

解除上海電荒之計劃

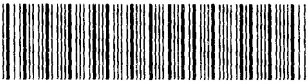
「聯合電力」計劃

上海電力公司述

中華民國三十六年五月



上海图书馆藏书



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## 計劃及其歷史背景

昔日之上海，分為若干地區，各自為政，現已合而為一，隸屬於同一系統。惟因此項歷史之背景，上海市所用之電，係由若干電業公司供給。當年各公司之創設，原為供給其特定區域之需要。每一公司就其僅係本市一部份之營業區域內，均有合法之專營權。每一公司均為獨立之組織。各公司之資金，發電容量，用戶數目，用電負荷及其他主要事項，均互不相同。

上海各電業公司，目前面臨一共同之問題。此問題關係本市公眾之利益，至深且鉅。各公司在日人佔據期內，發電所及設備均遭損失。因此之故，各公司發電容量併計，不足以供應本市需要之總數。各公司不但須解除目下之電荒，且須採取行動，擴大容量，以供應將來負荷之增加。

「聯合電力」之計劃，為設立一中心發電廠，以求上述問題之解決。

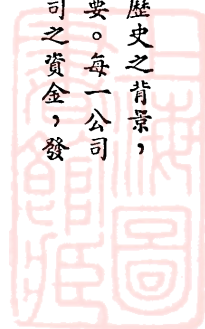
本市各電業公司，倘分別進行發電設備之增加，結果必添裝若干容量較小之機件，其規範及大小，必不一致，其效率必較鉅型者為差，而其所需之資金總額必較多。反之，中心發電廠具有下列極明顯之優點：

可減少所需之資金。

因機件容量鉅大，發電成本必較經濟。

可使基本負荷由效率最高之發電設備供給，至年份較舊，效率較低之機件，除在最高負荷暫予開用外，無庸于其他時間內開用，以資經濟。

可減少各公司之備用機件，使不生產之投資，減低至最小之限度。



可使各公司供電成本及電價之差別漸趨消滅。

「聯合電力」之計劃，可具備上述之優點，而對於現有各公司之專營權，則絕無妨害。

### 對於上海目下電荒及將來負荷增加之意見

現今上海市發電容量之不敷數，計達六〇，〇〇〇瓩。此六〇，〇〇〇瓩之不敷數，倘能彌補，即可由工廠內已裝就之生產設備，加以利用，同時可使九萬之失業工人，獲得工作。簡言之，上海目下電力之缺數，為需要量之三分之一。

目下本埠電力之不敷數為六〇，〇〇〇瓩，已如上述。供不應求之情形，此後必日益嚴重。預計在發電容量可能的增加以前，上海電力之短缺額，至少必增加至一〇〇，〇〇〇瓩，或竟至一五〇，〇〇〇瓩。

上述電力供不應求之情形，係將全部合併計算。至就上海電力公司而論，以其發電容量供給其本身區域內需要，極為充分。倘上海電力公司能解除其道義上之責任，而無庸向隣區輸電，則其本身區域內，不致有電荒之現象。

閩北，華商，浦東三公司之發電設備，倘未受損燬或被日人遷移，則目下之情形，亦不至如此之嚴重。

為求全市經濟之復蘇起見，上海電力公司雖無法律上之義務，寧願以可供給于本身區域內之電力，提出一部份，轉供于同業。蓋上述三公司倘不獲得此項供應，勢必無從供給其區域內主要之需要，即專供自來水所需之電，亦屬不敷。



上海電力公司因須供電于隣區各公司，對於本身用戶之用電，不得不加限制。又因同一緣由，不得不開用舊機，以供應基本負荷。此項舊機，本係作為備用機件之用者。供電成本，為之提高，服務標準，為之減低。上海電力公司為地方，為同業，固樂于為此種協助。然對於營業區域以外之電力需要，上海電力公司實無庸增加投資而求其供求之平衡。不特此也，即目下對隣區各公司之供應，亦應使其得以早卸責任。

