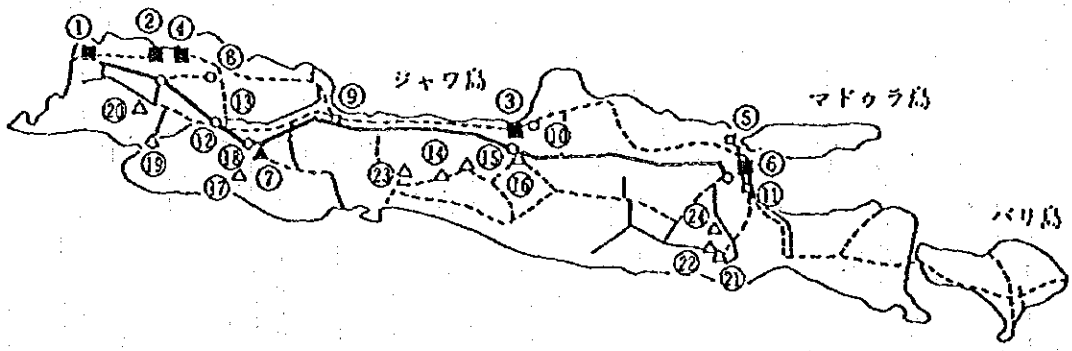
ＰＪＰⅡは脱石油化政策の推進、安定した電力供給等の従来の政策を基調としていが、次の２点に際立った特徴がある。

① 原子力発電所の建設について言及している。

② 急速な電力需要の増加に対し、ＰＬＮ及びその他の政府機関のみによる電力供給

図－2　ジャワ島の送電系統（１９９２年３月末現在）

発　電　所	設備容量	発　電　所	設備容量	発　電　所	設備容量
① Suralaya	1,600.0MW	⑨ Sunyaragi	84.0MW	⑰ Lamajan	19.2MW
② Muara Karang	700.0MW	⑩ Pandean Lampur	61.8MW	⑱ Cikalong	19.2MW
③ Semang	300.0MW	⑪ Ujung Pandang	44.4MW	⑲ Ubrung	17.1MW
④ Tanjung Priok	100.0MW	⑫ Sagulia	700.0MW	⑳ Kracak	16.6MW
⑤ Gresik	600.0MW	⑬ Cirata	500.0MW	㉑ Suteni	105.0MW
⑥ Perak	150.0MW	⑭ Mrica	184.5MW	㉒ Wlingi	54.0MW
⑦ Kamojang	140.0MW	⑮ Garung	26.4MW	㉓ Sengguruh	29.0MW
⑧ Pulo Gadung	142.0MW	⑯ Jelok	20.5MW	㉔ Mendalin	23.2MW



■ 火力発電所　　o 500kV変電所
▲ 地熱発電所　　—— 500kV送電線
△ 水力発電所　　---- 150kV送電線
□ ガスタービン　　—— 70kV送電線

〔出所〕 PLN資料より作成.

では十分でないことを公式に認め、民間セクター参入の必要性を強調している。
ＰＪＰⅡにおけるエネルギー政策を要約すると以下のとおりである。

① 国内に賦存するエネルギー開発のため調査、探査の強化。
② 石油への依存度の低減。
③ 省エネルギー対策の推進とエネルギーの合理的利用。
④ エネルギー源の多様化と適性配分。

2）第6次5カ年計画（ＲＥＰＥＬＩＴＡ　Ⅵ）

（1）開発政策

ＲＥＰＥＬＩＴＡⅥの開発政策は、ＰＪＰⅡの基本政策に基づき以下のような項目に要約される。

① 資源調査、探査の強化

開発需要に見合ったエネルギーを安定的に供給するためには、国内に賦存するエネルギー開発のための調査、探査をこれまで以上に推進していく必要がある。

② 石油依存度の低減と石炭の開発、利用の促進

埋蔵量に限りのある石油を、可能な限り長期にわたり有効に利用するためには石油に代わる1次エネルギーとして、豊富な埋蔵量を有する石炭資源の利用拡大を図らなければならない。石炭の開発と利用は、環境への影響を十分に配慮し進めなければならない。

③ 省エネルギー対策の推進

当該期間中のエネルギー需要の増大に対し、新たなエネルギー源の開発と併せ省エネルギー対策を推進する必要がある。

④ エネルギー源の多様化

上記②項の石油への依存度の低減（脱石油化）を推進するためには、天然ガス石炭の利用拡大を図るとともに、再生可能なエネルギーである水力、太陽光、風力、バイオマス、海洋エネルギー等の利用も推進しなければならない。

大規模エネルギー供給源である原子力発電については、環境への影響、安全性廃棄物処理方法等について十分検討した上で、原子力発電所受入れへの、社会的環境の整備に努める。

⑤ 発電所建設への民間セクターの参入促進

急増する電力需要に対応するためには、ＰＬＮの独占体制による事業展開には限界があり、民間セクターにも参入の機会を与えるための制度改革が必要である

⑥ 電気事業経営の効率化

エネルギー全体の管理の合理化、一般消費者へのサービスの向上を図るため、エネルギー関連組織の再構築化を推進する必要がある。具体的にはＰＬＮの分権化を進め、民間を含めた電力事業者との全国的な競合関係から、電気事業経営の効率化を推進する。

⑦ 地方電化

地域間格差の是正、僻地の住民の福祉の向上を目的として、地方（農村）電化をさらに推進する。地方電化プログラムの計画、実施、管理は徐々にＰＬＮから協同組合省に移管する。

（2）電力需要予測

ＲＥＰＥＬＩＴＡⅥ期間中の電力需要は７１，５００ＧＷｈ（１９９４／９５）から１１５，３００ＧＷｈ（１９９８／９９）まで年率約１０％の割合で増加していくものと予測している。

計画期間中の電力需要予測を表－７に示す。

表－7　REPELITA　VI期間中の電力需要予測（千GWh）

	1994/95	1995/96	1996/97	1997/98	1998/99
工業用	48.6	54.5	61.7	70.0	77.8
運輸用	7.4	8.5	9.6	10.9	12.5
家庭、商業用	15.5	17.6	19.9	22.4	25.0
合　計	71.5	80.6	91.2	103.3	115.3

（3）施設拡張計画

前記の電力需要予測に基づき、ＰＬＮは当該期間中に９，５２２ＭＷの発電所、１０，５４８ｋｍの送電線、１３３，３１７ｋｍの中電圧配電線、１９６，７４１ｋｍの低電圧配電線等の建設を予定している。

さらに発電所の建設については、ＰＬＮとは別に民間セクターの資金により、２，４９５ＭＷの石炭火力発電所を中心とする建設を計画しており、民間セクターによる発電所の電力はＰＬＮに売電されることになる。

施設拡張計画の概要を表－８（１）～（３）に示す。

表－８（１）　ＰＬＮによる発電設備拡張計画（MW）

	1994/95	1995/96	1996/97	1997/98	1998/99	合　計
水　力	－	13	－	666	213	892
石炭　火力	465	－	1,365	765	－	2,660
ガス　火力	776	1,670	206	412	280	3,344
地　熱	55	3	130	167.4	－	355.4
ガスタービン	154	260	895	340	100	1,749
ディーゼル	78.9	65.6	112.1	74	73.5	404.1
小水力	10	10.1	11.7	9.3	14.5	55.6
その他	－	--	62.4	－	－	62.4
合　計	1,538.9	2,021.7	2,782.2	2,433.7	746	9,522.5

表－8（2） 送電線建設計画（km）

	1994/95	1995/96	1996/97	1997/98	1998/99	合 計
500 KV	100	829	233	124	390	1,666
275 KV	－	－	140	－	－	140
150 KV	1,754	1,509	1,638	1,657	2,150	8,708
70 KV	12	－	10	12	－	34
合 計	1,866	2,338	2,011	1,793	2,540	10,548

表－8（3） 配電線建設計画（km）

	1994/95	1995/96	1996/97	1997/98	1998/99	合 計
中圧(km)	26,338	32,980	22,298	25,220	26,481	133,317
低圧(km)	40,687	49,125	32,340	36,336	38,253	196,741
変圧器(MVA)	4,598	5,515	3,545	3,983	4,183	21,824

3）第6次5カ年計画（REPELITA　VI）の見直し・第7次5カ年計画（REPELITA　VII）

修正版

「イ」の国家開発企画庁は、REPELITAVI　及びREPELITAVIIの検討を行い、近く発表することとしている。

その概要を表－9に示す。

表－9　REPELITA　VI　dan　VII

	REPELITA　VI		REPELITA　VII	
	PLN	Swasta（IPP）	PLN	Swasta（IPP）
PLTA（水力）	821	－	3，392	－
PLTU（石炭火力）	2，595	1，630	1，375	4，250
PLTGU（ガス火力）	3，139	1，098	66	66
PLTP（地熱）	353	135	58	895
PLTG（ガスタービン）	1，261	－	160	－
PLTD（ディーゼル）	420	－	10	120
PLTM（その他）	123	－	83	－
TOTAL	8，712	2，863	5，061	5，061

（注）Swasta（IPP）：独立系発電事業

III 、收集資料

Code Number : INA - 232

Project Title	:	FEASIBILITY STUDY FOR LOMBOK BASED THERMAL POWER PLANT
Location	:	Lombok Island, West Nusa Tenggara
Executing Agency	:	State Electricity Corporation (PLN) Directorate General for-Electric Power and New Energy, Ministry of Mines and Energy
Objectives	:	To investigate the most technical and economical justification of construction a based thermal power plant in Lombok Island.
Project Description	:	Study required to carried out the justification of constructing a based thermal power plant.

Scope of Assistance Requested :

a). Expert services	:	mm	= US $	1.100.000
b). Fellowship	:	mm	= US $	50.000
c). Equipment	:		= US $	50.000
d). Field Investigation	:		US $	550.000
		Total cost	= US $	1.750.000

Related to Project Aid :

TERM OF REFERENCE

FEASIBILITY STUDY FOR LOMBOK BASE THERMAL POWER PLANT

E T A -

SPONSORED BY

MINISTRY OF MINES AND ENERGY
DIRECTORAT GENERAL OF ELECTRIC AND ENERGY DEVELLOPMENT
PERUSAHAAN UMUM LISTRIK NEGARA (PLN)

TERMS OF REFERENCE
FEASIBILITY STUDY FOR LOMBOK
BASE THERMAL POWER PLANT

1. BACKGROUND

Over the last decade, Indonesia has experienced rapid economic growth. On a short term the economy will be affected by the recent decline in the world oil price, while in the long term, increase in domestic consumptions could reduce the surplus of oil available for export.

High priority is therefore given to a subtitution process aiming at a reduced use of oil products by means of power generation in hydro electric and/or coal/peat fired steam power plants.

In line with the energy policy of the Government of Indonesia the principle goals of the power sector represented by PLN consist of an adequate and reliable satisfaction of the growing power demand by construction of based thermal power plants.

According to the Energy and Load Demand Forecast of Region XI, prepared by Electricity Demand Research Division (DKL) of PLN, the estimated maximum demand of the service territory of PLN on Lombok Island is about 89 MW in 2005. The existing power generating facilities owned by PLN are almost entirely diesel generators having a total installed capacity of less than 20 MW, and most of the generating plants are aged. In view of this situation, PLN is planning to install new diesel generating plants. However, the fuel for diesel generators is expensive as it needs to be transported to Lombok Island from Sumatra Island and other areas. On the other hand, one of the priority policies of the Government of Indonesia is less dependence on oil, or a non-oil policy, and another government policy is to satisfy energy demands of a region, utilizing locally available energy resources.