### 營業權契約為推行「聯合電力」之計劃所先應具備之要件

為使「聯合電力」之計劃，得以于一定輪廓內推行起見，必須由當局授予保障，釐定準繩，訂立於契約之內，俾有遵循。

迄今為止，「聯合電力」僅為一種理想——為求解決上海電荒起見切實可行之理想。此項電荒情形，在十八個月之前，早為上海電力公司所逆料，且已言之者屢。本文所述「聯合電力」之計劃，迄今為止，尚無任何物質之基礎，蓋因缺乏支持，已蹉跎十八個月之久矣。

「聯合電力」之計劃之發展，所處環境，對於計劃之實現，實至困難。在已成過去十八個月之寶貴時間中，與實施「聯合電力」之計劃有關之條件，可稱每况愈下。國際情形，未臻安定。金融及幣制各問題，已成世界性。此項問題動盪于中國各地，尤以上海為最甚。目下上海擁有極多之人口，過剩之需電推動之機器，過剩而可利用于生產之游資。上海之所缺少者，為日用必需品，及三分之一之用電需求。「聯合電力」之理想，實在此種不愉快之氛圍中產生。

計劃中之電力設備，倘無必需之外匯，則無從取得。其所需外匯之多寡，須視採用何種設備而定，

約計之為：

美金六，六〇〇，〇〇〇元至一二，〇〇〇，〇〇〇元。

至為辦理建造工程起見，需用國幣資金。依照目前物價計算，所需以國幣支付之數額約為：

國幣一〇二，〇〇〇，〇〇〇元至一二六，〇〇〇，〇〇〇元。

欲籌措所需之資金：必須先使資金之供應者切實明瞭下列各點：

一・運用此項資金之辦法，換言之，即「聯合電力」在營業權契約下之權利與義務。

二・資金運用方面之利息及償付辦法。

「聯合電力」之計劃如付諸實施，則是否訂購新機器或用日本賠償之設備，應先加研究，方可決定。目前各國均感電力之缺乏，故國外機器製造廠所接之定單，已超過相當時間之供應力。所需交貨時間，較之戰前，約須遲緩二倍至三倍。另一方面，日本賠償設備之是否完整適用，亦須先行檢視，方可決定。如能適用，並須先辦妥允許拆裝之手續。

為求上述各項未臻明瞭之事項得以確定起見，其所先須具備之要件，為營業權契約之賦與。蓋倘無此項契約，則「聯合電力」之理想，事實上無法使之進展至籌措資金或接洽設備之地步。

### 「聯合電力」計劃之說明

## 發電廠及設備

### 發電廠



擬在黃浦江邊之適當地位，第一步先裝置一〇〇，〇〇〇瓩之發電設備。

此項設備至裝置完成所需之時間，估計如下：

如用日本賠償設備，為二年半至三年。

如訂購新機器，為三年半至四年。

此項設備所需之成本，包括輸電線路及互接線路，估計如下：

如用日本賠償設備 美金六，六〇〇，〇〇〇元

另加 國幣一〇二，〇〇〇，〇〇〇，〇〇〇元\*

如用新設備 美金一二，〇〇〇，〇〇〇元

另加 國幣一二六，〇〇〇，〇〇〇，〇〇〇元\*

(\*) 照目前物價及工資計算

新設備所需之資金，雖較日本賠償設備為高，但估計使用新設備，較之用日本賠償設備，每年供電成本，約可節省美金一百萬元。由另一方面言，倘使用日本賠償設備，本市電荒之解除，可提早一年至一年半。此層至為重要。蓋倘無此項時間因素在內，則對於賠償設備之投資，殊不值致慮。但採用賠償設備之究能否縮短電荒之時間，尚屬疑問。所可向日本取得之機器，未經檢視，情形不明，或有若干部份必須添配，方可運用。倘有訂購配件之需要，則其所需交貨之時間，與訂購整套新設備或相差無幾，亦未可知。

「聯合電力」之計劃，對於將來負有重大之責任。蓋倘上海此後用電負荷之增加，能符合通常之速度，則預測此後十五年之期間內，「聯合電力」所需置備之發電容量，將達到五〇〇，〇〇〇瓩。此項發



電容量所需之投資，約為美金一〇〇，〇〇〇，〇〇〇元。

如在初步一〇〇，〇〇〇瓩設備之裝置期內，負荷增加情形，足以證明有較大之需要時，則祇須屆時所需增加之投資，其資金供應方面，可獲合理之解決，「聯合電力」自必能擴充其發電容量，以資供應。是以初步工程計劃之訂立及附屬機件之購辦，包括燃料搬運器及底腳等項在內，概就將來擴充之情形，預先籌劃妥善。

「聯合電力」之計劃，倘付諸實施，現有各電業公司在其專營權契約下所負之義務，並不因此而解除。「聯合電力」計劃之擬具，固以由各公司共同參加為基礎。然各華商公司自願參加若干，並不有所勉強。「聯合電力」營業權契約對於發電事項，並無專營之權利。現在各公司依照其專營權契約得以發電之權利，並不受有影響。各公司間亦仍可自行相互連接，互通有無。「聯合電力」之營業權契約，應使新公司有權發電，並與其他各公司以線路相連接，俾得從事於電力之變售。

### 輸電及連接設備

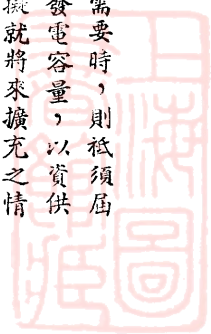
「聯合電力」之計劃，對於輸電方面，擬從事于下列之事項：

#### 建造高壓之架空輸電線路。

現有各公司之發電廠與將來之中心發電廠互相連接，及其發電事項之調整。

上項設備之成本，根據一三二，〇〇〇伏之輸電電壓計算，業已包括于上文所述之總成本之內（即美金六，六〇〇，〇〇〇元至一二，〇〇〇，〇〇〇元，另加國幣一〇二，〇〇〇，〇〇〇，〇〇〇元）至一二六，〇〇〇，〇〇〇，〇〇〇元。

上項架空線路，需以電塔支持，而電塔之建造，需要土地。此項電塔，如建造于道路之上，所佔面





積太多。且土地交易之磋商，亦係繁艱之工作。如用地下線路，則輸電及連接設備之成本，較之架空線路，須增多美金一四，〇〇〇，〇〇〇元。

輸電之電壓若干，亦至為重要。經初步之估計，採用各種不同電壓之建造成本如下：

電壓（伏） 建造成本（美金）

一三二，〇〇〇 二，一〇〇，〇〇〇元

六六，〇〇〇 四，二〇〇，〇〇〇元

三三，〇〇〇 六，二〇〇，〇〇〇元

三三，〇〇〇（地下線路） 一六，八〇〇，〇〇〇元

根據上列估計，一三二，〇〇〇伏電壓之採用，為事實之所必須。否則所需資金太鉅，購電者所負擔之電價，自亦必隨而增加。

一三二，〇〇〇伏之線路須用電塔支持，已如上述。每一英里之線路，約設電塔六座。預計在本市西北區鄉間及浦東鄉間，共數設五十四英里之線路，須建電塔三百座。此三百座電塔所需佔用之土地，共計約一七・六畝，即每塔約佔地〇・〇五八畝，各塔間之距離大致均等。如何使「聯合電力」能取得所需之土地，亦非簡易。又電塔之觀瞻不佳，亦足引起訾議。但因上述經濟方面之立場，權衡輕重，故而採用上述輸電方式。蓋為節省外匯起見，輸電線路自以實用為主，不應求其精美也。

### 資金之來源

以上所述之各項估計，已表示所需之資金，其半數必須為外匯，其餘半數則係當地之成本，可以國



幣支付。

所需資金中之外匯部份美金六，六〇〇，〇〇〇元至一二，〇〇〇，〇〇〇元，以中國目下財政經濟狀況而論，除由新公司向國外借貸而外，另無他途。

國外資金之能否取得，須視營業權契約內之條款，及對於外資如何償付而定。

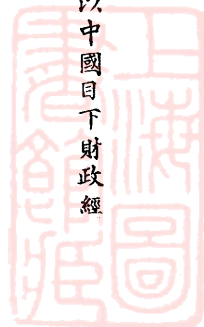
現經籌劃，此項計劃所需之外匯，大致可向國外獲得短期借款——或可以十年為期。惟須以「聯合電力」所發之美金公司債為担保，並須由中國政府允諾，就此項債券還本付息所需之外匯，准予按期結匯。