To meet such increasing load demand, PLN is intending to implement Feasibility Study on Lombok Base Thermal Power Plant.

2. OBJECTIVE OF THE STUDY

2.1. A Feasibility Study will be carried out with the following objectives :

(1) To review existing studies on the development of the area.

(2) To review a long range load forecast of the area.

(3) To determine the type of Based Thermal, that will be used in the power plant. The combined cycle has also to be considered as an alternative of development.

(4) To select a suitable site for a Based Thermal Power Plant in Lombok based on the PLN's site study.

(5) To determine the phasing of the development of such thermal power plant and the timing, the unit size of which shall also be determined according to the least cost development.

(6) To establish capital, operating and maintenance cost, to test their sensitivity to changes in basic parameters and to provide an economic and financial justification for the project.

(7) To prepare a feasibility grade design of the lay-out for the proposed plant, transmission and substation; to prepare detailed investment cost estimates and to establish an appropriate implementation schedule.

(8) To carry out economic and financial studies to ascertain the capital and annual investment requirements for the scheme, the cost of electricity production based on these requirements and the sensitivity of these to change in the main parameters.

(9) To provide the Terms of Reference for Engineering/Detail design of the Project and its implementation program.

2.2. Experts

For this project the assigned experts shall meet the following qualifications :

Experts	Experience	Class
Project Director	15 years or more	A
Team Leader	10 Years or more	A
Geodetic Engineer	10 Years or more	B
Civil Engineer	10 years or more	B
Geologist	10 years or more	B
Economist	10 years or more	B
Mechanical Engineer	10 years or more	B
Electrical Engineer	10 years or more	B
Cost Estimator	10 years or more	B
Environmentalist	10 years or more	B

2.3. Reports

The Consultant shall prepare the following reports:

1. Monthly report (10 copies)
2. Inception report after site visit (10 copies)
3. Interim report (20 copies)
4. Draft Final Report (20 copies).
5. Final Report (30 copies)

2.4. Time Schedule

The time schedule shall be made in the form of a bar chart containing data on survey, implementation study, field investigatin up to submission of final reports. Time schedule shall include : Working schedule and manning schedule.

2.5. Completion of Works

The study is expected to be completed within 18(eighteen) months after its commencement.

3. METHOD OF IMPLEMENTING THE STUDY

The Study will be conducted by Consultant selected and approved by the Government o Indonesia/PLN and the institution which provided the fund.

The Consultant has to prepare draft Inception Report(s) after reviewing existing data/reports and preliminary site visit; draft Interim report(s) after the field study/investigation. The consultation will be held between PLN and the Consultant to review the findings of the Consultant. On the completion of the study, the Consultant shall submit draft final report(s) to be discussed with PLN and then Final Report together with suitable appendixes to illustrate fully the engineering viability, preliminary design and economic/ financial justification of the recommended scheme.

4. SCOPE OF THE SERVICES

The Consultant shall perform a study comprising among others:

1. Preparation for and conducting of site surveys and field investigation, the results of which will be assembled and commented upon in an interim report.

2. Feasibility grade design and cost estimate for the optimal plant lay-out comprising the Project.

3. Economic & financial, type of fuel and comparison studies taking into consideration the long range expansion programe of the Lombok System.

The services to be performed by the Consultant shall include but not necessarily be limited to the following items :

4.1. Physical Survey of the Sites

Survey as necessarily for feasibility grade design and cost estimates of the Project, among others :

1. Topographical data collection and review.
2. Geological and hydrogeological data collection and review.

3. Review of construction materials, their availability and quality.
4. Hydrographic data collection and review.
5. Social and environmental consequences of project development and recommendation on the measures for their protection if that should be necessary.
6. Construction costs including land acquisition, site access, etc
7. Land and marine transportation (unloading methods) for delivery of fuel, equipment and construction materials
8. Cooling water
9. Supply of fresh water (feedwater)
10. Meteorology on land and sea (wind, tide, surface of water, etc)
11. Additional field investigation.

4.2. Feasibility Grade Design

With careful evaluation and analysis of the data obtained from the field investigations, the Consultant shall prepare the optimum plan or alternative plans, including the following :

1. The technical design and drawings of all elements of the project
2. Justification of the technical arrangement adopted
3. Detailed costs estimates, including cash flows in local and foreign currencies
4. Construction schedules for implementation
5. Project output studies, installed and firm capacity and relation/connection to existing and future systems

4.3. Economic, Financial and Comparison Studies

1. This economic study shall evaluate the Project considering the long range development programe of the power sector
2. The study shall be based on the present worth comparison of different alternatives for a reasonable range of discount rates
3. Sensitivity studies shall test effects of changes in construction periods, fuel costs, interest rates, etc.

Description shall also be made on the advantages, disadvantages and risk for each of the alternatives.

All the definitions and comparisons of the obvious alternative optimal plan shall have to be accurate enough to allow a decision on the priority of the recommended optimal compared to other project that are being planned.

4.4 Transfer of Knowledge

The Consultant shall carry out transfer of knowledge and technology to PLN's Counterparts during the implementation of the study. The consultant should provide in the feasibility study report the TOR of the engineering design stage.

CODE NUMBER

1. Project Title : Feasibility Study For Development Kelai-2 Hydro Electric Power.

2. Location : East Kalimantan

3. Executing Agency : Perusahaan Umum Listrik Negara (PLN) Directorate General for Electric Power and New Energy, Ministry of Mines and Energy.

4. Obyectives : To cope with the increasing power demand in East Kalimantan & South Kalimantan province.

5. Project Description :Pre Feasibility Study was done by PT.Wiratman

6. Scope of Assistance :

Requested :

a). Expert sevices	:	=	US$	1,700,000
b). Field Investigation	:		= US$	800,000
c). Training	:		= US$	100,000
Total	:		US$	2,600,000

7. Related to Project Aid :

TERMS OF REFERENCE
FEASIBILITY STUDY ON THE DEVELOPMENT OF KELAI - 2 HYDRO ELECTRIC POWER PROJECT

E T A

SPONSORED BY

MINISTRY OF MINES AND ENERGY
DIRECTORAT GENERAL OF ELECTRIC AND NEW ENERGY
PERUSAHAAN UMUM LISTRIK NEGARA (PLN)

1. BACKGROUND AND SUPPORTING INFORMATION

1.1. Justification of the Project

At present, a large part of nations electric power supply depends on thermal and diesel power plants. Due to the limited natural resources of oil preventing environmental deterioration caused by oil burning also, the development of hydro plant in Indonesia is strongly required the Sadang river which is located in the East Kalimantan Province.

Power demand in the East Kalimantan province is Region VI where the Kelai HEP project is increasing at the rate more than 10 % per year from 1982/1983 to 1984/1985.

In order to meet increasing power demand in this province, several power development project are under study. Comparing with such project, Kelai project can enjoy its superiority in the meaning of cheaper power supply cost in large scale, being supported by advantageous site characteristics.

1.2. Project Name and Scope of Works.

Name of Project : KELAI-2 HYDRO ELECTRIC DEVELOPMENT PROJECT.

Scope of work :

The services shall perform the study comprising among others :

1. Review and analysis of previous studies and evaluation of the present situation of the power system, if available.
2. Field/site survey and investigation
3. System study
4. Economic and financial justification of the project.

The services to be performed will included but not necessary be limited to the followings items :

1.2.1. Review and analysis of existing relevant data and report available and information.

1.2.2. Preparation of topographic map.

a. Topografical mapping.
b. Dam intake, power station, waterway sites and other major appurtenant structure scale : 1/1,000 at 0.5 m contour interval
c. Reservoir area scale : 1/5,000 at 2.5 m contour interval.

1.2.3. Topographic survey

a. Triangulation network survey
b. Levelling survey and setting of bench marks
c. Ground control survey for photogrammetric mapping
d. Detailed topographic survey for the sites of major permanent structures and constructions facilities

1.2.4. Hydrological and meteorological survey

a. Installation of river water level, rainfall gauging stations, pan evaporation and discharge measurement
b. Analysis of hydrological characteristics of the river
c. Measurement of sedimentation

1.2.5. Physical and chemical test of river water

1.2.6. Geological survey

a. Geological exploration of the dam site and other major structures such as power stations site etc.
b. Seismic exploration of the dam site and other major structures such as penstock line and quarry site etc. c. Test boring exploration of the dam and powerhouse foundation and site of major structures and quarry site including permeability and grout test.
d. Data collection of historical seismicity.
e. Test pitting for the borrow area.

f. Investigation of the quarry site and borrow area for rock and concrete aggregate and core material.
g. Physical test and analysis for the construction material.

1.2.7. Comparative study on the alternative layout or site of major permanent structures according to the topographic and geological survey results and finalization ot them.

1.2.8. Investigation and study of the substation and transmission line route.

1.2.9. Investigation and study of the transportation system and acces road for the construction use.

1.2.10. Power market survey and power developmemt planning :

a. Review and analysis of relevant information on growth of power consumption, forecast of power demand and characteristics of power consumption patterns, etc.
b. Review and analysis of the present and future programmed power system.

1.2.11. Formulation of optimum plan.

a. Assessment of the peak load demand and energy require ment for each region
b. To Study of Hydro Power Development Plant.
c. Optimization studies to determine the site of the project.
d. To carry out plant factor optimization in order to obtain the optimum installed capacity.

1.2.12. Investigation and assessment of irrigation and/or flood control benefits obtained from the regulated outflow, if any

1.2.13. Preliminary design of all components of the project

1.2.14. Study on the layout and capacity of temporary and prepatory facilities

1.2.15. Assessment on construction inputs such as labour, materials and equipment.

1.2.16. Preparation of general plan for construction and operation of the project.

1.2.17. Investigation of the house, road, land and rights to be compensated in the project area, and recommendation for compensation thereof

1.2.18. Environmental impact assessment including land resumption and resettlement.

1.2.19. Preparation of feasibility level estimate of all costs for construction, operation and maintenance of the project.

1.2.20. Assessment of the economic and financial feasibility of the project.

a. This economic study shall evaluate the project considering the least cost development plan.
b. To carry out sensitivity analysis, this study shall test effect of change in capital cost, fuel price, interest rate, etc.
c. To carry out cash flow analysis.

1.2.21. Besides the above mentioned, the engineer will also prepare the following :

a. The Project Implementation Program (IP)

The implementation program for the design and construction of the project be presented in bar-chart from and be specified accordingly the various activities. For the design stage and construction stage be separated.

b. The Project Cost Estimation

This shall be prepared as follows :

Be itemize or specified into the various project components: the civil works, electromechanical works, transmission line, substation all the preparatory works and also to include the Engineering Services cost for the design and

for the construction supervision.

- Be specified into the foreign currency and local currency portions and the total equivalent in US Dollar.

- To include the physical contingency and price escalation over the whole construction period.

  (The project cost estimate consists of : the base price + the physical constingencies + price escalation).

c. The Engineering Services (The Term of Reference and Cost)

For both, the project design (design stage) and for the construction supervision (construction stage).