如上述之外資或外匯不能辦到時，則「聯合電力」或其他任何救濟上海電荒之計劃，實難望其成功。如電荒不能解決，本市經濟之復興，亦必無從實現。

上文所述，上海工廠內現有之機器——目下在停用中者——需要六〇，〇〇〇瓩之增加發電容量，即可開工生產。倘此項機器得以開工，約有九〇，〇〇〇之失業工人，可獲得職業，每月約可生產美金一七，〇〇〇，〇〇〇元之成品。是以電荒之救濟，可促成出口貨物生產之大量增加，隨之而可增加外匯之來源，不特「聯合電力」外匯資金償付本息之結匯可不成問題，即其他事業之創辦，亦必有重大之裨益。

至所需資金內國幣部份，大約擬發行「聯合電力」之普通股或優先股，以資籌集。但外幣資金部份，必須先行接洽妥善，蓋非此不能取得必需之設備也。

工作人員之培植



中國缺乏工程人才，無可諱言。

民國二十九年以前，工程師之價值，未受重視。當時雖學有專長，所用常非所學。工程人才之造就及養成，因八年戰事關係，所受影響甚多。

目前全國上下，方力求工業之振興，工程人才之缺乏，業已引起各方之焦慮。

上海電力公司自成立以來，即招致受有高深教育之工程師，灌輸以關於電業應有之學識及經驗。此項方針，行之多年，頗著成效。惟迄今為止，仍感人手之未能充裕，及可造之材之不易獲致。

倘「聯合電力」之計劃見諸實施，上海電力公司對於將來服務于「聯合電力」之重要技術人員，極願代為訓練，但預計此項人材，必須經過三年之嚴格訓練，方可勝任愉快。

### 上海電力公司贊同「聯合電力」之理由

上海全市之情形，與上海電力公司或其專營區域，休戚相同，關係綦切。此層上海電力公司知之甚謔。上海電力公司今日倘不以大量之電撥供鄰區各公司，儘可以之供應與其自己之各用戶，如此其本身區域內之供電，可毫不匱乏。然上海電力公司認為本市任何區域內之用戶，倘不能獲得所需之電力，則全市經濟復興，不免因之而阻滯。上海電力公司所以贊同「聯合電力」之計劃者，亦因認其為解決全市電荒最切實，最經濟之辦法，倘一旦見諸實行，則工業發展之主要障礙，可藉此而獲得解除。

上海電力公司對於「聯合電力」計劃之贊同，尚有其他重要理由，聲述之如次：

此計劃可使各公司營業成本，漸臻平衡。

此計劃可使全市各區目下不同之電價，漸趨一致。



此計劃可使各公司倘分別增添設備所引起之不合理狀況，可不致發生。

各公司目下向上海電力公司躉購電力之條件，實難令人滿意。此項計劃，可使上述躉購辦法，得獲終止。

此計劃可使上海電力公司以其所發之電，全部供應于其本身區域內，儘量為其各用戶服務。

上海電力公司目下向隣區各公司供電，由發電廠輸送至隣區各公司地界之內，輸電損失甚為重大。有時上海電力公司發電廠所發之電，達到隣區各公司之消費者時，中途損失竟達百分之四十之鉅。倘以此項電力供應于上海電力公司自己之用戶時，在用電者可沾實惠，而在中途亦不致有如此之耗廢。

### 結論

民國三十四年九月以來，上海電力公司鑒于電荒之必將發生，就此問題，曾屢為各界言之。倘早謀解決，實較易設法。蓋訂購新機器，在當時祇需十八個月至二十個月即可交貨，今日則交貨期須待三年至四年之久也。

電力之需要，並非靜止性，倘供給之遲延愈久，則最後之不數量必愈鉅。

本市工資，須隨生活費用上漲，實係必然之趨勢。工資既增，工業自須多用機力，以資生產。勞工之代價，在中國已不復低廉。是以必須有電力之協助，則高價之勞工，方可在世界貿易市場，從事于競爭，而立於不敗之地。

上海電力公司因上述理由，對於「聯合電力」之計劃，及創立中心發電廠之建議，熱忱贊助，並切盼關於「聯合電力」之營業及資金各契約之早日成立，俾得迅速進行，早觀厥成。



## The Plan and Its Background in Broad Outline

The Municipality of Shanghai is the product of the amalgamation into one administrative system of a number of adjacent areas which, in the past, were separately administered. Against this historical background it is natural that the Municipality should now find itself served by several electric utility companies. Each of them came into existence to serve the needs of a particular area. Each holds a valid franchise to supply electricity to what has now become a mere section of the Shanghai Municipality. Each is a separate corporate entity. Each differs from the other as to capital invested, generating capacity, number and load characteristics of consumers, and in other important respects.

However, these electric companies are faced, at present, with a common problem which vitally affects the general interests of Shanghai. All of them suffered damage and loss of plant and equipment during the period of Japanese occupation to the extent that their combined capacity is now inadequate to supply the overall demand of the city for electric power. Not only must they act to relieve this present shortage, but they must also take action in order to provide expansion of capacity to care for inevitable load growth in the future.

The "United Power" plan contemplates solving these problems by establishing a centralized generating station.

Any program of independent expansion of generating plant by the several individual companies would involve the installing of smaller generating units of miscellaneous sizes, specifications, lesser efficiency and higher aggregate cost. On the other hand, a centralized generating station offers the following indisputable advantages :

It will lessen the overall capital costs.

It will provide the economies in costs of operation that are inherent in large-capacity generating units.

It will provide economies by permitting the carrying of base load by the most efficient generating units, and the closing down of older, less efficient plant except over short periods of peak demand.

It will reduce the amount of idle capital which would have to be tied up in "stand-by" plant if each individual plant were to provide its own "stand-by" capacity.

It will tend to level out existing differentials in the operating costs and public rates of the several companies.

All these advantages would be achieved without infringement upon the franchise rights of the existing companies.

### **Some Comments on Shanghai's Present Power Shortage and Prospective Load Growth.**

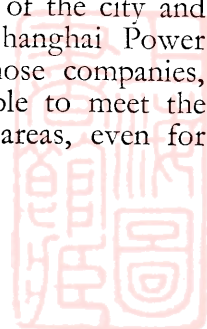
There is at present a generating capacity shortage of 60,000 kilowatts in the Shanghai area. Industrial equipment is actually installed in Shanghai factories which would utilize this 60,000 kilowatts if it were available and would thus give employment to some 90,000 workers now unemployed. Briefly, about one-third of the demand for power today is not supplied.

Before additional generating equipment can be installed, the present shortage of 60,000 kilowatts will have increased to at least 100,000 kilowatts, and perhaps to as much as 150,000 kilowatts.

The foregoing figures refer to the city-wide shortage,—that is, the shortage of combined capacity of the various companies in relation to the combined demand of all areas of the city. In contrast to this overall situation, Shanghai Power Company now has adequate capacity to meet the demands within its own franchise area. There would be no power shortage within its area if Shanghai Power Company were relieved of any moral responsibility for serving adjacent territories.

The present problem would not have been so acute if 100% of the generating capacity of the Chapei, Nantao and Pootung companies had not been damaged or removed by the Japanese.

In the interest of the economic revival of the city and without any legal obligation to do so, Shanghai Power Company has been supplying power to those companies, without which they would have been unable to meet the minimum essential demands in their own areas, even for water supply alone.



The supply of power to adjacent companies has necessitated restrictions of supply to the consumers of Shanghai Power Company. It has lowered the standard of Shanghai Power Company's service and increased its costs of operation, because old plant is now supplying base load instead of merely serving as "stand-by" plant. It is hardly necessary to state that Shanghai Power Company cannot make capital investment to provide electric service outside its own area and that Shanghai Power Company should be relieved as soon as possible of the existing burden of supplying power to adjacent companies.