- Prepare the terms of reference for the Engineering Services.

- Based on the project implementation schedule, expressed in bar-chart and state the home office and field office M/M and the total trips.

- Based on the above manning schedule including trips prepare the engineering services cost in the foreign and Rp./local currency.

  The total cost specified into the remuneration and direct cost.

2. OBJECTIVES OF THE PROJECT

2.1. Immediately Objectives

a. To provide the project area with electric power which forms a basis for a development of the area.
b. To protect the downstream area from habitual inundation.
c. To improve the social infrastructure in the area.
d. To upgrade the living standard of the people in East Kalimantan Province.

2.2. Long-term Objectives

a. To contribute to the comprehensive regional development of Province.
b. To promote the development of agriculture and industry.
c. To contribute to the non-oil policy of the government.

3. PLAN OF OPERATION

3.1. Activity Step

Kelai-2 Feasibility Study shall cover the following activity :

3.1.1. "Preliminary Investigation" shall be carried out for site reconnaissance, data collection, planning of investigation work and preliminary survey work.

3.1.2. "Detailed field investigation" shall be made on the optimum dam site according to the preliminary investigation.

3.1.3. "Feasibility design" shall be made according to the detailed field investigation.

3.1.4. "Inception report" shall be submitted after preliminary investigation.

3.1.5. "Interim report" summarizing the studies done the stage of preliminary investigation, shall be submitted after the complection preliminary investigation.

3.1.6. "Draft final report" shall be made according to the Feasibility design.

3.1.7. "Explanation and coordination of draft final report" shall be made in Indonesia or making consensus between both parties.

3.1.8. "Final report" shall be submitted to Government of Indonesia after reviewing the draft final report.

3.1.9. "Training in Consultant's Home Office" shall be carried out for comparing the technics of site investigation, feasibility design etc. to a number at PLN staff for the period of two months.

3.2. Time Schedule of Study

The time schedule shall be made in the form a bar chart containing data on survey, implementation study, field investigation up to submission of final reports. Time schedule shall include : working schedule and manning schedule.The study shall be completed within 18 months.

3.3. Computer Program

In order to follow the design carried out by the consultant. PLN wishes to receive once of the study starts a more complete description of the computer program as well as users mannual which have been utilized in this study.

3.4. Reporting and Technical Specification

The following report and tender document of site investigationwill be prepared in English and submitted to PLN within time periode indicated below.

- Inception Report and Tender document of site investigation

  The inception report (15 copies) and Tender document of site investigation(10 copies) not letter than 1.5 months after the starting date.

- Monthly Progress Report

  Monthly progress report (10 copies) covering the field and office studies of the Feasibility Study not letter than 2 weeks in the preceeding months.

- Interim Report

  The interim report (15 copies) sumerizing the studies at the stage of Detail Site Investigation especially concerning the proposal of a selected site for the project, within 2 months after the completion of the Detail Site investigation.

- Draft Final Report

  The draft final report (15 copies) and implementation program (15 copies) within 6 months after the completion of the Detail field investigation. This report shall summarize all work perform, findings and recommendation for the engineering study and provide maps, plans and diagram of the proposed project.

- Final Report

  The final report (30 copies) and implementation program (15 copies) within 2 months after finish of discussion and amendement of the draft final report.

3.5. Expertise requirement

a. Team Leader : Hydropower engineer with at least 15 years experience in planning and implementing hydropower development and related works.

b. Geologist with experience in investigation for dam, tunnel, power house and other structures of the hydropower station.

c. Civil engineers (field survey and home office in planning, designing and implementing the hydrological station and related works.

d. Hydrologist with experience in hydrological analysis, water forecast, and sediment balance study on rivers.

e. Electric engineers with experience in electric demand forecast and designing and implementing transmission construction.

f. Economic and financial analysis with experience in evaluating hydropower development projects.

g. Geodetic engineers with experience in planing and implementing topografical mapping.

h. Geophysicist with experience in seismic survey.

i. Environmental expert which has experience in planning hydro power plant.

4. TRANSFER OF KNOWLEDSGE

The Consultant shall carry out transfer of knowledge and technology to PLN's Counterparts during the Feasibility Study Stage.

TECHNICAL COOPERATION BY THE GOVERNMENT OF JAPAN

APPLICATION

By the Government of the Republic of Indonesia for a study on the Master Plan for Electric Power Sector to the Government of Japan

1. Name of Project

"Project for Technology Introduction and Development of Advanced Run-off-River Power Station (on the Indian Ocean Side of Java)"

2. Executing Organ

Directorate General of Electricity and Energy Development, Ministry of Mines and Energy.

3. Background of the Plan

The Government of the Republic of Indonesia produced its 2nd, 25-year Plan and the 6th, 5-year Plan in 1994.

Taking this opportunity and in response to sharply increasing power demands, it was also determined to strongly promote power development including hydro electric, geothermal, coal-fired and gas combined cycle power plants to supply power to the local area as well as to the cities.

It is planned to raise the electrification ratio (household basis) from the present 39% to 60% in 1998. The goal is 70% in 2003. This improvement of

the electrification ratio is extremely important since the gap between the cities and local areas in both the supply of electricity and in living standards are widening rapidly.

In this situation, the best measure to achieve the goal described above is, naturally, to utilize the hydro resources existing throughout the country. Using the natural resources available, the expansion of the electrified area and a reinforced power supply to the cities could be achieved by the deployment of more than 1,000 non-reservoir type, low cost hydro power stations. Such natural resources will not be depleted after their use non create a problem to the environment.

Of all the other power development projects in the 2nd. 25-year Plan and the 6th. 5-year Plan, such hydro power development is naturally placed as the first priority. Assuming a development of approx. 10,000MW over a specified period, the resultant energy would be equivalent to approx. 1 billion tons of petroleum production. The supply of this so-called 'clean energy' would also contribute not only toward correcting the problem of air pollution in Indonesia, but would also serve to provide countermeasures against global warming.

This project was planned based on this diversified background.

4. Purposes of the Plan

There are four types of hydro power generation system; the run-off-river type, the pondage type, the reservoir type and the pumped storage type. Following the independence of Indonesia, the hydro power stations promoted here are mainly large scale reservoir type power stations such as Saguling and Cirata. Although this type of power station provides a large output at

a low cost, major problem in some areas have been encountered recently including large scale residential transfer and the less of large farms.

In comparison, although their scale ranges from medium to small or micro, run-off-river power stations require no reservoirs and thereby provide no environmental problems. A larger head provides a larger output and the electricity is acquired at a low cost. Also, of all four types, the run-off-river power station presents the shortest construction period. It is also suitable for supply when the demand/supply balance is tight.

There are many potential sites for a run-off-river type power station at the upstream and midstream of the steep rivers (hereinafter called 'the area') in the mountains of Java, Sumatra, Kalimantan, Sulawesi and so forth. The utilization of this resource is suitable for the expansion of an electricity supply network. In this case, however, special technologies are required for site selection, planning, design and construction. These technologies advance quickly and the appropriate technology is required for low cost performance.

Therefore, the introduction of 'advanced run-off-river power station technology' that enables low cost performance, and the expansion of the local transmission/distribution network accompanied by this advanced technology are positioned as one of the policy plans according to the 2nd. 25-year Plan and the 6th. 5-year Plan.

When an independent technology is developed in the future based on this technology introduction, it can be applied to all the islands including Java, Sumatra, Kalimantan ,Sulawesi and so forth to expand the electrification scale in accordance with the 2nd. 25-year Plan. Due to its low cost performance, this technology could also be employed to renovate old

hydro power stations.

When introducing the technology, western Java on the Indian Ocean would be the model area as the electrification ratio in this area is the lowest in Java. Considering a run-off-river hydro power potential of approx. 450MW, power station will be made for a medium, small, and a micro power station, together with the expansion of the transmission/distribution network.
Also, any excess electricity will be transmitted to the cities to ease the demand/supply balance.

The plan to try in this area is also highly beneficial for academic research in Bandung city and for technology application through industrial accumulation. From this aspect, the plan is, therefore, also appropriate.

The Master Plan of the 'Project for Technology Introduction and Development of Advanced Run-off-River Power Stations (on the Indian Ocean Side of Java)' has been planned based on the above described concept.
See attached, 'concept of Policy Plan .

5. Study Content

The focal study includes medium, small, and micro hydro power development based on 'advanced run-off-river power station technology', accompanied by local transmission/distribution, an independent technology development plan, and countermeasures for the old hydro power stations. Details of the study are provided below.

1) Study of Existing Technologies Related Matters

2) Study of New Plans

transmission/distribution technology included)

(3) Independent Technology Development Plan (utilization of industrial accumulation in Bandung City included)

(4) Countermeasures for Old Hydro Power Station

3) Production of New Plan Study Related Manual

4) Hydro Power Policy

New system related the exisiting legurations including privatized operation.

6. Study Schedule

The study period is 18 months. See attached material 2 for details.

7. Report

Submit the following report at the specified period.

1) Inception Report

Report regarding the execution method and other matters within the first month.

2) Interim Report

Report an outline of the study conducted during this period, within 8

months after commencement.

3) Master Plan Report

(1) Draft

Submit the draft at approximately the middle of 16th month after study commencement.

(2) Final

Submit a final report which includes conclusions to the opinions described in the above Draft within 18 months after study commencement.

8. External and government Input

1) External Input

a. Nine experts for the study for 18 months

b. Training of Indonesian experts

c. Equipment

2) Government Input

a. Office Facilities

b. Counterpart personnel

c. Local operational fund

Division of undertakings between the government of Indonesia and the government of Japan is shown in Attached 3.

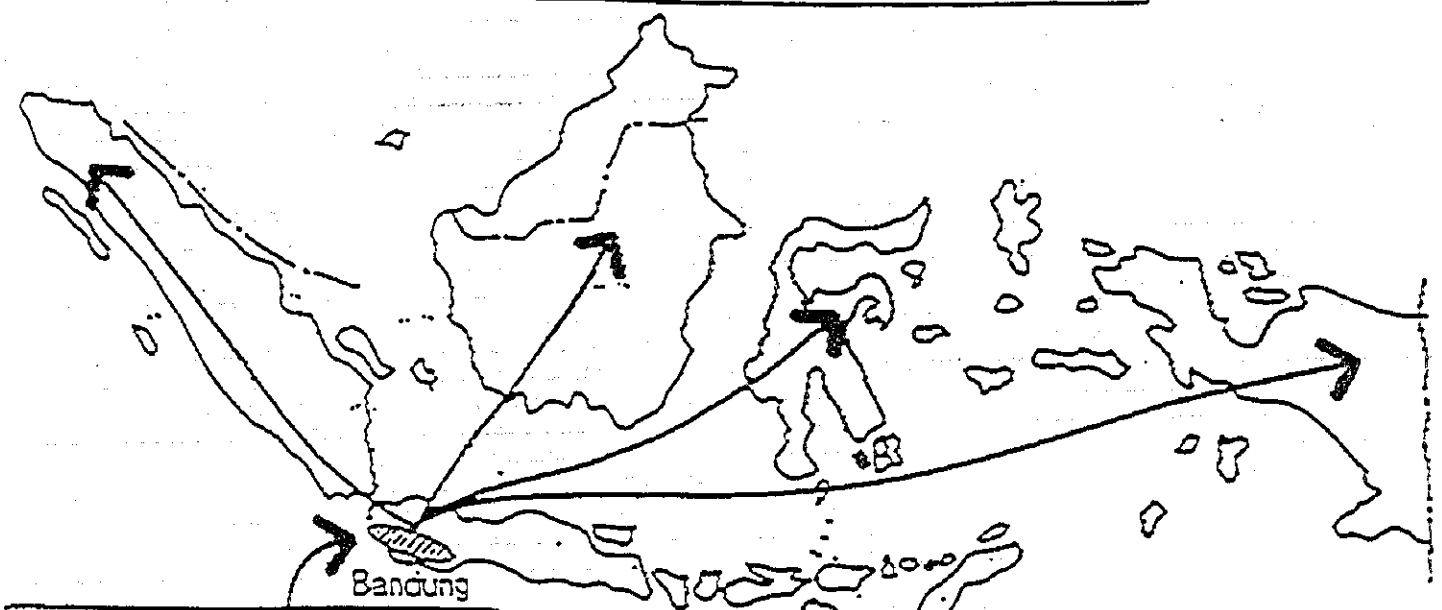
9. Contribution to the Project

1) External Input

a. Expert Service	(65m/m)	US$	1,300,000
b. Fellowship	(20m/m)	US$	160,000
c. Survey Cost			1,520,000
d. Equipment			40,000
Total			3,020,000