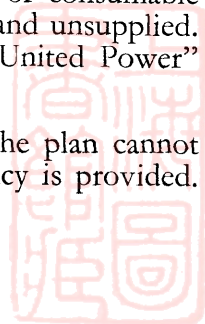
### **A Franchise is the Pre-Requisite for Developing the "United Power" Plan**

To provide a well-defined framework within which to develop the "United Power" plan, a new franchise must be executed. Only by means of a franchise can basic factors, undetermined at present but vital to the consummation of the plan, be resolved.

At the present stage, the "United Power" plan is only an idea,—a realistic attempt to find a solution for the power famine which was forecast by Shanghai Power Company eighteen months ago, and which remains unsolved. "United Power" is starting from nothing and is eighteen months late because of unsecured support.

The atmosphere in which the "United Power" plan is being developed is unfavorable. It has become increasingly so during the eighteen valuable months that have gone by. World affairs have become more unsettled. Financial and currency problems have become almost world-wide. China, and Shanghai in particular, have come in for a heavy share of them. Shanghai finds itself with a surplus of population, a surplus of power-consuming devices, a surplus of capital seeking gainful employment, but a shortage of consumable goods and about one-third of its power demand unsupplied. It is in this unhappy atmosphere that the "United Power" idea is being launched.

The power equipment required under the plan cannot be secured until the necessary foreign currency is provided.



The amount required, depending upon the particular equipment selected, will be :

US\$6,600,000 to US\$12,000,000

Chinese currency capital will be required to complete erection. Based on prevailing price levels, the Chinese dollar amount required will be :

C\$102,000,000,000 to C\$126,000,000,000

The required capital cannot be secured until the suppliers know definitely :

1. The provisions under which such capital will be employed,—in other words, the rights and obligations of “United Power” under its franchise.

2. The provisions for the servicing of the capital as to interest and amortization.

The question of whether new equipment should be purchased or Japanese reparations equipment utilized will have to be determined. Manufacturers abroad are so overloaded with orders, because of a world-wide shortage of power, that deliveries are now about two to three times slower than in pre-war days. On the other hand, Japanese reparations equipment cannot be decided upon until the available plants have been inspected and, if found suitable, release agreements have been completed.

The pre-requisite to the determination of these uncertain and unknown factors is a franchise. Lacking a franchise, the “United Power” idea cannot advance to the stage of active negotiations for capital or equipment. Other references are made in the following paragraphs to provisions in such a franchise.

## **The “United Power” Plan in Greater Detail**

### **Plant and Equipment**

#### *Generating Plant*

The plan contemplates an initial installation of 100,000 kilowatts of generating capacity at an appropriate site on the Whangpoo River.

The estimated time to install this equipment is :

2½ to 3 years if Japanese reparations plant is used.  
3½ to 4 years if new plant is ordered.



The cost of this equipment, including transmission lines and interconnections, is estimated as follows :

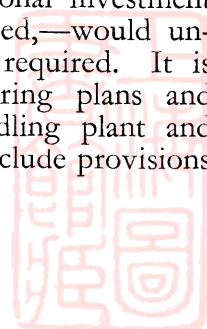
If Japanese reparations equipment is used	US\$6,600,000 plus C\$102,000,000**
If new equipment is used	US\$12,000,000 plus C\$126,000,000 **

\*\*At prevailing price and wage levels.

Despite the higher capital cost, it is estimated that the use of new equipment would result in operating economy of US\$1,000,000 per year as compared with the use of Japanese reparations equipment. On the other hand, the fact that relief of the power shortage can be secured 1 to 1½ years sooner by using reparations equipment is a factor of very great importance. If it were not for the time factor, investment in reparations equipment could not prudently be considered. However, there is uncertainty even as to the possible saving of time through use of reparations equipment. Available plants in Japan have not yet been inspected, and there is the possibility that they will require replacements of parts which will require as much time for delivery as new generating equipment.

The "United Power" plan carries heavy responsibilities for the future, as it must be anticipated that "United Power" will have to provide some 500,000 kilowatts of generating capacity within the next fifteen years, involving an investment of about US\$100,000,000, if Shanghai follows the normal trend of load growth.

If during the period of erection of the initial 100,000 kilowatts of plant the load growth confirms the need for more than 100,000 kilowatts of capacity, then "United Power,"—provided the required additional investment can be properly and prudently financed,—would undoubtedly provide the extra capacity required. It is contemplated that the initial engineering plans and accessory equipment, such as fuel-handling plant and even foundations, will from the start include provisions for such extensions.



It must be borne in mind that "United Power" would not relieve the existing electric utility companies of their present franchise obligations. The plan will not require those companies to participate in "United Power" to a greater extent than they choose, although it does contemplate that the existing Chinese companies will be partners in the new centralized company. The "United Power" franchise will not give it exclusive generating rights. It will not deny to existing companies their present franchise rights to generate. Nor will it deny interconnections between them. The "United Power" franchise will grant the non-exclusive right to generate, and the right to interconnect for bulk supply sales.

### *Transmission and Interconnection System*

The "United Power" plan proposes :

A high-voltage overhead system of transmission.

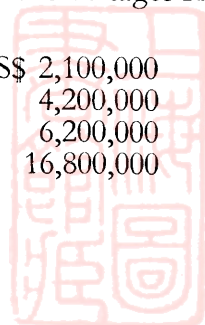
Interconnection and integration of the existing generating plants with the new centralized generating station.

The cost of this system, based on transmission voltage of 132,000, is included in the cost estimates of US\$6,600,000 to US\$12,000,000, and C\$102,000,000,000 to C\$126,000,000,000, referred to in an earlier paragraph.

An overhead system requires the use of towers, which in turn necessitates provisions for the acquisition of land. Such towers cannot occupy road areas. It is recognized that land negotiations are difficult in China, but if an underground system were adopted, the cost of the transmission and interconnection system would be about US\$14,000,000 higher.

In this connection, it is important to review the question of transmission voltage. A preliminary estimate of the comparative cost of utilizing various voltages for transmission is as follows :

132,000 volt system	US\$ 2,100,000
66,000 volt system	4,200,000
33,000 volt system	6,200,000
33,000 volt system (underground)	16,800,000



In view of the foregoing estimates, it is considered imperative that 132,000 volts should be adopted. Otherwise, the capital charges will be increased to the extent shown above, and rates to consumers will necessarily be higher.

The 132,000 volt lines would be supported on steel towers of which there would be about 6 per mile, or a total of about 300 towers for the estimated 54 miles of lines in the open country north and west of the city, and in Pootung. The bases of the towers would occupy an aggregate area of approximately 17.6 mow of land. Each individual tower would require about .056 mow, and the towers would have to be approximately equidistant from each other. The problem of acquisition of the land would not be simple. This complication, and also the objection to towers because of their unsightliness, are heavily outweighed, however, by the economies involved. Foreign exchange is too important to China's economy to waste upon refinements of a transmission system.

### Sources of Capital

The estimates previously set forth indicate that about one-half of the required capital must be in foreign currency and the other half in local cost or Chinese currency.

As to the US\$6,600,000 to US\$12,000,000 of foreign currency capital requirements, China's present financial and economic situation leaves no alternative other than to seek this foreign currency through borrowings abroad.

The support of foreign capital will depend upon the conditions of the franchise and the provisions made for the servicing of the foreign capital invested.

It is felt that short-term loans,—possibly with a ten-year term,—may be arranged by utilizing United States dollar bonds of "United Power" as security, provided the Chinese Government undertakes to release the exchange necessary to service and amortize such bonds in ten years.

If the foreign capital or foreign exchange is not obtained, neither the "United Power" plan nor any other scheme for

relieving Shanghai's power shortage can succeed, and there can be no economic recovery in the city.