2) Internal Input

CONCEPT OF POLICY PLAN



Master Plan (model)

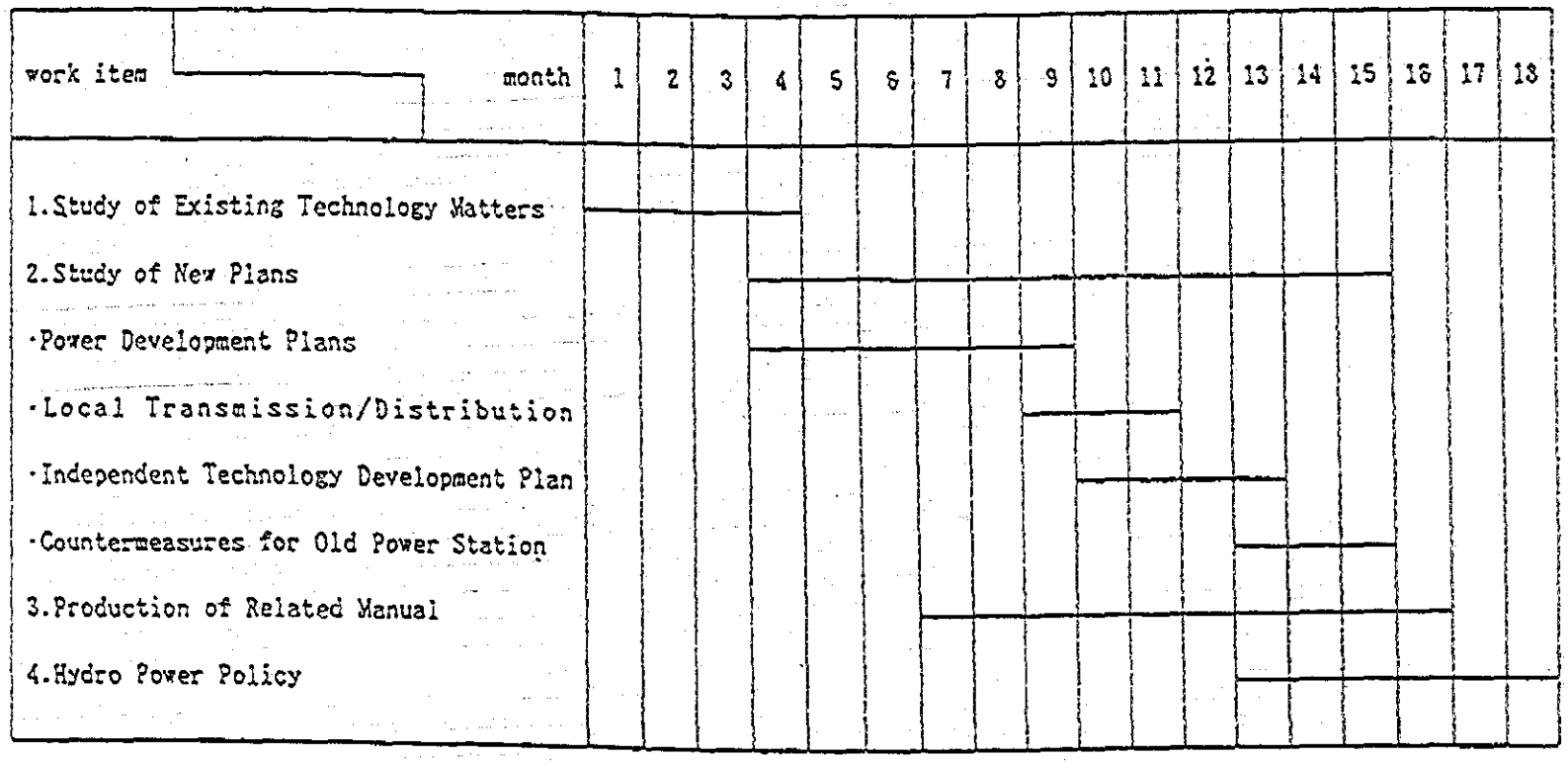
Project for Technology Introduction and Development of Advanced Run-off-River Power Stations

Advanced run-off-river power stations
(50MW; medium, small, micro)

- Local electrification
- Supplies to cities
- Renovation of existing power stations

Potential (450MW)

Time Schedule for the Study



(Attachment 3)

Division of Undertakings between the Goverment of Indonesia (GOI) and the Goverment of Japan (GOJ)

Work Item	Undertaking by GOJ	Undertaking by GOI
1. Study of Existing Technology Matters	1. Supervision of data collection and analysis	1. Provision of counterpert personnel 2. Collection and analysis of necessary data
2. Study of New Plans		
1) Power Development Plan	2-1) Planning of Medium small and micro hydro power depended on advanced tecnology	1. Provision of counterpert personnel 2. Collaborative works on the planning
2) Local Transmission/Distribution	2-2) Planning of schematic electrification on a local	1. Provision of counterpert personnel 2. Collaborative works on the

		planning
3) Independent Technology Development Plan	2-3) Planning of utilization of industrial accumulation in Bandung	1. Provision of counterpert personnel 2. Collaborative works on the planning
4) Countermeasures for Old Power Station	2-4) Evaluating of old power station	1. Provision of counterpert personnel 2. Collaborative works on the evaluating
3. Production of Related Manual	3. Making of 2.'s manual	1. Provision of counterpert personnel 2. Collaborative works on the making
4. Hydro Power Polisy	4. Suggesting of privatized operation and so forth	1. Provision of counterpert personnel 2. Collaborative works on the suggesting

Diisi oleh Biro AKELN
No. ID :

Lampiran Surat No :
Tgl :

DAFTAR ISIAN
BUKU BIRU 1995 - 1996

A UMUM

01 Nama Proyek (dalam Bahasa Inggris) : Project for Technology Introduction and Development of Advanced Run-off-River Power Station (on the Indian Ocean Side of Java)

Beri tanda V untuk jawaban yang dipilih

02 Tipe Proyek :
- [ ] 1 Bantuan Proyek
- [V] 2 Bantuan Teknis

03 Sifat Proyek :
- [V] 1 Proyek Baru
- [ ] 2 Proyek Lanjutan

04 Status Pengusulan :
- [V] 1 Diusulkan pertama kali
- [ ] 2 Pernah diusulkan, belum tercantum dalam BB
- [ ] 3 Sudah tercantum dalam BB yl, diusulkan kembali dengan penyempurnaan. Nomor BBID yang lalu:

05 Executing Agency
a Departemen/Lembaga : Pertambangan dan Energi

b Pada Ditjen/Eselon I : Listrik dan Pengembangan Energi

06 Institusi Pelaksana (Implementing Agency) :

Institusi	Porsi Pembiayaan
Ditjen LPE	% (dr. total biaya)

Bila proyek direncanakan untuk dilaksanakan oleh lebih dari satu Institusi Pelaksana, sebutkan Institusi lainnya dan porsi pembiayaannya.

	Institusi	Porsi Pembiayaan
a	--	% (dr. total biaya)
b	--	% (dr. total biaya)
c		% (dr. total biaya)

(lanjutkan sesuai keperluan)

07 Lokasi proyek dan perkiraan biaya yang dialokasikan untuk tiap-tiap lokasi dalam tingkat propinsi :

	Propinsi	Alokasi biaya
a		% (dr. total biaya)
b		% (dr. total biaya)
c		% (dr. total biaya)

(lanjutkan sesuai keperluan)

10 Kegiatan Proyek

a Jenis Kegiatan Proyek :

- [V] Jasa Konsultan
- [ ] Pekerjaan Sipil dan Konstruksi
- [ ] Pengadaan Barang dan Peralatan
- [ ] Pelatihan dan Pendidikan
- [ ] Lain-lain

b Uraian kegiatan utama proyek (usahakan tidak melebihi 250 kata)

Mempelajari masalah-masalah yang berkaitan dengan teknologi ketenaga-listrikan dalam kaitan dengan Pembangunan pembangkit listrik tenaga air

Penyusunan rencana pembangunan Pembangkit Listrik Tenaga Air

11 Pokok kebijaksanaan Repelita VI yang mendasari diusulkannya proyek tersebut (Pilih salah satu yang dominan) :

- [ ] 1 Pengembangan sumber daya manusia
- [V] 2 Pengembangan prasarana dan sarana ekonomi
- [ ] 3 Pembangunan daerah
- [ ] 4 Peningkatan peran serta masyarakat
- [ ] 5 Pengentasan kemiskinan
- [ ] 6 Efisiensi dan efektifitas pengeluaran pembangunan
- [ ] 7 Kelestarian fungsi lingkungan hidup

12 Waktu Pelaksanaan :

- / 1995 Awal (bln/th)
- / 1996 Akhir (bln/th)

13 Proyek ini termasuk dalam Program Anggaran Repelita VI:

Program Repelita VI : Pengembangan Tenaga Listrik kode :

Subsektor : E n e r g i kode :

Sektor : Pertambangan dan Energi kode :

Persentase biaya : ____ % (dari total biaya proyek)

Untuk proyek lintas program (mempunyai lebih dari satu program), sebutkan program lainnya dan porsi pembiayaannya.

Program Repelita VI : _____ kode : _____
Subsektor : _____ kode : _____
Sektor : _____ kode : _____
Persentase biaya : _____ % (dari total biaya proyek)
(lanjutkan sesuai keperluan)

14 Dampak/manfaat proyek : [V] 1 Nasional [ ] 2 Regional [ ] 3 Lokal
Bila regional atau lokal, sebutkan lokasi-lokasi (tk. propinsi) yang memperoleh manfaat langsung dengan adanya proyek.
a _____ a _____
b _____ b _____
c _____ c _____
(lanjutkan sesuai keperluan)

15 Kandungan Lokal
a Jasa Konsultan : _____ %
b Pekerjaan Sipil dan Konstruksi : _____ %
c Pengadaan Barang dan Peralatan : _____ %
d Pelatihan : _____ %

16 Proyek/bantuan teknis terkait (yang sedang/sudah berjalan atau sedang diusulkan)

Judul Proyek	No. 10 pada 88 yl.
1	
2	
3	

(lanjutkan sesuai keperluan)

C PEMBIAYAAN PROYEK

17 Biaya Proyek (hanya diisi satu a atau b, tidak keduanya)

a Bila Proyek merupakan Bantuan Proyek

Foreign Exchange Cost	:	USD
Local Cost	:	USD
Total Biaya Bantuan Proyek		USD

b Bila Proyek merupakan Bantuan Teknis

Tenaga Ahli	: 65 MM	:	USD 1,300,000
Kerjasama Pendidikan	: 20 MM	:	USD 160,000
Peralatan		:	USD 40,000
Biaya Lain-lain		:	USD 1,520,000
Total Biaya Bantuan Teknis			USD 3,020,000

10 a Jumlah PHLN yang diharapkan : USD 3,020,000
terdiri atas:

Hibah	:	USD 3,020,000
Pinjaman Lunak/Pinjaman	:	USD
Kredit Ekspor	:	USD

b Pertimbangan mengusulkan pembiayaan proyek ini dengan jenis PHLN tersebut

c Cara Penyaluran :
- [ ] 1 DIP atau yang disamakan
- [ ] 2 Penerusan pinjaman (SLA, dsb)

19 Dana pendamping : USD 16,000 (ekivalen)
terdiri atas:

Rupiah murni APBN	USD 16,000	(ekivalen)
Rupiah murni DIPDA	USD	(ekivalen)
Anggaran BUMN/BUMD	USD	(ekivalen)
Pinjaman Dalam Negeri	USD	(ekivalen)
Rupiah Pinjaman Luar Negeri	USD	(ekivalen)

20 a Perkiraan biaya operasi dan pemeliharaan setelah proyek selesai : Rp -- (per tahun)

b Sumber pembiayaannya berasal dari :
- [ ] 1 APBN
- [ ] 2 APBD
- [ ] 3 Anggaran BUMN/BUMD
- [ ] 4 Lain-lain

D KESIAPAN PROYEK

21 Status Kesiapan Proyek

a Kerangka Acuan :
- [ ] 1 Kerangka Acuan (TOR) belum disiapkan
- [ ] 2 Kerangka Acuan (TOR) garis besar sudah disiapkan
- [V] 3 Kerangka Acuan (TOR) sudah disiapkan

b Studi Kelayakan : [V] 1 Belum ada studi
[ ] 2 Studi awal sudah selesai
[ ] 3 Pra-studi kelayakan sudah dilaksanakan
[ ] 4 Studi kelayakan sudah dilaksanakan
[ ] 5 Studi kelayakan dan semua studi yang dibutuhkan sudah selesai

c Jenis analisa apakah yang sudah dilakukan terhadap proyek : [ ] Analisa Permintaan
[ ] Analisa Teknis
[ ] Analisa Keuangan
[ ] Analisa Ekonomi
[ ] Analisa Kelembagaan
[ ] Analisa Sosial
[ ] Analisa Lingkungan Hidup

22 Gambaran keuntungan proyek yang diharapkan berdasarkan hasil analisa tersebut di atas:

a *Ukuran kuantitatif*
Internal Rate of Return : [ ] %
Net Present Value : [ ]
Benefit /Cost Ratio : [ ]
Break-even Point : [ ] tahun

b *Ukuran kuantitatif lainnya* (a.l: Jenis barang, beneficiaries) : Item | Jumlah | Satuan
(lanjutkan sesuai keperluan)

c *Ukuran kualitatif* : Diversifikasi pembangkit non minyak akan mengurangi ketergantungan pada minyak bumi
(lanjutkan sesuai keperluan)

E SUMBER PEMBIAYAAN

23 Inisiatif usulan Proyek : [ ] 1 Dirumuskan oleh Executing Agency
[V] 2 Diusulkan oleh Penyedia PHLN
[ ] 3 Dirumuskan bersama-sama dengan Penyedia PHLN

24 Lembaga/Negara Penyedia PHLN yang berminat : [ ] 1 Belum ada
[V] 2 Sudah ada pembicaraan dengan beberapa Penyedia PHLN
sebutkan : JICA atas nama Pemerintah Jepang

25 Apakah sudah termasuk dalam rencana pembiayaan Penyedia PHLN : [ ] 1 Belum termasuk dalam program Penyedia PHLN
[ ] 2 Sudah termasuk dalam program Penyedia PHLN
sebutkan : (Penyedia PHLN & tahun)
_____ th. _____
_____ th. _____

26 Tahap persiapan yang telah dilakukan oleh Penyedia PHLN : [ ] 1 Identifikasi proyek sudah dilakukan oleh Penyedia PHLN
[ ] 2 Fact Finding sudah dilakukan oleh Penyedia PHLN
[ ] 3 Studi kelayakan sudah dilakukan oleh Penyedia PHLN
[V] 4 Penilaian sudah dilakukan oleh Penyedia PHLN

DEPARTEMEN/
LEMBAGA NON-DEPARTEMEN

Cap

(Tanda tangan)

1. PROJECT TITLE : Feasibility Study for small size Geothermal Resources 2x5 MW at Umsini, Manokwari, Irian Jaya.

2. LOCATION : Umsini, Kabupaten Manokwari, Irian Jaya.

3. EXECUTING AGENCY : Perusahaan Umum Listrik Negara (PLN).
Directorate General for Electric Power and Energy Development.
Ministry of Mines and Energy.

4. OBJECTIVES : To investigate the most technical and economical justification of constructing a small scales Geothermal Power Plant in Umsini, Kabupaten Manokwari, Irian Jaya.

5. PROJECT DESCRIPTION : The Study is required to conduct the possibility of developing a Geothermal Power Plant in rural areas in Kabupaten Manokwari, Irian Jaya.

6. SCOPE OF ASSISTENCE REQUESTED :

		Foreign Currency	Local Currency
a.	Expert Services :	USD 300.000	-
b.	Fellowship :	-	Rp. 300.000.000

7. EXPECTED IMPLEMENTATION TIME : 9 Months.

8. RELATED TO PROJECT AID :

digest fs

TERMS OF REFERENCE

FEASIBILITY STUDY FOR SMALL SIZE GEOTHERMAL RESOURCES LESS THAN 10 MW AT UMSINI, IRIAN JAYA

MINISTRY OF MINES AND ENERGY
DIRECTORATE GENERAL FOR ELECTRIC POWER AND ENERGY DEVELOPMENT

TERMS OF REFERENCE
FEASIBILITY STUDY FOR SMALL SIZE GEOTHERMAL RESOURCES LESS THAN 10 MW, AT UMSINI, IRIAN JAYA

1. BACKGROUND

1.1. Load growth on Kabupaten Umsini, Irian Jaya Province currently increasing at approximately 15 per cent per annum which, if sustained, will double the power supply requirements every five years; while at present, a 100 percent of its electric power supply depends on diesel power plants.

1.2. The Government of Indonesia (GOI) stressed on a guideline for the energy policy including review, presertation, diversification of natural resources; making all efforts countinuously for diversification of energy resources and reinforcement of promoting such diversification through development, utilization and customary use of substitute fuels.

1.3. Geothermal Energy is a clean energy resources, renewable, nonexportable, and the only alternative energy resources which is potentially could be developed on Irian Jaya Province.

1.4. Based on President Degree No. 45 dated October 1, 1991, PLN (Stated Electricity Corporation) have the authority to develop fully small scales Geothermal Power Plant (less than 10 MW) from steam field development, construction to operational activities without any steam price charged.

1.5. Based on surveys and initial investigations done by Directorate of Vulcanology and PLN indicated that there is possibility for developing of mini geothermal power with units range from 5 up to 10 MW at Umsini, western part of Irian Jaya.

2. OBJECTIVES and ACTIVITIES

2.1. A feasibility study will carried out with the following objectives :

(1) to establish location of a geothermal field geometrical model of reservoir, estimation the order of magnitude of the heat or power potential and the grade of heat obtainable therefrom.

(2) to investigate the technical and economic justification of developing mini geothermal electric plant taking into consideration the substitution of diesel power plants gradually on Irian Jaya Province.

(3) to prepare a feasibility grade design of the layout proposed for the plant, prepare detailed investment cost estimates and establish an appropriate implementation schedule.

2.2. The study is expected to be completed within 9 (nine) months after its commencement, with the main activities as follows

(1) *First Activity*

The purpose of the first activity is to review the existing data, to investigate the geology and geothermal manifestation by means of geological, geophysical and geochemical investigations; and to locate the exploration drilling point at the prospective geothermal field for further activity.

(2) *Second Activity*

The purpose of the second activity is to conduct site investigation at the prospective geothermal field to make a Feasibility Report for further installation of small size geothermal power plant at Umsini, Irian Jaya.

3. METHOD OF IMPLEMENTING THE STUDY

3.1. The study will be conducted by a consultant selected and approved by Government of Indonesia and The Bank.

3.2. The Consultant has to prepare Inception' Report after a preliminary survey and Interim Report (s) after the field study/investigation and consultation will be held between PLN and Consultant to review the findings of the Consultant. On the completion of the study, the Consultant should submit a Final Report together with suitable appendices to illustrate fully the resource and engineering viability, preliminary design, economic justification and environmental feasibility of the recommended plant.

4. SCOPE OF THE SERVICES

4.1. Collection and review a data from geological, geophysical and geochemical investigations, the results of which will be assembled and commented upon in an Interim Report.

4.2. Prepare a conceptual model of the field taking into account results from all scientific disciplines and showing physical boundaries, structural and stratigraphy, and giving details of the distribution of pressure, temperature, chemical constituents and fluid.

4.3. Determine the quantity of geothermal energy available over the expected power plant life from the Umsini field area, and prepare a plan for the optimum development and delivery of this resource to one or more power plants.

4.4. Identify all resource constraints on the full development of this field, quantity these constraints, and propose a plan for the mitigation of these constraints.

4.5. Undertake detailed site investigations and prepare options for siting and layout of the geothermal power plant, based upon field studies and data analysis, including water supply, present land use, soil conditions and required construction materials.

4.6. Feasibility grade design and cost estimate for the optimal steam production and plant layout.

4.7. Technical, economical and environmental studies with respect to diesel generating substitution.

5. EXPERTISE REQUIREMENT

5.1. Team Leader : Geothermal expert with at least 15 years experience in exploration, steam development and operational geothermal energy.

5.2. Geologist with experience at least 12 years in great variety of specialized exploration, drilling and well testing techniques.

5.3. Geophysicist with experience at least 10 years in geothermal exploration, and has a good knowledge in modern techniques exploration techniques.

5.4. Geochemist with experience at least 10 years in geothermal exploration.

5.5. Mechanical Engineer with experience at least 10 years in Geothermal development scheme.

5.6. Electrical Engineer with experience in electric demand forecast, economic and financial analysis.

5.7. Environmental Expert which has an experience in planning and developing Geothermal plants.

Supplement to a decision of the Minister of Mines and Energy, Number: 2353.K/41/M.PE/1994, dated December 22, 1994.