As has already been shown, there is installed in Shanghai factories machinery,—now idle,—that requires the power output of an additional 60,000 kilowatts of plant. This machinery, if the power were available to put it to work, would give employment to some 90,000 idle workers and produce goods to a gross value of some US\$17,000,000 per month. It is obvious that expansion of power facilities will make possible greatly increased production of exportable products which, in turn, would build up China's foreign exchange balances and facilitate the servicing of foreign investments in "United Power" and other badly needed projects.

The Chinese-currency half of the required capital could probably be obtained through the issuance of "United Power" common or preferred stocks in Chinese dollars. However, the foreign-currency capital must first be arranged. Without it, the necessary equipment cannot be financed.

#### **Provision of Operating Personnel**

There is a shortage of engineers in China.

Prior to 1930, there was a lack of appreciation of the value of engineers. The talents of trained engineers were often wasted by diverting them to other than engineering employment.

The eight-year period of war further interrupted the education and supply of engineers.

Now that China is confronted with the need to industrialize, the shortage of trained men has become more acute.

Shanghai Power Company, since its advent to Shanghai, has sought highly technically-educated engineers and has trained them in the "know how" of the electric power business. Its efforts have met with great success, though it is still short of operators and of suitable material to train.

Shanghai Power Company will undertake, most willingly, to train operators for "United Power" but the provision of such trained personnel will require at least three years of intensive, supplementary effort.

## Reasons for Shanghai Power Company's Endorsement of the "United Power" Plan.

Shanghai Power Company is realistically aware that its own welfare, and that of the franchise area it serves, is inseparably interwoven with the general welfare of the entire city. Shanghai Power Company will necessarily be affected for better or worse by the general economic status of the entire area that constitutes the Municipality of Shanghai. Although Shanghai Power Company today could meet all the electric requirements of its own consumers if large blocks of power were not being delivered to the adjacent electric companies, it realizes that there can be no progress toward general economic revival until all of the consumers, in whatever areas of the city, are adequately served. Shanghai Power Company endorses the "United Power" plan because it believes it to be the most practicable and economical approach to the solution of the city-wide power shortage now obstructing the economic recovery and progress of Shanghai.

There are other important reasons for endorsing the "United Power" plan. Thus:

It will tend to level out the operating costs of the various electric utility companies.

This would lead, in turn, to a levelling of rates in the various sections of the city, where unavoidable discrepancies now exist.

It would eliminate the uncoordinated, hodge-podge situation which would necessarily develop if each company attempted to provide its own expansion of capacity.

It would bring to an end the present unsatisfactory arrangements whereunder adjacent companies purchase power in bulk from Shanghai Power Company.

It would permit Shanghai Power Company once again to utilize all its own energy within its own area for the maximum benefit of its own consumers.

It would eliminate the costly transmission losses which now occur between Shanghai Power Company's generating station and the point of consumption in the areas of the adjacent companies. In some instances as

much as 40% of the energy generated by Shanghai Power Company for delivery to an adjacent company fails to reach the ultimate consumer. This condition is particularly deplorable from the standpoint of Shanghai Power Company's own consumers, who would get the full benefit of the energy generated if it were available to them.

### Concluding Comments

Since September 1945, Shanghai Power Company has constantly pressed for attention to Shanghai's power shortage problem. If attacked earlier, a quicker solution could have been found because deliveries of new equipment could then have been arranged in 18 to 20 months, compared with the 3 to 4 years now required.

Let it be borne in mind that power demands are not static,—and that the longer the expansion of capacity is delayed, the greater will become the ultimate shortage.

Let us also bear in mind that increased living costs must be accompanied by higher wages. The higher the wages, the greater the reliance upon power as against handicraft. Labor is no longer cheap in China. Ample supplies of electric power are all the more necessary in order that China's high-priced labor may successfully compete in world trade.

It is in the light of these conditions that Shanghai Power Company endorses the "United Power" plan for a centralized generating station in Shanghai, and urges the prompt execution of a franchise and the necessary financial agreements to enable it to be brought to an early fulfilment.



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A Plan  
for  
Relieving Shanghai's Electric  
Power Shortage

The "United Power" Plan



SHANGHAI POWER COMPANY

May 1947