GENERAL PLANS ON NATIONAL ELECTRIFICATION

I. INTRODUCTION

Legal Ground for General Plans on National Electrification

Public Law No. 15/1985 on Electricity directs the government to adopt comprehensive and integrated plans on electricity in consideration of the people's views and opinions. Since enactment of Public Law No. 15/1985, general plans on electricity have been included in Five-Year Development Plans. However, present situations and changes demand that more explicit General Plans on National Electrification be formulated.

Public Law No. 15/1985 also stated that electricity be provided by a state-owned enterprise, private concerns and cooperatives. Therefore, a General Plan on National Electrification is expected to serve as the instrument for establishing, maintaining and integrating providers of electric power. Thereby, the purpose and objective of providing electricity are accomplished efficiently and effectively. Furthermore, the government is responsible for the formulation of not only the regulatory instruments pursuant to Public Law No. 15/1985 but also for adoption of General Plans on National Electrification[1].

Targets of the Second Long-term Plan

Table I.1 shows targeted deliveries of electric power throughout the second long-term plan and during each Five-year Plan.

		Five-year Plans					
Targets	Unit	V	VI	VII	VIII	IX	X
Electrification ratio	%	39	60	70	80	90	95
Rural electrification	%	49	79	100	100	100	100

1. Government Regulations No. 10/89; Presidential Decree No. 37/92; a decision of the Minister of Mines and Energy, No. 02.P/03/M.PE/1993; a decision of the Minister of Finance, No. 128/KM.00/93.

Sub-Sector at the End of the First Long-term Plan

There is a major difference in the generation of electric power during the first and the second long-term plan. Private participation becomes more pronounced during the second. The need for generation of electric power by the private sector arose during the first long-term plan when the State Electric Company found itself unable to meet demands for power by the industrial sector. Private electric generators utilized fuel and operated independently of the State Electric Company network. Fuel subsidies promoted growths by private electric generators which, by the end of the first long-term plan, produced around 8,400 mW. Meanwhile, the State Electric Company generated around 13,200 mW. These figures showed that the private sector produced substantial amounts of electric power.

Shortages of electricity in the beginning of this decade clearly demonstrated that the State Electric Company did not have the resources to build all the facilities needed to support the nation's economic growths. However, enlistment of the private sector based on patterns pursued during the first long-term plan, may cause this sub-sector to be inefficient and suffer substantial losses.

The 1993 Broad Guidelines of State Policy mandated that efforts be pursued to maintain the levels of economic growth which the nation has achieved. The foregoing necessitates mobilization of resources outside the government. The target could be achieved if the available resources are mobilized under planned and integrated schemes based on national policies.

Development Policies

To promote private participation in an efficient generation of electric power, the government pursues the following measures:

1. improved performance by the State Electric Company through corporate restructuring and privatization[2];

---

2. Government Regulations No. 23/94 changed the status of the State Electric Company, from a state enterprise under the purview of a ministry to a limited liability company.

2. revisions to basic electric rates to reflect actual costs of generation of electricity[3];
3. institutional restructuring and revisions to work procedures to create a competitive business climate which promotes efficiency[4];
4. opening of equal opportunities to private providers of electric power to use available energy resources based on market prices; and
5. initiation of measures to promote energy conservation and preserve the environment.

Some of the above measures are underway. Consequently, the electric sub-sector is undergoing the initial phase of a major change. A General Plan on National Electrification is therefore needed in the formulation of measures on managing contingencies.

Role of a General Plan on National Electrification

A General Plan on National Electrification and a mechanism which can be applied to review it regularly are expected to maintain a balance between supply and demand. A balance between supply and demand reduces risks which the private sector encounters in supplying electric power and which the State Electric Company has to manage in distributing electricity. During the first long-term plan, systems on developing electric power were formulated on the principle of relatively high over supply. It was pursued based on the following considerations:

1. uncertainties in project completion[5];
2. high growth rates without reaching saturation points.

---

3. While establishing basic electric rates, the government also imposed periodic rate increases. Periodic rate increases were based on inflation, changes in fuel prices, changes in exchange rates between the rupiah and United States dollar, changes in the price of electricity purchased by the State Electric Company from private suppliers.
4. Bulk Supply Tariff and Power Purchase from Small Producers are designed to promote participation by the private sector and cooperatives in the generation and distribution of electricity.
5. Uncertainties resulted from limited financial capacities and time-consuming procedures. A 1980 study showed that the average project cycle in Indonesia was two times longer that the cycle projected when a project was appraised.

However, these measures could be disastrous in the future because the State Electric Company have to assume risks not only upstream but also downstream[6]. A General Plan on National Electrification, therefore, is expected to early on detect and prevent disasters.

Mechanism used in formulating a General Plan on National Electrification

A General Plan on National Electrification is based on macro policies adopted by the government[7]. To ensure integration of the concerned sectors, a Consultative Committee was created to coordinate the functions of the various ministries[8]. The Committee monitors and manages national issues on electrification.

II. DEVELOPMENT RESULTS DURING THE FIRST LONG-TERM PLAN

An Overview

Development in the electric sector during the past twenty five years provided valuable lessons which could be utilized in formulating future programs. Undoubtedly, the electric sub-sector is structurally weak; its systems are fragmented and consume substantial amounts of fuel. But the high growth potentials throughout the country offer opportunities for improving this sub-sector. Through continued diversification of consumption of sources primary energy, Indonesia will be able to generate electricity much more efficiently. The results achieved during the first long-term plan are summarized below.

---

6. In an oversupply, the State Electric Company must purchase power in excess of the marginal prices (short-runs).
7. A State of the Union Message is one of the most complete sources of data. It is delivered periodically by the head of state.
8. The Consultative Committee was created pursuant to a decision of the Minister of Mines and Energy. Chaired by the Director General of Electricity and New Energy, it comprises of officials of the Ministry of Mines and Energy, National Planning and Development Board, Ministry of Industry, Ministry of Finance, Agency for Research and Application of Technology, Ministry of Cooperatives and Smallholder Businesses and the State Electric Company.

Facilities for the Supply of Electricity

Tables II-1 and II-2 summarize facilities for the generation, transmission and distribution of electric power during the first long-term plan.

Table II-1: Electric Generators

Type	Capacity (mW)
Hydro-electric generators	2,215
Diesel-electric generators	2,140
Gas-fired electric generators	1,413
Gas- and steam-fired electric generators	2,817
Geothermal electric generators	250
Steam-fired electric generators	4,341
Total	13,176

At the end of the first long-term plan, electric power measuring 8,400 mW was generated by providers other than the State Electric Company. Consequently, at the end of the first long-term plan, Indonesia produced more than 21,000 mW of electricity.

Table II-2: Transmission and Distribution Facilities

Type	Volume	
Transmission	19,896	kms.
Main Transformers	23,936	mVA
Medium-tension networks	118,315	kms.
Low-tention networks	162,442	kms
Distribution stations	17,899	mVA

Service Delivery

Table II-3 shows service delivery, a measure of how development results were utilized during the first long-term plan.

Table II-3: Growths in Service Delivery

	Start of First Long-term Plan	End of First Long-term Plan
Increases in sales of electricity	1	29
Household connections	3.4%	38.7%
Villages served	3%	45%
Per capita consumption (kWh/person)	12	334

Efficiency

Table II-4 shows indexes used to indicate efficiency in the electric sub-sector.

Table II-4: Increased Efficiency

	Start of First Long-term Plan	End of First Long-term Plan
Network shrinkages	30%	12%
Fuel shares	82.7%	46.5%

The above figures compared with reductions in fuel shares for all energy sectors, from 87.8% to 63.7%. The electric sub-sector was more successfull than the other energy sectors in taking advantage of opportunities to reduce fuel shares.

Conditions During the Initial Years of the First Long-term Plan

During the initial three Five-year Plans, measures focused on consolidating construction programs in the electric sub-sector. During these periods:

1. Electricity was supplied by generators which operated separately and independently of one another.
2. Electricity was supplied mostly by generators which consumed diesel fuel and gas.
3. Network shrinkages were high and in some areas exceeded 30%.

Financial constraints and limited institutional and human resources made it almost impossible to resolve the above issues.

The Measures Taken

At a time when the supply of electricity was critical, several measures were taken to lay down the foundations for construction in the electric sub-sector. They included reform to the State Electric Company pursuant to Government Regulations No. 18/1972 and adoption of standard tensions in 1971[9]. These measures, though modest, had far-reaching impacts. They enabled, among others, procurement of loans from the International Bank for Reconstruction and Development (IBRD) to rehabilitate distribution networks in Jakarta. The IBRD loans marked the beginning of a more purposeful development in the electric sector.

The industrial sector, meanwhile, grew rapidly and the State Electric Company was unable, due to financial constraints, to meet the needs of the industry for electric power. The industrial estate in Pulo Gadung, North Jakarta, was one of the situations in which the State Electric Company was forced to build fuel-guzzling electric generating plants to meet the needs of industry. The industrial sector generally built electric generators which consumed substantial amounts of fuel. They were able to do so because fuel subsidies were intended to promote growths by industries.

---

9. Low-tension lines were converted from 127/220 Volt to 220/380 Volt to increase the capacities of the distribution lines.

Remedial Measures during the First Long-term Plan

Consolidation of the sub-sector on electricity gained momentum during the initial years of the third Five-year Plan. The government adopted policies on fuel conservation because fuel assumed an important role as a source of government revenues to underwrite national development. Among the main policies adopted then to develop a national electric supply system were:

1. relocation of all diesel electric generators from Java to the regions where measures on the production of electricity were pursued independently of one another;
2. creation of interconnection systems to save on reserves and promote a stable supply of electric power[10];
3. construction of more efficient steam-fired electric generators; at that time, gas-fired generators assumed the basic electric load;
4. preparations for the construction of a coal-fired electric power plant in Suralaya and 500 kV transmission lines; they enabled construction of a 700 mW hydro-electric generating plant in Saguling and a 500 mW hydro-electric generating plant in Cirata, West Java;
5. aggressive marketing programs.

The highest growth in the supply of electricity throughout the first long-term plan occurred during the third Five-year Plan. Consequently, over supplies were utilized in relatively short periods and construction of larger and more efficient power plants became more feasible. Efforts at increasing efficiency through exploitation of growth results started during the third Five-year Plan.

The Suralaya steam-fired power plant was built within the framework of efforts at diversifying consumption of sources of primary energy. It utilized coal produced in Indonesia. The Suralaya plant, rehabilitation of coal mines in Bukit Asam, South Sumatra and construction of rail lines from the mine pits to Tarahan represented an integrated project on infrastructure construction.

---

10. The interconnection between West and Central Java was established in 1980 with 150 kV transmission lines.

The Suralaya coal-fired power plant has two 400 mW generators. Its construction occurred simultaneous with the installation of 500 kV transmission lines between Suralaya and Ungaran in Central Java. The two projects were pioneering endeavors because Java then had a small electric generation and distribution system. The first unit became operational in 1984 when peak loads in West and Central Java reached approximately 1200 mW. Problems undoubtedly occurred when the unit was put into operation. The problems lasted briefly due to high growths in demands for electric power. In 1987, the two units became operational with a capacity factor of 72%.

Therefore, successes in achieving efficiency and diversifying consumption of sources of primary energy during the first long-term plan were attributable to the pioneering measures pursued in the initial years of the third Five-year Plan.

III. SOURCES OF PRIMARY ENERGY

Hydro-power

A survey undertaken in the early nineteen eighties identified 1,210 potential sources of hydropower in Indonesia. The survey revealed that these sources, with energy potentials of 400 tWh, could generate around 75,000 mW a year. Table III-1 shows the sites where these potential sources of hydropower were located.

Table III-1: Sites of Potential Sources of Hydropower

Island	Sites	Capacity (gW)	Energy (tWh/a)	(%)
Sumatra	447	15.58	84.11	20.9
Java	120	4.20	18.04	4.5
Kalimantan	160	21.58	107.20	26.7
Sulawesi	105	10.18	52.95	13.2
Irian Jaya	205	22.37	133.76	33.3
Nusa Tenggara	120	0.62	3.28	0.8
Maluku	53	0.43	2.29	0.6
Total	1,210	74.96	401.63	100.0

One-third of the potential sources of hydropower were found in Irian Jaya where the demand for electricity was lowest or around 4.5% of the demand in Java. This disparity was the major reason for the slow exploitation of hydropower in the province. Diesel electric generators or mini hydro-electric generators were built in areas with adequate sources of hydropower because the local electric systems were unable to make maximum uses of hydro-electric generators[11].
Therefore, diesel electric generators were installed during the first long-term plan not only to supply electricity but also to upgrade local electric systems in anticipation of construction of hydro or coal-fired electric generators. When a large electric generator was built, the diesel generators were reassigned to other systems. Java went through this process in the nineteen seventies. At the end of this decade, Sumatra is expected to relinquish some of its diesel generators to other regions.

Geothermal Steam

Interim figures estimated that geothermal steam could generate about 16,000 mW of electricity. During the first long-term plan, only 140 mW of the potential sources were exploited. Institutional and financial constraints were the main obstacles to exploitation of geothermal resources.

Natural Oil

Indonesia remains as an oil exporting country. In spite of it, oil is a proxy rather than the main option in planning expanded generation of electricity. Oil will be utilized during peak loads.

Coal

Coal is a base option for the generation of electricity. The reasons are:

1. Coal is available in adequate amounts[12];

---

11. A hydro-electric generator is built to optimally take advantage of the conditions of a river. It is engineered to achieve maximum capacity because it is more advantageous when deployed to carry peak rather than basic loads.
12. Current reserves are estimated at 36 billion tons.

2. Coal price is transparent and is based on market mechanism[13];
3. Coal can be transported with ease.

In formulating a General Plan on National Electrification, coal-fired electric generators are used as the basis for calculating optimum supplies to meet basic loads.

Natural Gas

Natural gas is one of the main options for the generation of electricity. It is clean and can be converted into energy with relatively cost-effective technology. A gas-fired electric generator can be built in a relatively shorter time.

Unlike coal, however, natural gas cannot be utilized as a base option. The amount of natural gas in reserves has not been positively established and pipes are needed to transport it to an end user. Thus, plans on gas consumption to generate electricity during the seventh Five-year Plan must be based on present competitive prices[14]. Consequently, gas-fired electric generators cannot be used as positive alternatives for the generation of electricity. Decisions on construction of gas-fired electric generators, therefore, are made on a case-by-case basis.

IV. ESTIMATED NEEDS FOR ELECTRIC POWER

Macro Assumptions

Measures on attaining peak loads throughout Indonesia during the 1993/94 fiscal year generally fell short of their targets. The macro assumptions applied during reviews were based on figures furnished by the National Planning and Development Board in formulating the sixth Five-year Plan. They were based on the following considerations:

1. Commitments were made on nearly all the large projects in the Java electric supply systems;
2. The rates for peak loads were very expensive.

---

13. Coal for Units 5-7 of the Suralaya power plant was procured through bids.
14. Estimated between US$ 2.53 and US$ 3.00 per MMB/BTU.

3. Government policies, including those set forth in Government Regulations No. 20/1994, were designed to promote growths.

The low growths in peak loads during the 1993/94 fiscal year were deemed to be short-term. Nonetheless, measures on preventing losses due to over supplies were initiated. They included setting of a 23% growth in sales by the State Electric Company during the 1994/95 fiscal year.

Growths in Need for Electricity

Basically, growths in sales of electricity resulted from increases in Gross Domestic Product (GDP) and electrification programs which were indirectly influenced by growths in GDP.

Table IV-1: Assumed Economic Growths and Electrification Targets

Variables	Sixth Five-Year Plan	Seventh Five-Year Plan
Growths in Gross Domestic Products		
Industries in Java	11.8%	11.4%
Industries outside Java	13.4%	11.8%
Industries throughout Indonesia	12.1%	10.3%
All sectors	6.2%	6.6%
Ratios of electrification targets		
Java	71%	87%
Outside Java	43%	55%
Indonesia	60%	74%

Table IV-1 showed assumptions on growths of the macro economy and targets of electrification through the seventh Five-year Plan. Consequently, the growth elasticity in the electric sector vis-a-vis the Gross Domestic Product cannot be applied to measure efficiency in the development of this sub-sector.

V. PLANS ON SUPPLYING ELECTRICITY DURING THE SIXTH FIVE-YEAR PLAN AND PROSPECTS FOR THE SEVENTH FIVE-YEAR PLAN

An Overview

Measures on generation of electricity during the sixth and seventh Five-year Plans are presented in this section and include reviews of the sixth Five-year Plan. They are presented in consideration of the following:

1. Since drafting of the concept on the sixth Five-year Plan, the private sector has assumed increasing roles in the generation of electricity[15].
2. The 1993/94 fiscal year posted a low growth rate. Medium-term prospects are, therefore, taken into account[16].
3. There were over supplies, especially in the Java-Bali system.

Reviews were made in two phases. The first occurred during formulation of long-term needs for coal- and gas-fired electric generators. The second was made when the State Electric Company considered hydro-electric generators to replace gas-fired generators to carry peak loads.

Reviews of measures for the sixth Five-year Plan were based on scheduled completion of on-going prjects of the State Electric Company and the operation private generators which tied in with the national electric supply scheme.

---

15. In the middle of 1993, it was difficult to project the amounts of electric power the private sector could generate. The Coordinating Minister for Economic, Financial and Industrial Affairs concurrently Overseer of National Development did not approve then allocation to the private sector. Presently, however, it is set at 2500 mW. It was a decision difficult to predict when the sixth Five-year Plan was formulated.
16. The Java-Bali system was allocated a peak load of 6512 mW during the 1993/94 fiscal year. The system, however, was able to deliver only 5757 mW. The difference is substantial and deserves a review.

Alternative Carriers of Basic Loads

Gas- and steam-fired electric generators are excluded as alternatives from the calculation of needs for carriers of basic loads. The exclusion is made even though, pricewise, gas- and steam-fired generators are more superior than coal-fired generators. Therefore, coal-fired generators planned for the seventh Five-year Plan are proxies which could be substituted by gas- and steam-fired generators. However, it is difficult to schedule construction of coal-fired generators because of the legal ramifications of delivery contracts. Gas reserves are immeasurable. Experience shows that the State Electric Company was able to save significantly in the operation of its gas- and steam-fired electric generators. Savings could be made if all the aspects related to gas supplies and deliveries are known.

Success of deregulatory measures in the electric sub-sector hinges highly on the fuel supply system. It means that the government must consider deregulation of the oil and natural gas sectors; deregulation concerns not only the supply but also the delivery of oil and natural gas.

Alternative Carriers of Medium Loads

In light of the prices of coal, natural gas, HSD or MFO and the costs of financing construction of gas-fired, gas- and steam-fired as well as coal-fired electric generators, the most appropriate carriers for medium loads are gas- and steam-fired electric generators. The reasons are:

1. A gas-fired electric generator with an HSD consumes substantial amounts of fuel even though its construction construction costs are relatively lower.
2. A coal-fired electric generator requires substantial construction costs; therefore, it is more appropriate as a carrier of basic loads.
3. Costwise, a gas- and steam-fired electric generator lies between the two extremes, a gas-fired generator and a coal-fired generator. It is very efficient.

---

17. Load Following Units

The price of natural gas is very competitive. Therefore, a gas-fired fired generator is most appropriate as a carrier of basic loads. A developer is inclined to sell electricity on a take-and-pay basis. Therefore, it is high time for the State Electric Company to consider gas-fired generators as carriers of medium loads and pursue an appropriate contracting strategy. The costs of transporting gas represent the difference in the prices of gas utilized for the two proposals. It is time to change the notion that gas- and steam-fired generators are appropriate only as carriers of basic loads.

Carriers of Peak Loads

Gas-fired electric generators which utilize HSDs are generally assigned as carriers of peak loads. If economic considerations demonstrate that hydro-electric generators are more superior as carriers of peak loads, then the hydro-electric generators may substitute for the gas-fired generators[18]. Since the construction period for a gas-fired electric generator is shorter than the period for a hydro-electric generator, then it is necessary to early on decide the carriers of the peak loads.

Assuming that cost-effective sources of energy are availale, reservoir pumps[19] are alternative carriers of peak loads. Basically, the costs of building reservoir pumps are higher than the costs of constructing a gas-fired electric generator. The economics of the proposal lie in the marginal costs of the basic loads. Therefore, reservoir pumps are feasible only [20] if the State Electric Company has an underloaded coal-fired generator or a gas- and steam-fired generator. A privately-owned coal-fired generator is definitely excluded from this category since, as required by an enabling contract, it must be operated to its maximum capacity.

---

18. The energy benefits of a hydro-electric generator are higher at peak loads even though its capacity benefits are minimal. The optimal capacity of a hydro-electric generator is determined by a trade-off between the two benefits.
19. Storage pumps.
20. It must be established that 150% of the marginal costs of basic loads are lower the marginal costs of energy at peak loads.

Results of Re-Analysis

A re-analysis of measures on increasing generation facilities during the sixth Five-year Plan and prospects for the seventh Five-year Plan is in order. It is based on the previously described approaches. Table V-1 outlines the compositions of additional generating capacities.

Table V-1: Planned Increases in Generating Facilities

	Sixth Five-Year Plan		Seventh Five-Year Plan	
Type	State	Private	State	Private
Hydro-electric generators	821	0	3392	0
Diesel generators	420	0	10	120
Gas-fired generators	1261	0	160	0
Gas- and steam-fired generators	3139	1098	66	66
Mini hydro-electric generators	123	0	0	0
Nuclear electric generators	0	0	0	0
Geothermal electric generators	353	135	58	895
Coal-fired generators	2595	1630	1375	4520
Total	8712	2863	5061	5601

Based on the above additional generating capacities, the following are worthy of note.

1. Additions to gas- and steam-fired generators during the sixth Five-year Plan balance out additions to coal-fired generators.
2. Additions to generating capacities during the sixth Five-year Plan fall below additions during the seventh Five-year Plan. This is due to reduced reserves. Reserves are reduced because of larger and expanded interconnection systems.
3. A nuclear electric generating station is an alternative for the subsequent Five-year Plan. Depending on its economics, nuclear power plants may replace coal-fired electric generating plants.

Java-Bali System

Table V-2 highlights increased generating capacities by the Java-Bali system. A major issue encountered by the Java-Bali system was the high amounts of reserves, 65%, during the 1993/94 fiscal year. (See the balance sheet attached to this report). The over supplies far exceeded the 25% ceiling deemed to be reasonable under present operation of the Java-Bali system.

To resolve the foregoing, the State Electric Company pursued aggressive marketing and increased connections to end-users. It attempted to eliminate obstacles to transmission and distribution through accelerated completion of funded crash programs.

Table V-2: Capacities Added during Sixth and Seventh Five-year Plans

	Sixth Five-Year Plan		Seventh Five-Year Plan	
Type	State	Private	State	Private
Hydro-electric generators	513	0	2018	0
Gas-fired generators	861	0	0	0
Gas- and steam-fired generators	2673	900	0	0
Nuclear electric generators	0	0	0	0
Geothermal electric generators	305	135	0	0
Coal-fired electric generators	2200	1230	800	4120
Total	6552	2265	2818	4495

As was stated earlier, the over supplies will be very detrimental to the State Electric Company when in 1998/99 the private sector begins generation of electricity. The above measures would help the State Electric Company prevent larger losses due to excess reserves.

Sumatra System

Table V-3 highlights additions of generating capacities by the Sumatra system.

Table V-3: Capacity additions during sixth and seventh Five-year Plans

	Sixth Five-Year Plan		Seventh Five-Year Plan	
Types	State	Private	State	Private
Hydro-electric generators	289	-	942	-
Diesel electric generators	88	-	-	-
Gas-fired electric generators	205	-	-	-
Gas- and steam-fired generators	400	-	-	-
Mini hydro-electric generators	38	-	-	-
Geothermal electric generators	5	-	20	520
Coal-fired electric generators	330	300	200	300
Total	1355	300	220	820

The Sumtara system comprises of independent sub-systems. In planning programs on Sumatra interconnections, however, the sub-systems are taken into account. (See details in attached supplement). The present Sumatra system resembles the Java-Bali system prior to the nineteen eighties. Proceeds of loans from the Asia Development Bank were set aside to begin construction of 275 kV transmission lines which connect the various regions of Sumatra.

Reserves in Sumatra are adequate. The West Sumatra-Riau system (Region III of the State Electric Company) will experience surpluses upon completion of the Ombilin coal-fired power plant, the Singkarak and Kotopanjang hydro-electric generating stations. The Sumatra interconnection system is strategic and very significant for the region's growth.

Other Systems

Basically, short-term measures on providing electric power in other areas of the country closely resemble those taken in Java-Bali and Sumatra. There are no meaningful difficulties in the way of such measures. The private sector is scheduled to take part in providing electric power in North and South Sulawesi, West and East Kalimantan. (Private electric projects are itemized in the supplement).

VI. CLOSING

The General Plan on National Electrification confines itself to efforts at increasing electric generating capacities. It is an area with the most revisions, especially since the private sector is expected to assume sizeable roles in this area. Presidential Decree No. 37/1992 opens the widest opportunities for the private sector to engage in the transmission and distribution of electricity. In spite of the stated opportunities, the private sector is yet to make an offer.

Several conclusions, therefore, can be reached:

1. A General Plan on National Electrification assumes an important role in maintaining a balance between the supply of and demand for electricity. The mechanism and method used in preparing a General Plan on National Electrification need to be improved to prevent under and over supplies of electric generating facilities.
2. Over the short term, the State Electric Company must give priority to measures on overcoming over supplies through aggressive marketing.
3. Interconnection systems need to be expanded.
4. Natural gas is a major potential source of energy to generate electricity. At present, however, only coal meets the prerequisites of a major source of energy. Measures are needed to give natural gas a more meaningful role.

The foregoing described growths in development of the electric subsector and the role of a General Plan on National Electrification mandated by Public Law No. 15/1985. Recommendations from the public at large are welcome to help improve this General Plan on National Electrification.

CERTIFICATION

The undersigned, Johannes S. Girsang, a sworn translator in Jakarta, Indonesia, License No. 737/1986, dated May 6, 1986, does hereby certify that the above is a full and true translation of the present document.

Johannes S. Girsang

DEVELOPMENT STUDY ON WOOD WORKING INDUSTRY

1. Project Title : Development Study on Woodworking Industry

2. Location : Jakarta, Indonesia

3. Executing Agency : Directorate of Wood and Rattan Industry

4. Objectives :
   a. Review of the existing wood industrial structure.
   b. Increase the export volume and export value of high value added wood products as the effort of increasing non-oil products export.
   c. Find strategy of human resource Development to meet the requirement at manufacturing high value added wood products.

5. Project Description :
   a. Identification of the types of high value added wood products ;
   b. Evaluation of technology being used, and identification of new technology for higher efficiency concerning utilization of raw material and production technology;
   c. Evaluation of products design which technically designated by the buyers;
   d. Market survey for prospective woodworking and wood furniture products;
   e. Assessment of required qualificat - ion of human resources in secondary wood processing industry producing high value added products, and needs for additional training for the existing workers, including improving workers' awareness of minimizing timber waste.

6. Estinated Time : 1 (one) year

7. Proposed Budget

a. External Inputs

1). Expert Services	:	25	mm	: US $	350,000
- Team leader	:	12	mm		
- Wood Working Technologist	:	4	mm		
- HRD Specialist	:	5	mm		
- Product design	:	2	mm		
- Product finishing	:	2	mm		
2). Survey	:			US $	183,500
3). Seminar	:			US $	5,000
4). Miscellaneous	:			US $	6,500
		T o t a l :		US $	545,000

b. Internal Inputs (in Thousand rupiahs)

1). Support personnel	:	Rp.	59.240,-
2). Survey	:	Rp.	84.000,-
3). Seminar	:	Rp.	4.500,-
5). Miscellaneous	:	Rp.	2.260,-
T o t a l	:	Rp.	150.000,-

TERMS OF REFERENCE
DEVELOPMENT STUDY ON WOODWORKING INDUSTRY

I. BACKGROUND

1. Justification of the Project

According to the study of the International Bank for reconstruction and Development (IBRD) in 1993, the Indonesian forest industrial sector has experienced a rapid growth since 1980 . The expansion rate of plywood industry has been phenomenal. Presently, there are 115 Plywood industries with total capacity of 9.5 millions M^3, and it has been followed by the increase of saw mills industry which gain 1973 industries and total capacity of 11.9 millions M^3. This high expansion rate of primary wood processing industry is as the reflection of the government policy that has been more plywood-promoting.

The policy of imposing high export taxes on sawn timber was aimed at establishing further processing of wood products, particularly woodworking and furniture products as major exporting industry for Indonesia. Currently there are 1030 secondary wood processing industries with total capacity of 11,5 millions M^3. The intention of the Indonesian Government to pursue promotion of the secondary wood processing sector is to increase export volume and export value of higher value added wood products as the realization of increasing export of non-oil products. Further expected result is that the sector is potentially able to deliver high employment. However, the unavailability of high quality logs in the secondary wood processing sub sector has been identified as a major constraint for further growth of secondary wood processing industry.

The finding of the IBRD study indicated that the incremental value added from shifting 20 % logs to secondary processing is about 10 %, while the incremental of employment is 11 %. The gains would be higher if residues from sawmilling could be productively and economically used for secondary processing. Therefore, continuous efforts for developing secondary wood processing industry to yield high value added wood products should be intensively done. This in turn would become substantial contribution to the growth of national economic.

In connection with the development of high value added wood products, the design and quality of wood products should be competitively acceptable for international consumers. The way to approach is through self innovation or transfer of technology from the more technically advanced countries. This could be answered by having qualified human resources for manufacturing high value added wood products. To obtain the expected skilled personnel, an assessment of human resources qualification required by the industries as well as additional training needs for the existing workers should be conducted. Moreover, the awareness of the existing workers regarding utilization of raw material efficiently should also be improved.

2. Project Title: Development Study on Woodworking Industry

3. Institutional Framework:

The supervisor of the study as well as the executing agency of the project will be the Directorate General for Multifarious Industry, Ministry of Industry.

4. Follow-up of the Project:

Next activities following the study would be implementing the results according to the priority and the possibility of having needed supporting factors. To carry out the study results, it is necessary to prepare and or encourage the industry to start producing recommended high value added wood products.

The assessed qualification of human resources required for the industry will be fulfilled by the existing workers who will be trained according to the training needs assessed.

The policy of shifting wood processing industry into high value added secondary processing products will simultaneously economize the use of limited raw material. The added value oriented products will encourage more investment of new enterprises on wood-working and broader employment.

II. OBJECTIVES

The basic objective of the project is to switch the production policy in wood processing industry from primary wood processing industry to secondary wood processing industry that yield high value added wood products. At the same time, the promotion of the secondary wood processing industry will give opportunity for more employment.

1. Immediate Objectives :

The project will analyze the potential secondary wood products having high value added, their future prospect, as well as its required skilled personnel for manufacturing.

The expected results would be:

- Increasing the export volume and export value of prospective high value added wood products;

- Increase the numbers of employment opportunities within the secondary wood processing industry;

- Feasibility study of the new chosen technologies for secondary wood processing industry;

- Assessed required qualification of human resources and required training needs for the improvement of human resources in the high value added wood manufacturing industries.

2. Long-term Objectives :

The successful accomplishment of switching wood production into high value added secondary wood processing would substantially contribute to the growth of national economic.

III. PROJECT DESCRIPTION

To accomplish the immediate and long-term objectives, the following activities should be taken into consideration :

a. A two month survey on secondary wood processing industry will be conducted, that will cover :

- Identification of the types of high value added wood products ;

- Evaluation of consumers interest on secondary wood products design.

- Anticipation of the future trends of prospective secondary wood products.

b. Evaluation of technology being used, and identification of possible new technology for higher efficiency regarding utilization of raw material and production technology. These evaluation and identification will be resumed within four months. The found new technologies are fully expected able to accommodate the development of new product designs and the use of diversified raw materials which eventually lead to the high competitiveness of the high value added wood products.

c. Evaluation of products design that totally and technically designated by the buyers and should be done by producers.

d. - Assessing human resources qualification required by the manufacturing industry of high value added wood products as well as the needs of additional training for the existing workers which would also be aimed to improve their awareness of minimizing timber waste.

- The assessment would cover job analysis and job evaluation which is expected able to match between job requirement and the personnel qualification. Training program that answer the needs of fulfilling the required qualification will result in possessing qualified human resources within the industries.

d. After finishing all field surveys, second stage survey would be carried out to cover additional data that required further analysis.

e. The consultant would submit an inception report after finishing each activity.

f. A preliminary report is expected to be handed in at the eleventh month to be reviewed by appointed committee members. A seminar will be conducted before final report.

IV. PLAN OF OPERATIONS

The duration time of the study will be 1 (one) year.

V. CONTRIBUTION OF THE PROJECT

a. External Contribution :

1). Expert Services	:	25 mm	: US $ 350,000
- Team Leader	:	12 mm	
- Wood Working Technologist	:	4 mm	
- H R D	:	5 mm	
- Product design	:	2 mm	
- Product finishing	:	2 mm	
2). Survey	:		US $ 183,500
3). Seminar	:		US $ 5,000
4). Miscellaneous	:		US $ 6,500
T o t a l	:		US $ 545,000

b. Internal Inputs (in Thousand Rupiahs)

1). Support personnel	:	Rp. 59.240,-
2). Survey	:	Rp. 84.000,-
3). Seminar	:	Rp. 4.500,-
4). Miscellaneous	:	Rp. 2.260,-
T o t a l	:	Rp. 150.000,-